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ELEVENTH ANNUAL MEETING

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AND

OTOLOGICAL SOCIETY

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Dr. Frederick Cheever Shattuck, Jackson Professor of Clinical Medicine, Harvard Medical School, delivered an address of welcome on behalf of the local medical profession, after which the President delivered his address.

ADDRESS OF PRESIDENT.

Gentlemen of the American Laryngological, Rhinological and Otological Society: We welcome you to Boston at the eleventh annual meeting of the society. To express to you all the gratification which I feel at the honor you have done me in electing me your president is impossible. It will give me greater pleasure if this meeting shall prove as successful as its predecessors, both in its scientific and social aspects. An ideal medical meeting should be, in my opinion, an interchange of views, honest and sincere even if divergent and opposed, as a trial is made up of every possible presentation of a case. The society, as a well educated jury, must decide upon the merits of the pleas presented by the readers. Above all, truth and light are what we seek. Let us do so with open minds, unprejudiced and willing to yield our most cherished beliefs if evidence can be produced to show that we are wrong. Does this plea appear to you unnecessary? Remember the storm of vituperation which followed Jenner’s glorious discovery of vaccination. Remember the disbelief which in very recent years Klebs-Loeffer’s bacillus, and later antitoxin, had to undergo. We must demand proof, and clear scientific proof, and not assertion merely; but if we receive it let us accept it gladly, willingly and enthusiastically.

How numerous have been the operations devised upon the nasal septum, and how many of their originators will say
frankly in a medical meeting to-day that their methods have since been improved upon? And yet in our hearts what respect have we for him who adheres to old operations only because he has devised them!

May our papers be careful and thorough and our discussions fearless and unprejudiced, with the one object in view of attaining the truth, irrespective of personal motive or interest. So shall we not only maintain the high standard of this society, so dear to us because we have reared it from its cradle and watched its growth with delight and pride—but also raise it to such eminence that any man shall be able to point to its transactions as the wisest, fairest and most progressive work in the specialty it represents.

The foundation of this society and its phenomenal success rest upon this one principle, to be fair to all and to give to every worthy specialist the opportunity to demonstrate his power publicly, to meet others and to exchange his best for theirs. This is the essence of true democracy, and it can only be a failure when self-seeking and demagogism take the place of public spirit and a desire for truth.

Men in older associations are sometimes surprised at the enthusiastic devotion shown to this society by its members. The reason may perhaps be found in the fact that membership in the older associations is rather a reward for long, successful service in the specialty, than a helping hand when it is most needed. When we have climbed to the top we enjoy the appreciation of others. But we never can forget the hand that helped us while we were climbing and the encouragement that cheered the dreary path.

No one who will study the earlier transactions and compare them with the present, can fail to be proud of our progress, not only in the kind and variety of subjects treated, but in the scientific research and accuracy of observation shown. The section meetings have been eminently successful and have demonstrated the wisdom of continuing them. To my mind, nothing shows our progress so much as do these section meetings. A few years ago we should have been justly proud to have had such programmes at our annual meetings as we now have at the sections. During the past year the activity of our members has not decreased. It is impossible in the space allotted to do more than allude to the excellent work of Coakley, Luc, Freudenthal, Turner, Coffin, Kyle and Mosher
on the frontal sinus, and of Richards, Stucky, Berens on the general subject of sinus diseases; while we find intra-nasal surgery and deformities of the nose represented by Richardson, Gibb, Mosher and Berens; papers on the pharyngeal lesions by Myles, Packard, Cline, Ingals, Leland and Hopkins, and neuroses by Hudson Makuen. These contributions and many others in the transactions of our sections may serve to give an idea of the activity of members of this organization.

And now, gentlemen, it is my pleasant duty to welcome you to Boston in the name of your Boston fellows and in my own. We have tasted the hospitality of the South in Kentucky, and of the West in Chicago and Cincinnati. Washington has shown us her wonders, New York her wealth and luxury, and Pittsburg her industries. Boston can show you monuments of the past which have been a large factor in making this great country what it is—a university which founded among the first in the land, has always stood and stands today for the best of all knowledge and progress in America, and a medical school, recently endowed with magnificent buildings and equipment, which will, we hope, enable us to do better work in medicine and surgery than has hitherto been possible anywhere. To those interested in hospitals, the Massachusetts General, the Eye and Ear Infirmary and the City Hospital will appeal as having the newest ideas in construction and in management.

The contagious department of the City Hospital, which is under the management of Dr. McCollom, is a model in antiseptic construction, and has, we believe, the best possible appliances for the treatment of contagious diseases.

The new out-patient department of the Massachusetts General is solving one of the great problems in out-patient work, which has been to so regulate records that they shall be of value as statistics and yet shall not fall into the hands of the patient, to be conned over and reported in a garbled form elsewhere. As the patient arrives, his record on a large card is sent to the department to which he is accredited by the admitting physician. On reaching this department the patient is brought to the physician in charge and the card bearing his name has entered upon it the diagnosis and treatment required. The patient is then dismissed and his card is sent down to the out-patient office, where it is indexed both under the head of name and of diagnosis. In this way the patient himself does not see
the entries made as to his symptoms or disease, while the physician is enabled to refer to the office for reports of classes of disease, or for names of patients which he requires. Should the patient be transferred for opinion or for treatment to another department, his card is so marked and a page carrying it conducts the patient to the designated specialty. Thus every card records all opinions delivered by the authorities of each department the patient may visit, and a large library of clinical cases is rapidly being accumulated.

It may not be amiss to allude in a few words to the teaching of laryngology at present in use in the Harvard Medical School, since most of us are interested in this class of work. Laryngology is taught in the third and fourth years of the course. Lectures being given once a week during the latter half of the third and first half of the fourth year. The whole number of students is divided into sections and clinically instructed in the use of instruments, technique and diagnosis at the various hospitals, under different instructors, each student getting about twelve exercises. The study of anatomy of the sinuses, of the nose and throat has been introduced and is taught by one of our members. It seems to me that the study of anatomy of this specialty by the students marks a distinct advance.

In the new out-patient department already alluded to, a room is set apart for anatomical and pathological specimens of nose and throat diseases. The study of sinuses and newer methods of examining the trachea and esophagus have greatly broadened our specialty, so that the time given to the study of laryngology seems ridiculously small. The student is most carefully instructed in the more important surgical operations, which without years of study and practice he can never attempt, and which naturally he will seldom see. The whole number of hours given to surgery is about 583, to laryngology and otology 135. Does the general practitioner see over three times as much surgery as he does of nose, throat and ear diseases, and, more important still, does he do three times as much of it?

Time forbids, gentlemen, that we should go more fully into this subject. We have a long and interesting programme before us, and I declare the 11th annual meeting of the society open for the transaction of business.
PRESENTATION OF CASES.

Tympano-Mastoid Exenteration, Showing Healing of Cavity by Blood-clot, and Wound by Subcutaneous Silk Suture: Dr. Frank B. Sprague of Providence, R. I., showed this case. The patient was a boy of 19, who gave a history of chronic suppurative otitis media dating back fifteen years. Three weeks ago Dr. Sprague performed a radical mastoid operation after the Stacke-Zaufal method. The cavity was allowed to fill by a blood-clot up to the drainage tube, and the external mastoid wound was closed by subcutaneous silk sutures, so that now the scar was scarcely visible. An ordinary cigarette drain was inserted into the tympanum and allowed to come out through the opening of the canal, in which was placed a stiff rubber drainage tube, about half an inch in diameter, for the purpose of giving a good conformation to the canal, and an opening of sufficient size to insert the dressings. The tube was allowed to remain in about a week. At the present time, the whole canal was well formed, and new skin formation was well under way. The case was a good illustration of what the organized blood-clot could do in the repair of the mastoid wound in chronic cases, where radical operation was necessary.

This patient, Dr. Sprague said, prior to the operation had suffered from epileptic convulsions during the past seven years, the seizures coming on about twice weekly. Since the operation he had been entirely free from attacks, and it would be interesting to note whether it would have a permanent beneficial effect on the epilepsy.

A Case of Angio-Neurotic Edema: Presented by Dr. O. B. Douglas of Concord, N. H. The patient was a man, 41 years old, who recently came under the speaker’s observation, complaining of a sudden swelling of his tongue. He stated that last Christmas he had had for the first time a similar experience. The swelling first involved one edge of the tongue, and gradually extended to the other, subsiding on the side first affected as it increased on the opposite side, and usually disappearing in the course of twelve hours.

He had also had similar manifestations involving the right arm, face, scrotum, etc., subsiding usually in twelve hours. There was never any pain nor rise of temperature, and usually no premonitions nor discoverable immediate cause. The patient was an habitual drinker of Bass’ ale, and occasionally of
whiskey. His appetite was usually good; his bowels were regular.

The case was interesting, Dr. Douglas said, on account of the possible occurrence of edema of the glottis during one of these attacks. Osler had reported a number of similar cases, in two of which death occurred from acute edema of the glottis.

**DISCUSSION.**

Dr. Wolff Freudenthal of New York said that from the history given by Dr. Douglas, he was inclined to regard the case as one of urticaria or giant urticaria. He had observed a number of such cases, and in one that he reported about fifteen years ago the larynx was affected. The usual history obtained from these patients was that the attacks followed some indiscretion in diet, and that fact should not be lost sight of in the treatment of these cases.

Dr. Thomas H. Halsted of Syracuse, N. Y., said he agreed with Dr. Freudenthal that Dr. Douglas' case apparently belonged to one of the varieties of urticaria, and was closely allied to angio-neurotic edema. In three such cases that had come under his observation, two developed edema of the glottis.

Dr. Halsted said that one of the most important features in connection with this condition was the possibility of its following the use of diphtheria antitoxin. It was well known that this remedy frequently gave rise to various types and degrees of urticaria and of angio-neurotic edema, and the possibility of its causing edema of the glottis, which might be mistaken for the presence of diphtheritic membrane in the larynx, should not be overlooked.

Dr. Charles W. Richardson of Washington, D. C., said he thought the case shown by Dr. Douglas was one of angio-neurotic edema, and when it affected the larynx there was usually a great deal of infiltration of the tissues of the neck. In many of the cases there was a marked hereditary taint, and in one case that came under the speaker's observation the condition could be traced back through three generations. The father had had three attacks in which there was marked edema of the pharynx and larynx, with threatened suffocation, and the son had two similar but less severe attacks. One peculiarity of the hereditary factor in these cases was that the male members of the family were more prone to be affected than the
female. The condition was often associated with errors in diet. It usually subsided very quickly upon purgation and free incision.

Dr. William L. Ballenger of Chicago, Ill., said that about eight years ago he reported a case of angio-neurotic edema which was apparently similar to the one shown by Dr. Douglas. The patient was a young woman of 23, who was on her way to the theatre. While on the train she developed a severe headache, and after traveling about five miles she had an attack of suffocation. She left the train at the next station and was brought to Dr. Ballenger's residence. When he saw her, she was suffering from acute dyspnea, and upon examination he found the uvula, the lateral wall of the pharynx and also the glottis somewhat edematous. In addition to that, both sides of the nose were edematous and much infiltrated, and the patient was in an extremely nervous state of mind. Under the use of astringent applications, the condition practically disappeared at the end of twenty-four hours.

In this case there was no history of any other member of the family ever having been similarly affected. The young woman was a teacher; she was of a neurotic temperament, and had considerable digestive disturbance. There had never been a recurrence.

Dr. J. A. Stucky of Lexington, Ky., asked if there was any history of rheumatism in Dr. Douglas' case. He was inclined to believe that these manifestations were associated with the acute lithemic condition.

Dr. Lewis A. Coffin of New York inquired as to the condition of the stomach and bowels in Dr. Douglas' case, and said that while the causes of these manifestations were numerous, he thought that in the majority of cases the condition was due to gastro-intestinal trouble. In one case under his observation, a woman, the immediate symptoms were quickly relieved by sedatives, and this, followed by lavage of the stomach and bowels, gave relief for some time; in fact, until another attack was brought on by some indiscretion in diet.

Dr. James E. Logan of Kansas City, Mo., said he had noticed that many of these patients partook liberally of cheese, especially in the form of Welsh rarebits.

Dr. John F. Culp of Harrisburg, Pa., mentioned the case of a woman who developed this condition every time she indulged in eating nuts, and her last attack was produced by eating a
small quantity of nut candy. The tongue and palate became very much swollen, and suffocation seemed so imminent that preparations were made to do a tracheotomy. Under applications of cocain solution, however, and the use of ice, she became comparatively comfortable in a few hours. This patient, Dr. Culp said, had long suffered from chronic indigestion, and had some trouble with her bowels.

Dr. Harry L. Myers of Norfolk, Va., mentioned a case in which the edema involved the eyes. This patient gave a distinct history of rheumatism and asthma. In another case the larynx was much affected. The treatment that seemed most efficacious in the cases he had seen was large doses of benzoate of soda and injections of pilocarpin.

Dr. O. B. Douglas, in closing, said that during the patient's first attack adrenalin chlorid was applied, and apparently had some good effect. It was tried again in the second attack with no effect whatever. Appreciating that the condition was neurotic in character, he administered whiffs of chloroform until the patient became unconscious, when for the first time the swelling remained stationary. It did not, however, immediately begin to subside.

In reply to various questions, Dr. Douglas said that this man gave no history of rheumatism; he had never been poisoned by ivy or sumach; he was not constipated and had never complained of any stomach symptoms.

Dr. Douglas said that in another case that came under his care recently the edema of the larynx was relieved by spraying with adrenalin chlorid solution, and recovery was very prompt. That patient was a woman.

PRESENTATION OF INSTRUMENTS.

Dr. Chevalier Jackson of Pittsburg, Pa., exhibited a number of new instruments, including a bronchoscope, an esophagoscope, a tracheoscope, a laryngo-pharyngeal speculum, and a long forceps, and gave a practical demonstration of their use.

Dr. Thomas J. Harris of New York asked Dr. Jackson whether the lamps in the instruments he had shown worked properly. He had heard the criticism made that because of deposits of mucus, or for other reasons, the lamps frequently went out in the course of the manipulations, and on that account some operators had gone back to the use of a good reflecting head-light.
Presentation of Instruments.

A New Septum Cutter: Dr. William L. Ballenger of Chicago showed this instrument, and demonstrated its use. It was devised for the purpose of facilitating the sub-mucous window-resection of the nasal septum. The mucous membrane was first incised and elevated, and then a small incision was made in the septum. The septum cutter was then introduced, and the operation was rapidly completed. By means of it, a window-resection of the septum could be done in a very few minutes.

Dr. Ballenger also showed an improved tonsillar snare for the partial removal of the tonsil.

An Improved Head Lamp: Dr. J. A. Stucky, of Lexington, Ky., said that one great desideratum in the nasal sinus and mastoid operation, as well as operations within the pharynx, was plenty of light without too much heat. He considered the lamp he showed an improvement on the Jackson lamp in that it did away, (1) with the metal reflection; (2) it fitted the head comfortably, and could be worn for hours with ease; (3) the sixteen candle power lamp used did not produce as much heat as the ordinary ten candle power; (4) the lamp could be removed or adjusted by an assistant without the operator touching it.

A New Septotome: Dr. Walter A. Wells, of Washington, D. C., showed this instrument, the purpose of which was to cut out of the cartilaginous portion of the septum a tongue-shaped flap, and to accomplish with a single incision at least as much as was done in the Asch operation with two separate incisions. This overcame the necessity of removing one set of scissors to substitute another, which might prove a serious drawback in case one was operating upon a nervous patient under a local anesthetic.

In the Asch operation, the result of the incisions was to create four small triangular segments, with their points in apposition, which meant that we had four possible points of sloughing. With the instrument shown by Dr. Wells, but a single flap was cut, and this having what many rhinologists considered the ideal shape for this operation, the chances for sloughing should be decidedly lessened.

By means of a screw, the tongue-shaped flap might be shortened to any desired length. The instrument was so constructed that the flap, when cut, was bent well to the other side, thus converting the two stages of the Asch operation into one.
DR. JACKSON’S INSTRUMENTS.
Moreover, he thought a decided advantage was gained over the Asch instrument as regarded the introduction of the septotome. There was, in the latter, no sharp point to become engaged in the tissues as it was being introduced. It had a large and a small jaw, the former for the free side; the latter for the side obstructed. Even though one side of the nose be completely obstructed, the shape and size of the smaller jaw was such that it might be wedged in without any laceration of the tissues.

The object of the flat band of steel, which was attached to the larger jaw of the instrument, was that it would act as a spring, and force back into the median line the flap that had been cut out of the septum, a very important provision to prevent its being caught by the instrument as it was being withdrawn.

Modified Head Lamp: Dr. Wendell C. Phillips of New York showed this lamp at the request of Dr. H. Bert Ellis. It was a Nernst light, and could only be used with the alternating current.

Dr. H. P. Mosher of Boston showed the following new instruments:

1. A wire cheek and lip retractor for use when entering the antrum through the canine fossa, and for dressings by the same route after the operation. The retractor was made of wire and thus was lighter than the ordinary retractor made for that purpose. It had its three prongs so bent that the canine fossa was widely exposed. One end of the retractor was made for the right cheek, and the other for the left. The retractor could be used in order to expose the teeth and gums of both jaws in the ordinary routine of the first examination of a patient.

2. A safety pin closer for use in the esophagus and the trachea. This device was originated for the case of a patient with an open safety pin, point up, in the esophagus. The essential part of the safety pin closer was a ring placed at right angles to the end of a long wire handle. The size of the ring was such that it could pass a large esophageal tube, while the handle was of a sufficient length to allow the ring to project well beyond the end of the tube. A forked wire was used with the ring in order to engage the knee of the pin and push it through the ring. As this was done, the point of the pin was disengaged from the mucous membrane and the pin closed. The safety pin closer could be improvised very easily for any
DR. BALLENGER'S TONSIL INSTRUMENTS.

SIZE OF FLAP.

DRAWN HALF SIZE.

DR. WELLS' SEPTOTOME.
length and size of tube, and for any sized pin. A set of esophageal instruments should have two or three rings of different sizes. By bending the ring upward, so that it was more or less parallel with its long handle, it made a good penny catcher, and by bending the handle somewhat an inch or two above the ring, the ring could be made to hug and explore the front wall, the posterior wall or either side of the esophagus at will.

3. A nasal splint. This splint was devised in order to treat a case of fracture of the orbital rim of the superior maxilla combined with a fracture dislocation of the nasal process of the same bone. The upper end of the nasal process of the right side projected very markedly outward and caused great deformity. The deformity was readily reduced, but the usual bandages and splints would not hold the fracture in the corrected position. The base ball mask splint was then made. It held the fracture easily, and the result was excellent. The advantages of the new splint were its steadiness and its power.

The splint consisted of an ordinary base ball mask, with two set screws. These could be adjusted laterally and vertically, so that pressure could be applied at any given point on either side of the nose. Owing to the support which the splint obtained from the forehead, the chin and the sides of the face by the pads placed at those points, the mask could be bound firmly to the head and face, so that it could not slip. The wires of the mask gave such a fixed point of departure for the application of the force of the set screws that as little or as much pressure as was desired could be used. In this way, the
splint could be employed either as a retaining apparatus for a fracture, or as a correcting apparatus after operations for old fractures of the nose, with lateral deformity. With such a splint it would be possible to do a certain amount of orthopedic work, so to speak, on the nose.

After the pressure of the screws was no longer necessary, the screws could be removed and the mask worn alone for a time as a safeguard against any accidental trauma. In the case where the splint was first used, the child wore the mask in this way for a few days. This allowed the parents to leave her at night without anxiety.

EXHIBITION OF SPECIMENS.

Epithelioma of the Larynx: Dr. Chevalier Jackson showed this specimen, which was one of squamous-celled epithelioma of the larynx, and was removed post-mortem from a patient who had been under the care of Dr. E. S. Montgomery, of Pittsburg. Laryngectomy had been refused by the patient.

Epithelioma of the Antrum: Dr. Jackson also showed this specimen, which was removed from a man about sixty. The entire upper maxilla was involved in the epitheliomatous process, and was removed. The patient lived for two years after the operation without a recurrence. The preliminary ligation of the external carotid rendered the operation practically bloodless, and thus a tracheotomy was unnecessary.

Epithelioma of the Larynx: Dr. Jackson also exhibited this specimen, which was one of laryngeal epithelioma perforating the thyroid cartilage. It was removed by total laryngectomy, taking out the glands at a subsequent operation. There was a fatal recurrence at the end of four months.

Killian’s Inspection of the Trachea and Esophagus: Dr. H. P. Mosher of Boston demonstrated this on the dead in a sitting position, as was usually done. Dr. Mosher said that a much better view of the parts could be obtained by placing the patient on his back, with the head hanging down over the edge of the table. If Killian’s method failed after a short trial, he advised doing a tracheotomy, and then inserting a pair of bent forceps and seizing the foreign body under the guidance of a Kelly cytoscope.

In the removal of foreign bodies from the esophagus, Dr. Mosher said he did not favor the use of the old-fashioned probang.
Obstruction of the Eustachian Tube.

PAPER:

OBSTRUCTION OF THE EUSTACHIAN TUBE A FACTOR IN POST-OPERATIVE MASTOID FISTULA AND IN CHRONIC SUPPURATION OF THE MIDDLE EAR.

THOMAS HUBBARD, M. D.

My attention was called to the question of tympanic drainage in the course of observation on certain patients having permanent perforations of membrana tympani. The intermittent discharge was at first of catarrhal character and later muco-purulent or purulent. The cause of recurrence was either irritation or infection from the auditory canal with increase of fluid in the tympanum, or congestion of the Eustachian tube with consequent obstruction to normal tympanic drainage. With this conception of the important function of the tube in mind one cannot escape the conclusion that it should be carefully studied as a factor in all conditions of the middle ear and cells accessory thereto, in which drainage is diverted externally. In the cases above referred to, having perforate drum membrane with tubal obstruction, all that was necessary was to relieve Eustachian congestion, cleanse the external canal, protect the tympanum from irritation and normal drainage was re-established. In other words, it is the relation of the calibre and functional activity of the tube to the quantity and quality of fluid to be drained away which determines the direction of flow. To illustrate this point one of the cases will be briefly narrated:

A gentleman having a permanent perforation of more than ten years' duration sought relief from offensive discharge and constant pruritus and erythema of the skin of the canal. The routine treatment was used for several weeks, antiseptic cleansing of the canal, removal of small granulations, tympanic irrigation through a large perforation, catheterization and medication of an obstructed tube by bougies dipped in 10 to 15 per cent. nitrate of silver ointment. This was followed by
the adaptation of an artificial drum membrane—a rubber disc on silver wire—and discharge promptly ceased, having been diverted through the Eustachian tube. A year after the initial use of the rubber disc as an obturator he reported that his ear was in satisfactory condition, hearing improved, and there was no perceptible discharge even during an attack of coryza. This case is narrated not to enlarge the subject matter under discussion, but to illustrate the principle of treatment of aural fistulous discharges in general, including a certain class of fistulae persisting after the operation for simple acute mastoiditis.

To be sure, the majority of fistulae at the site of mastoid operation are due to incomplete operation; either a pyogenic cell having been overlooked, or antrum not thoroughly cleaned out, or diseased attic being the source of pus. Such as these usually require a second operation. But there are cases in which a perfect operation is followed by a persistent mucus or muco-purulent discharge from a small fistulous tract in the depth of the excavation, and to this condition attention is directed. The first step is a careful examination of the Eustachian tube. An acute purulent mastoid inflammation of a few weeks' duration with constant flow of pus through the tube causes hypertrophy of normal lymphoid tissue in and around the tube and finally obstruction to drainage. Simple inflation by the Politzer method or even the catheter does not definitely determine the functional capacity of the tube. The use of the bougie is indicated for accurate diagnosis and treatment. The normal mucous secretion of tympanum and accessory cells left with intact secreting membrane will seek outlet by the channel of least resistance. The problem is to re-establish the normal function of the tube; to encourage active drainage—something more than merely an overflow of the tympanic contents.

In one case which I have in mind, in which a slight mucus flow from the wound persisted several months, a few applications of the bougie dipped in nitrate of silver ointment seemed to remove an obstruction and the fistula promptly healed. In this case there was probably granulation near the Eustachian orifice. Recovery would probably have taken place in time, but even a mucous fistula is more or less of an opprobrium in mastoid surgery, and rational treatment is urgent. The habit of diverted drainage should not be allowed, if pos-
sible to prevent, for it is not improbable that even Eustachian
secretions, following the path of least resistance, may be per-
manently directed toward the fistulous tract, if tubal obstruc-
tion near the pharyngeal orifice prevent for any considerable
time natural flow into the naso-pharynx.

The second division of the subject refers to tubal obstruc-
tion as an indication for radical surgical operation in chronic
suppurative conditions. Whatever be the cause of the purulent
discharge—more or less extensive areas of pyogenic membrane
in poorly drained cells, or eroded membrane, ultimate success
of treatment may depend upon the condition of the natural
drainage canal, the Eustachian tube. The proposition is simply
stated. If the tube be permanently closed, impervious to
forcible inflation and impenetrable by prolonged application
of the bougie, then the only way by which the external dis-
charge can be stopped is by destruction of all secreting mem-
brane, normal or pyogenic, and cicatrization and epidermization
of the tympanum attic and mastoid cells.

I can state my position more clearly by an illustrative case.
A lad of seventeen gave the history of having had a foul smell-
ing ear discharge for twelve years. The symptoms for which
he applied for relief were: constant discharge with odor, head-
ache, occasional vertigo. lack of power of mental concen-
tration interfering with his education, and impaired general
health. Routine treatment, attic and tympanic irrigation, gave
decided relief for a time. Persistent attempts to open the Eus-
tachian tube failed. There was probably recent obliteration
of the osseous portion, as he told me that for about four
months he had not been able to blow air through by the Val-
salva method, a practice which had formerly given him relief.
Treatment was stopped for a month to see if improvement
was permanent, and at the end of that period he requested
the radical operation, as he had relapsed into the former con-
dition. The radical operation was done and the result was
perfect. All annoying symptoms disappeared and his general
and mental condition are decidedly improved. In this case
permanent occlusion of the tube was a factor in deciding
against prolonged treatment and fortified the decision in favor
of the radical operation. It was also a factor in the excellent
result.

Conclusions: Obstruction of the Eustachian tube is a com-
mon sequence of acute purulent otitis media and purulent mas-
toiditis, and retards recovery.
It is a factor in causing chronic otorrhea, and post-operative mastoid fistulae or delayed healing of mastoid.

Permanent occlusion gives one indication for the radical operation in chronic purulent otitis.

The condition of the tube should be determined prior to radical operation, and if permanently occluded in the osseous portion there is no necessity for deep curettment of the tympanic orifice.

DISCUSSION.

Dr. Edward B. Dench, of New York, said the occurrence of a post-aural fistula after mastoid operation as the result of permanent occlusion of the Eustachian tube was a possibility, but he thought it was rare. Personally, he had never seen it. In a certain number of cases these post-operative fistulae persisted for some time, and the explanation offered by Dr. Hubbard for the chronic discharge might be the correct one. Almost invariably, however, the persistent suppurative process could be traced to the presence of a small piece of necrosed bone that had been left behind.

The speaker emphasized the absolute uselessness of depending on drainage through the Eustachian tube, and in any case where the otologist had to deal with a foul, persistent discharge resulting from the presence of dead bone, there was only one thing to do, and that was to remove the cause of the suppuration by surgical intervention.

Dr. Max A. Goldstein, of St. Louis, said that at the last Section Meeting he showed two cases where there was a distinct connection between the mastoid fistula and the Eustachian tube, so that by catheterization of the tube, and blowing air or vapor through the catheter, mucus from the Eustachian tube could be ejected through the mastoid fistula. In both of these instances the Eustachian tubes were perfectly free, and their contents were mucus in character—not mucopurulent.
I present to you a report of a case of carcinoma of the larynx in which complete laryngectomy was performed. The patient died two months later. The direct cause of death was obscure, and is especially worthy of consideration.

L. F., aged 43 years, woman, married, white, native of Australia; occupation, laundress; residence, Nome, Alaska.

First Examination, September 10, 1904. History: Had always been healthy and unusually strong, active and temperate in her habits; no previous serious illness. Two years before began to get hoarse, till voice entirely disappeared. Three months ago dyspnea was first experienced, and it gradually increased. In consequence she gave up work and went to Tacoma, where she consulted Dr. Peleg Wing, who immediately sent her to me at Colorado Springs.

Present Condition: Marked dyspnea; general appearance healthy, well nourished; height 5 feet, 6 inches, weight 152 pounds. Before dyspnea began, weight had increased from her average normal weight of 145 pounds to 160 pounds.

Larynx: After spraying with adrenalin and cocaine a good laryngoscopic image was obtained, showing a nodular tumor growing from the anterior wall of the larynx, and extending around two-thirds of its circumference. The upper surface of the growth was pushing up the false cords, so that they were tense and convex, but it did not extend above them. I removed a portion of the growth with a curette; it proved to be carcinoma. A curetting at the same time from the posterior wall showed normal membrane.

Sept. 5: The dyspnea became so serious that tracheotomy was done in an emergency by my colleague, Dr. Gildea.

Sept. 10: As Dr. W. W. Keen, of Philadelphia, happened fortunately to be in Colorado, I waited for him to perform a total laryngectomy. I had previously seen him do this operation. He very kindly operated the next day. His report is as follows:
Operation, Sept. 11, 1904: I rigged up extemporaneously a Trendelenberg apparatus for the administration of the chloroform by carrying a long rubber tube into the tracheotomy tube, and, in order to prevent kinking of it at the opening of the tracheotomy tube, I wound a spiral spring for about four inches around that end, but I soon had to discard it and administer the chloroform on some cotton and gauze held by a pair of forceps over the tracheotomy wound.

In order to get room enough, I first made an incision in the middle line from the tracheotomy opening to the top of the sternum. The trachea lay at a great depth. I next divided three rings below the tracheotomy tube. This enabled me to displace the tube downward sufficiently to work above it, though, as I have already said, I soon had to dispense with the tube entirely. When I took the tube out, I passed a silk suture through the skin and the margins of the tracheal wound and drew apart the two margins of the wound, passing the sutures through the skin of the two shoulders, so that I was able to dispense with retractors. She was then placed in the Trendelenberg position. I then proceeded to do a total laryngectomy in the manner devised by myself (Annals of Surgery, July, 1899). As the epiglottis was entirely free from disease, I left it in place. Only two vessels were tied. A light packing of iodoform gauze was placed in the upper part of the wound where it was shut off by suture from the pharyngeal cavity; this was to be removed the next day.

The day after the operation, her temperature by the vagina was 101.8 degrees, its highest point. By the fourth day it had fallen to the normal, and after that fluctuated between the normal and 101 degrees. Nutritive enemata were given for six days afterward. She was annoyed by a considerable amount of discharge from the wound, which, of course, was infected in consequence of the already existing suppuration. Food was taken by the mouth on Sept. 15, the fifth day. She sat up in bed on the second day and was out of bed on the fourth day. Wound healed entirely by October 25.

The specimen removed by operation consisted of the larynx, the first ring of the trachea—the epiglottis was not removed—portions of the right thyroid lobe and of the isthmus, with these a parathyroid gland and a normal lymph gland; also portions of both sterno-thyroid muscles. Microscopical examination of the growth showed carcinoma of the squamous type.
Section of the right margin of the isthmus of the thyroid revealed carcinomatous invasion; none in the lobes or muscles.

Convalescence: There was never any evidence of communication between the mouth and wound. Improvements in all particulars appeared to continue for several weeks. Three weeks after the operation, it was noticed that she was beginning to whisper intelligently.

Relapse: About the middle of October there was some enlargement observed over the site of the right lobe of the thyroid. Dr. Keen telegraphed, urging removal of the portions of the thyroid gland not excised at the operation. The patient would not consent to a second operation, and therefore an X-ray treatment was given, three times a week. The treatment did not arrest the slow increase of the swelling, and dyspnea began to appear, though in a mild degree and slightly to increase. Upon November 6, two months after the operation, she received her last X-ray treatment, which she did somewhat reluctantly, as she thought it had lately caused her to breathe with more difficulty. She then walked up a flight of stairs to her room, but quickly began to walk up and down the room in an excited manner, exclaiming she could not get her breath. The house physician came almost immediately and found her sitting erect with very little movement of the chest and cyanosis coming on. The doctor could not then introduce the tube which the patient usually wore, but passed down a probe without encountering any obstruction. A little clotted blood in a watery secretion was ejected, and then her head fell forward and respiration ceased; the heart continued to beat for perhaps one or two minutes.

Post-Mortem, sixteen hours after death: A well developed and nourished woman at middle age. Tracheotomy opening in the neck. Incision above and below the tracheal opening healed, with the exception of a small granulating area immediately below in front. Tracheal opening smooth and admitting the tip of the little finger without difficulty. On the right side of the tracheal opening a hard mass was felt about the size of a pigeon's egg, and on the left a similar mass of smaller size. Connecting the two a bridge of infiltrated tissue could be felt passing immediately below the tracheal opening. Two glands about the size of almonds could be felt on the left side along the posterior border of the sterno-mastoid; the upper end of the trachea, esophagus, thyroid and adjacent
A—Uninvaded lumen of larynx.
B—Cornu of thyroid cartilage.
C—Carcinoma.
D—Thyroid (right tube).
E—Site of emergency tracheotomy.

A—Uninvaded lumen of larynx.
B—Cornu and thyroid cartilage.
C—Carcinoma.
D—Right tube of thyroid.
E—Site of emergency tracheotomy.
Carcinoma of the Larynx.

A—Cricoid cartilage.
B—Uninvaded lumen of larynx.
C—Carcinoma.
D—Right lobe thyroid.
E—Site of emergency tracheotomy.

A—Cricoid cartilage.
B—Uninvaded lumen of larynx.
C—Carcinoma.
D—Right lobe of thyroid.
E—Site of emergency tracheotomy.
muscle were removed en masse. The trachea showed no appreciable changes or stenosis, esophagus negative. The lateral masses noted appeared to be intimately connected with the lobes of the thyroid. Heart and vessels normal except a few small atheromatous patches in the arch of the aorta. Pleura normal; lungs crepitant throughout; cut surfaces showed everywhere a large amount of dark frothy fluid. Fibrous adhesions between omentum and cecum, peritoneum smooth; no fluid. Left kidney small, less than 2-3 the size of the right one. Capsules stripped with difficulty; other viscera no gross changes.

Microscopical Examination: Kidneys and liver showed passive congestion and many small hemorrhages. Sections were made from the tissue on either side and below the trachea, including the upper end of the trachea for a distance of two or three rings. Section from left side including the left lobe of the thyroid showed nothing beyond dense round celled infiltration. Lower section showed small carcinomatous area on anterior mucous surface of trachea. Tissue external to trachea showed granulation tissue and muscle infiltrated with carcinoma. Right section showed no changes in trachea except desquamation of epithelium and round celled infiltration. Right lobe of the thyroid infiltrated with carcinoma of squamous type.

This is a summary of the facts.

There was a brilliant and successful operation, and except for the natural hesitancy of the operator to remove the entire thyroid body, which macroscopically appeared normal, there would probably have been no recurrence of the disease. The original tumor evidently began, as they so frequently do, in the thyroid angle, and remained confined almost entirely to the area covering the inner surfaces of the thyroid cartilages, but unfortunately it must have infected, through the cartilage, the thyroid gland. That the disease began intrinsic to the larynx accounts for its slow growth in two years, since it is usually rapid when its primary seat is extrinsic.

What was the cause of death? Suffocation? No, there was no chronic stenosis or even sufficient temporary swelling of the tracheal mucous membranes.

Acute edema of the lungs? No, there was not time for that, moreover the character of the respiration and the post-mortem appearances did not bear out this opinion; although
the frothy liquid which exuded on section of the lungs 16 hours after death may suggest it, it was too slight in amount.

The cutting of the pneumogastric nerve in the operation could not account for it, for the symptoms did not come on for two months. Excision of the pneumogastric, Dr. Keen tells me, is only followed by temporary disturbances of respiration.

Could death have been caused by suspension of the functions of the parathyroid glands?

As I find physicians generally are not well informed about the anatomy and physiology of these bodies, I venture to briefly speak concerning them. There are four parathyroid glands in man. They are found adjacent to the thyroid gland, two on each side of the neck. While variable in size and position, are of an average measurement of 6-7 m.m. in length, 3-4 m.m. in breadth, and 1.5 to 2 m.m. in thickness, and are oval in shape. They are apt to be mistaken for the accessory nodules of thyroid tissue which are variable in size, number and position. The parathyroids, while they may be mixed in with these, or even be enclosed within the capsule of the thyroid, are different in their structure, in which they resemble the pituitary gland, and are moreover quite distinct in function.

Experiments upon animals have demonstrated that if the thyroid alone is removed, a cachexia results, which leads on to myxedema. On the other hand, if the parathyroids only are excised there ensue entirely different symptoms of which polypnea, that is rapid breathing, and tetany are the most evident. When they are both removed, the parathyroid symptoms are less, but there appears a clinical picture resembling a complete case of exophthalmic goitre.

When parathyroidectomy is alone performed the symptoms are less, according to the number of glands removed, also if the animal is previously and even subsequently fed upon a vegetable or milk diet.

In connection with this influence of diet, it is well to note that the symptoms are very slight in Aves and Rodentia, are increased but still slow in the Ungulata. In the Anthropoidea there is well-marked chronic cachexia; and in the Carnivora the symptoms take an intensely acute and rapidly fatal course.

Chiefly for these reasons, the theory has been advanced that the parathyroid secretion is essential to an animal's well-being.
and that it antagonizes some toxin formed during the metabolism of nitrogenous food.

Might not it be a possible and even probable explanation of the cause of death of this patient, that first the removal of one parathyroid in the operation, and then the gradual destruction by the carcinoma of the remaining three, brought it about mainly in consequence of the effects of their obliteration upon the respiration.

With respect to the possible part played by the X-ray treatments, I would suggest that as one of the immediate effects of the exposure of the X-rays is to cause a local hyperemia, therefore an increased pressure was induced and so an added difficulty in the proper functionating of these glands. This might account for the patient feeling worse after the treatments, or again as it has been demonstrated that X-rays cause the deterioration of glandular tissue, they may have accelerated the destruction of the parathyroids.

**DISCUSSION.**

Dr. Chevalier Jackson said the case reported by Dr. Solly was an exceedingly interesting one, and had been skillfully managed. Professor Keen’s technique for total laryngectomy was well known, and could not be much improved, excepting in regard to the Trendelenburg anesthetizing tube, which he would probably eventually abandon. All the chloroform that was required could be very easily given on a gauze sponge held in a haemostatic forceps.

Dr. Keen had abandoned preliminary tracheotomy, and Dr. Jackson said he thought it was entirely unnecessary to keep these patients breathing through a tracheotomy canula for a week prior to the operation. The tracheotomy, if one was necessary, could be done at the time of the operation, the only argument against this being the advantage of a preliminary union of the trachea to the neck integument.

It was a good idea to have these patients sit up as early as possible after the operation, as many of the resulting pulmonary complications were the result of keeping them in bed too long, especially if supine. Morphin and deep anesthesia were the other two causes of pneumonia.

The speaker said there was one feature of the treatment described in Dr. Solly’s paper that he wished to criticise, and that was the giving of nutrient enemata. He regarded them
as a delusion and a snare, although it was sometimes necessary to give them to satisfy the family. He did not think they were of any value as a means of prolonging life. While the rectum was a good thing to drink out of, it was a poor thing to eat out of. Thirst could be quenched, but hunger could not be appeased. A stomach-tube was harmless, and enabled the placing of food where it could do some good. The odor of rejected alleged nutrient enemata made one hope that none had been absorbed.

Dr. Jackson said that in one of his cases of total laryngectomy he removed the involved pneumogastric nerve and the common carotid and jugular, and the patient apparently suffered no ill effects from it. About four months later the malignant process for which the operation had been done recurred in a gland on the opposite side of the neck; this increased in size until it pressed upon the pneumogastric nerve on that side, with resulting cadaveric paralysis, so that the patient could not expectorate, and he literally drowned in his own secretions. With each respiratory movement, the secretions bubbled up into the larynx, and then receded into the bronchi, until cyanosis and death occurred.

While he regarded Dr. Solly’s ingenious parathyroid theory plausible, and probably correct, he would ask if any nerve involvement had been noted.

Dr. H. W. Loeb, of St. Louis, said that of five cases of laryngectomy that had been under his observation, the first three died of a recurrence of the disease. In one of these there was a partial laryngectomy followed by a total laryngectomy, and finally death. In the other two, recurrence and death took place within six months after the complete operation. The fourth case was that of a stone-mason who had been treated by another physician for supposed syphilis of the larynx. The case proved to be one of carcinoma, as demonstrated by the microscope, and the entire larynx was removed. The man made an uneventful recovery, and was still enjoying good health, working at his trade, fifteen months after the operation, without any signs of a recurrence.

In the fifth and last case the larynx was removed without a preliminary tracheotomy. For a week after the operation the patient was fed by means of the stomach-tube. On the seventh day, while sitting up in bed, he had a sudden gush of blood from the mouth, and died. At the post-mor-
tem the operative wound was found to be in excellent condition, and death proved to be due to a pulmonary embolism.

Dr. John F. Woodward, of Norfolk, Va., said that in 1899 he was consulted by a man 40 years old who complained of hoarseness. There was neither swelling nor tumor, nor other apparent cause for the hoarseness. About three months later, however, a swelling was noticed between the true and false cords on the left side. He was treated for a time, and his symptoms improved, but subsequently he complained of dyspnea, and there was a swelling over the entire inner portion of the left larynx. A swelling of the thyroid was also noticed at that time. He was lost sight of again, and when he reappeared, about six months later, he said that he had visited the Johns Hopkins Hospital, where he had been told that he had carcinoma of the larynx and thyroid. At first he refused operation, but finally returned and begged to have something done for him. With the assistance of Dr. Joseph White, of Richmond, Va., a tracheotomy was done under cocaine with considerable difficulty, on account of the thickened tissues. The patient returned to his work as a railroad man, and remained comparatively well for about eighteen months. The pneumogastric nerve then showed evidence of involvement by pressure, and the patient died by being drowned in his own secretions, as in the case reported by Dr. Jackson. Dr. Woodward doubted the value of late operations in these cases, inasmuch as tracheotomy seemed to promise as much comfort and prolongation of life.

Dr. Wendell C. Phillips, of New York, said that in connection with the discussion of Dr. Solly's paper, the fact should not be lost sight of that those men who operated with comparative frequency for the removal of the larynx, either partial or complete, advocated a preliminary tracheotomy, and they did so for the reason that their final results were better, so far as the occurrence of septic pneumonia was concerned.

Dr. E. Fletcher Ingalls, of Chicago, said we should not lose sight of the rule that laryngectomy should not be done in extrinsic cases; that is, when the disease had extended outward beyond the walls of the larynx, but in intrinsic cases the results were often very favorable. The speaker said he had in mind two such cases where the operation was done for him between two and three years ago. In both instances the laryngectomy was done by the Keen method; in one of them a
preliminary tracheotomy was done, and in the other it was not. Whether such a preliminary tracheotomy tended to prevent the onset of a septic pneumonia was doubtful. An interesting feature in connection with his cases was that both patients were able to enunciate very distinctly after the operation, although the trachea was stitched to the skin, and one of them had learned to talk so that he could be heard distinctly fifteen or twenty feet.

Dr. Solly, in closing, said that in the case he had reported, the condition was an intrinsic one, and very clearly defined.

In the case reported by Dr. Jackson, the patient's death was apparently due to pressure on the opposite pneumogastric, and this might have occurred in his own case, although no nerve elements were found in the tissues removed at the autopsy, and there were no evidences, during life, that the opposite pneumogastric was involved in the recurrent growth. The patient raised a little frothy secretion just prior to his death, and on section of the lungs, some frothy matter was found there. The post-mortem was very carefully made, and no thrombus nor embolus was discovered; neither were there any evidences of renal disease, although one of the kidneys was small.
Paper:

An unusual case of laryngeal syphilis requiring tracheotomy.

Clement F. Theisen, M. D.

The following case, because of several rather unusual features, was considered worth putting on record:

Mrs. J., aged 38 years, married, consulted the writer for the relief of a gradually increasing difficulty in breathing. This she had noticed for nearly a year, and on any exertion, like walking up stairs, great dyspnea always came on.

There was, at the time the patient consulted the writer, a well marked respiratory stridor, and the inspiratory thrill, which is characteristic of laryngeal stenosis, could be felt when the fingers were placed over the region of the larynx. Her first husband contracted syphilis, and also developed a pulmonary tuberculosis, of which he died. The patient’s family history, however, is negative in this respect, there having been no cases of tuberculosis so far as known.

The patient herself was inoculated with syphilis by her first husband some years ago, and received a thorough course of treatment. At that time there were well marked constitutional symptoms, with necrosis of the bone in several of her toes, necessitating some operative work. No symptoms of laryngeal obstruction developed until about a year before the writer was consulted, and since then, as before stated, there had been an increasing difficulty in breathing.

On examination, the nose and naso-pharynx, with the exception of a slight naso-pharyngeal catarrh, were found practically normal. Patient had a slight chronic pharyngitis. The tonsils were not enlarged. The uvula was slightly elongated and thickened, and was infiltrated for about one-half its length from the tip. This portion of the uvula was very hard to the touch. There was no ulceration, nor any evidence of former ulceration.

The entire epiglottis was infiltrated, its surface being perfectly smooth, however, and was also extremely firm to the touch.
Case of Laryngeal Syphilis Requiring Tracheotomy. 31

It was pulled back to such an extent that the laryngeal entrance was practically closed, and the only way a laryngeal examination could be made was by pulling up the epiglottis after cocainization. The epiglottis was also free from ulceration. This peculiar position of the epiglottis is probably due to old lateral syphilitic adhesions. There is considerable resistance when the epiglottis is pulled up in making a laryngeal examination. The aryepiglottic ligaments appear thickened and shortened.

On laryngeal examination, a most interesting state of affairs was found. The glottis, with the exception of a very small opening posteriorly, was closed by a mass of cicatricial tissue stretching from side to side, just under the vocal cords. This was found to be extremely dense and unyielding when examined with a probe. Practically no changes in any other part of the larynx could be seen. The movements of the arytenoids were somewhat impaired, the result probably of an old perichondritis.

A careful physical examination of the patient was made by an excellent general practitioner, who found her lungs normal. He found a right movable kidney and a digestive disorder, otherwise the patient was found to be in a fair general condition.

The sputum was examined several times with negative results. The patient was told that her laryngeal condition was serious, and consented to remain in the hospital for a time. A piece of infiltrated epiglottis was removed and sent to the Bender Laboratory for examination. The report stated that the piece removed showed simply a chronic inflammatory process. No tubercle bacilli were found in sections of the removed tissue.

Iodide of potash was administered, in order to see what effect it would have on the infiltrated uvula and epiglottis. The uvula became decidedly thinner and softer, but no change in the epiglottis could be determined.

The administration of the iodide, however, brought on a sudden attack of laryngeal edema, with greatly increased dypnea, and it was then promptly stopped. Preparations for performing tracheotomy were made, but the edema subsided so quickly, with proper local measures, that it was not required.

As the patient did not desire any further operations at this time, she was discharged from the hospital, but was kept
under constant observation. During the succeeding few months she got along fairly comfortably, when she did not exert herself in any way, but finally, when attacks of dyspnea became more frequent, she consented to a tracheotomy.

She was again admitted to the hospital and a low tracheotomy performed. A general anesthetic was not used on account of the great laryngeal obstruction, but the operation was performed with a solution consisting of equal parts of a 1-2 per cent cocain and a 1-10,000 adrenalin chlorid solution, making a solution of 1-4 per cent cocain, and 1-20,000 adrenalin.

In a discussion upon the fatal results of operations upon the nose and throat (in the Transactions of the American Laryngological Association for 1903), I called attention to the value of this solution in performing tracheotomies. It should be put up under aseptic precautions, preferably the day of the operation, and the bottle kept under a 1-1,000 solution of biclorid, until the solution is drawn into a sterile hypodermic syringe after the patient's neck is prepared for the incision. It is only necessary to inject a few minims at different points along the line of incision. It is an ideal solution for tracheotomies in adults. I mean of course in cases in which the patient is in no immediate danger of death, so that the operator can take his time.

The use of a general anesthetic in cases where there is some form of laryngeal obstruction,—and that is usually the condition for which a tracheotomy is performed,—is not safe.

In emergency cases, where the patient is in imminent danger of death, the operator would of course not lose time in using any anesthetic at all, either general or local, nor could a local anesthetic of this kind be used, in performing tracheotomies upon children or very nervous adults. It should only be used in selected cases. The addition of even such a weak solution of adrenalin chlorid to the cocain solution, has distinct advantages, as it assists in preventing the possible unfavorable effects of the hypodermic injection of cocain.

The writer's patient complained of very little pain during the operation, and it certainly adds very materially to the comfort of the operator, if he is able to take his time in performing a tracheotomy.

The further history of this case is of no great interest perhaps, except that the gain in the patient's general condition has been quite remarkable.
Case of Laryngeal Syphilis Requiring Tracheotomy.

At the time of the operation she was much reduced, and since then she has gained over thirty pounds in weight. She is still wearing the tracheotomy tube, and will probably continue to do so for some time. She has been told that a radical operation, consisting of a thyrotomy, with a careful removal of the cicatricial tissue, followed by intubation, might relieve the breathing to such an extent that she would be able to permanently discard the tube. Up to the present time, however, I have not been able to get her consent, as she is so well satisfied with her condition. There is no way of dilating this stricture from above, as the cicatricial tissue is so absolutely unyielding.

The question as to just what to do in such severe cases is an interesting one. We must always be prepared to perform tracheotomy, and must bear in mind a statement of Simpson's, "That all cases of laryngeal or tracheal stenosis, however gradual, may at any moment take on a sudden exacerbation." The proper method of getting rid of the laryngeal stenosis after tracheotomy is of great importance.

J. Payson Clark has reported an interesting case of probable syphilitic stenosis of the larynx, in a young adult, on whom a tracheotomy had been performed for increasing dyspnea. Dr. Clark was unable to pass intubation tubes, so while the patient was under ether, the tracheotomy tube was removed, and gradually larger sizes of female urethral sounds were passed through the tracheal opening and up into the larynx. A pair of long, narrow, slightly curved forceps was then passed up through the tracheal opening and through the glottis. The intubation tube was put on the forceps, which was then pulled back through the tracheal opening until the intubation tube was properly adjusted. The patient, however, unfortunately coughed out the tube, and as he would not consent to have it reinserted the tracheotomy tube had to be put back, when he left the hospital. This method would probably not be applicable to cases of syphilitic stenosis, in which, as in the writer's case, the cicatricial tissue practically occludes the glottis, and is so dense. The patency of the glottis would first have to be restored by removing this tissue by a laryngo-fissure, after which this method would undoubtedly be very useful.

In cases of simple syphilitic stenosis of the larynx, caused by infiltration and thickening of the cords and ventricular bands, or perichondritis with edema of the mucous membrane,
intubation with gradually larger tubes, preceded in all severe cases by a tracheotomy, is, I believe, the best treatment.

The writer has had several cases of this sort, in one of which the stenosis was in the trachea, well below the glottis, and could be finally dilated with Schrötter's tubes.

A preliminary tracheotomy in severe cases of syphilitic stenosis of the larynx should be performed perhaps in the majority of the cases. Then the operator can work from above, without the danger of an attack of sudden edema, and asphyxiation of the patient.

There are many cases of syphilitic stenosis of the larynx on record, in which tracheotomies had to be performed for increasing or sudden alarming dyspnea. I will not take your time in considering them in detail.

Such cases have been reported by Jeanne, Leonard, Navratil, Descos, Stein, Hall, Clark, Woods, Spencer and in the cases reported by these authors, the stenosis was caused by infiltration and thickening of the vocal cords, and ventricular bands, and not by cicatricial tissue stretching between the cords.

In a fairly careful search of the literature of the past ten years, not many cases were found in which the stenosis was produced by cicatricial tissue occluding the glottis by uniting the cords or extending across the trachea.

Cases of this kind have been reported by Bleyer, Moritz, Collinet, Echtermeyer, Heymann and Hubbard. In Hubbard's case the diagnosis of syphilis was not absolutely positive. I was only able to find a few reports of cases in which the peculiar position of the epiglottis, closing the laryngeal entrance, was present.

Navratil and Zwilling have reported such cases.

Bleyer has reported eight cases of syphilitic stenosis of the larynx caused by a web formation. They were operated on by his combined method of tubage and the knife. He first cut through the membranous formation with Lenox Browne's sharp dilator, and then quickly dilated with intubation tubes.

In Hall's case of syphilitic stenosis, a tracheotomy had to be performed, and the patient died after coughing out the tube.

In Moritz' case there were adhesions uniting the cords, in a young woman, aged 24 years. A tracheotomy was performed.

Collinet has reported a case of syphilitic stenosis of the larynx, in which cicatricial tissue took the place of the cords and ventricular bands.
In Echtermeyer’s case there was a membrane uniting the cords and almost closing the glottis. A tracheotomy was performed, after which the membrane was removed, and intubation practiced until the patency of the larynx was restored.

In a case reported by Spencer, the stenosis was caused by the presence of firm irregular masses of tissue, which covered the vocal cords and ventricular bands. This was removed by thyrotomy.

In Descos’ case a tracheotomy was performed for extreme dyspnea, and later a laryngo-fissure was made, and the soft parts of the larynx resected. There were no adhesions in this case.

Navratil has reported two cases, in which tracheotomy had to be performed for laryngeal stenosis caused by syphilis.

Heymann has reported a number of cases in which membranous adhesions existed in the larynx. He does not give the exact number of cases.

In a case recorded by Sargnon daily intubation had to be performed before the stricture was permanently dilated.

Navratil and Zwillinger have reported cases in which the epiglottis was pulled back (as in the writer’s case) to such an extent that the laryngeal entrance was closed.

In Zwillinger’s case, there were adhesions between the epiglottis and aryepiglottic folds. In Hubbard’s case a thyrotomy was performed and the membrane uniting the cords removed.

**Conclusions.**

*a.* Intubation is particularly useful in the cases in which the stenosis is not extreme, and when it is caused by a thickening and infiltration of the cords and ventricular bands, thus narrowing the glottis.

In some such cases intubation may be carefully used perhaps without preliminary tracheotomy.

*b.* When the stenosis is extreme, or when membranous adhesions exist between the cords, leaving only a very small opening, a tracheotomy should precede attempts to dilate the stricture from above. It is in such cases that a sudden edema may be fatal before an intubation tube can be properly adjusted.

*c.* Tracheotomy, followed by laryngo-fissure offers the best chances of a permanent cure when there is much cicatricial tissue occluding the glottis by uniting the cords.
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CANDIDATE'S THESIS:

A CASE OF INFECTIVE THROMBOSIS OF THE SIGMOID AND LATERAL SINUSES AFTER ACUTE MASTOIDITIS. DEATH FROM MENINGITIS. AUTOPSY REPORT.

Arnold Knapp, M. D.

(WITH TEMPERATURE CHART.)

In no intracranial complication of purulent otitis has greater advance been made than in sinus thrombosis, both in comprehension of the morbid process and in operative extension of the treatment. Notwithstanding, the following is a report of a case unsuccessfully operated upon, in a measure due to errors in judgment on the operator's part. As the report is a complete one and mistakes if properly interpreted are always instructive justification for its publication is given.

J. A.; male; aged twenty-four; Italian; was admitted to the New York Ophthalmic and Aural Institute on January 26, 1905.

Present Illness: About three weeks ago, after exposure to cold, the patient felt pain in his left ear. A paracentesis was performed, discharge followed and patient returned to work. Yesterday and today he has felt quite ill, and has had chills.

Condition on Admission: A well-nourished young man; flushed face; anxious expression; excited. The region of the left mastoid is very tender. The tenderness extends downwards and backwards where the pain is apparently most severe. The head is held in a constrained position. There is moderate discharge from the left ear. Mt. bulging. Anterior perforation. Canal normal. T. 104.6°. P 120. Eye-grounds normal.

Diagnosis: The painful swelling posterior and inferior to the mastoid with rigidity of the neck point to an infectious process in the posterior cerebral fossa. This taken in con-
junction with high fever and the history of chills makes the diagnosis very probable of a perisinuous abscess complicating an acute mastoiditis.

Operation January 26, 5 p. m. Ether. To the usual incision, one extending directly backwards from the center is added. The periosteum is easily detached, as it is unusually loose. The cortex is dry. On removal of the cortex over antrum serous fluid exudes. The same fluid is contained in all of the mastoid cells. The mucous membrane in these cells is greenish and detached from the underlying bone. Free hemorrhage from the mastoid emissary vein. The sigmoid sulcus is distinct and seems transparent in places. On making an opening through this bone thin fluid pus appears, which was collected between the sinus wall and the bony sulcus. The mastoid process showed a pneumatic structure with well-developed tip and zygomatic cells. These were completely removed. The antrum was small. There were some granulations in the aditus. External semi-circular canal was exposed. The dura above this unavoidably laid bare. The bone over the sinus was then removed. The sinus wall for one inch in length was discolored and mottled, but without any granulations whatever. Exposure of the sinus was continued in both directions until healthy parts were reached. The sinus was soft and compressible.

The microscopic examination of the pus revealed diplococci in capsules.

Subsequent Course: On the following day the patient was restless, complained of pain in the wound; the temperature remained at 104°, pulse at 90. The temperature then came down gradually, and from the third day on it was nearly normal.

February 2. First dressing. The sinus appears to be covered with healthy granulations.

February 4. The patient complains of headache, and feels chilly. His temperature shot up to 104°. On the following day the wound was dressed. There is some swelling of the soft parts in the digastric fossa. On the following two days the fever continues, but is less. He still complains of headache and seems peevish. On the 7th the temperature was normal. On the 8th and 9th the temperature gradually rose to 103° with a chill. The region below the mastoid is swollen. There is some tenderness posteriorly and inferiorly. He com-
Infective Thrombosis of the Sigmoid and Lateral Sinuses. 39

plains of headache, does not take his nourishment well and seems to be failing physically.

Operation February 10: The wound is covered with flabby granulations. After these are scraped away the sinus is bare and protrudes like a solid sausage-shaped mass. The bone is removed along the course of the sinus posteriorly and down towards the bulb. The sinus is then incised. It is firmly clotted with a thickened outer wall. The outer wall is excised and a fairly healthy looking clot removed. In the center it is white and soft. A curette passed into the region of the bulb removes an apparently healthy clot from the dome of the bulb, but hemorrhage is not obtained. Passing backwards a clot is seen in the superior petrosal vein and at about a distance of one inch posterior to this, free hemorrhage takes place and the current is re-established.

The eyes show some swelling of the disc. In the evening the temperature was 104°; pulse 120.

On the following day he was very much better. He took his nourishment, but in the evening, after two chills in an interval of half an hour, the temperature rose to 105.6°; pulse 92. The region in the neck below the bulb shows absolutely no abnormality.

Operation February 12: The regular vein is exposed at the cricoid cartilage. It contains fluid blood. It is doubly ligated, divided, and the upper end dissected up as far as possible. A gland is removed. The upper end is left in the upper part of the neck wound. At 9 p. m. the temperature went up to 106.4°.

On the following day he complains of pain in the head, ear and throat. The respirations are more rapid and at 6 p. m. an infusion of 1½ liters of salt solution is made. In that evening the temperature rose to 108°. The eye-grounds are normal. Palpation about the wound and in the neck is negative.

Operation February 14: The sinus is followed back toward the torcular. An apparently healthy clot is removed and free bleeding occurs. The orifice of the superior petrosal sinus is curetted. From the region of the bulb very little can be obtained. The upper end of the jugular vein is slit open and a probe introduced to the base of the skull. The bulb is syringed with great care without evacuating clot or pus.

On the following days the patient is delirious with periods
of coma; great restlessness; general twitching; herpes labialis; right hemiplegia; involuntary passage of urine. Died on February 17, at 2 p. m., with symptoms of meningitis.

Autopsy February 17, 5 p. m.: A purulent exudate is present over the convexity of the brain, especially anteriorly, with considerable edema, fluid serum and enormously dilated veins. The superior longitudinal sinus is not thrombosed. Pus in the form of thick membranes is found in the posterior cranial fossa, especially about the anterior extremity of the right cerebellar lobe, on its superior surface and in the floor of the fossa. The dural surface of the lateral sinus shows no macroscopic lesion. On following the lateral sinus back, it is seen to contain pus and broken down clot with disease of the sinus wall directly anterior to the torcular. An unusually large set of veins given off from the left lateral sinus ramify over the tentorium. These veins are dilated and one is thrombosed. The other sinuses contain fluid blood. The left temporal bone is removed together with the jugular vein. The vein in its upper part contains a recent clot, its walls are somewhat discolored. The bulb contains a moderately disintegrated clot; the walls show no gross lesion. No extension from this area is visible.

Remarks: In this case the peculiar condition of the mastoid cells first of all attracts our attention. The cells and the antrum contained dark serous fluid, not pus. The mucous membrane was greenish and separated from the underlying bone. This is evidence of severe infection which leads to necrosis without the formation of granulations. A distinct perisinuous abscess was present between the sigmoid groove and the sinus wall. The sinus wall was discolored and mottled without any evidence of the formation of granulations. It offered, in other words, no barrier to the absorption of infectious material which in this case produced the fever and the chills. As the sinus was compressible and soft it seemed justifiable not to open the sinus, but to await developments. On the following days the temperature came down and the symptoms seemed relieved until on the eighth day after the operation, namely, the day after the first dressing, there was some rise of temperature. During this period the thrombosis probably was developing from an affected sinus wall or a parietal thrombus. It was not until the eighth day after the operation when the temperature rose, and thus the first
symptoms of disintegration of the clot became manifest. As the patient's pulse remained perfectly normal the gravity of the condition was not recognized. It is the opinion of no less an authority than Grunert that the pulse-rate gives us the most important clue as to the intensity of the pyemic process. In the following days the temperature came down as is seen on the chart and the operation was delayed until on the ninth day, when with sudden rise of temperature and a chill the patient's marked depreciation of health became noticeable. The sinus was then exposed and a firm clot removed, which only in its center revealed any softening or discoloration. The region of the jugular bulb was curetted without producing any return flow of blood. The removal of the clot in an opposite direction was followed by an apparent re-establishment of the circulation. The cerebral side of the sinus showed no macroscopic changes. The pyemic manifestations were not checked, the temperature continued to show intense variations with chills, and two days later the jugular vein was ligated. The patient had never exhibited any symptoms either in the neck nor in the upper part of the jugular vein indicative of a bulb thrombosis. It seemed, however, inasmuch as free hemorrhage had occurred from the torcular side of the sinus, that the source of infection must be located in the bulb. The normal jugular vein was ligated and the upper extremity followed up; an attempt to syringe out the bulb was made without evacuating any clots. The septic manifestations continued. The temperature rose to 108°. The jugular bulb seemed to show no active inflammatory signs, the continued source of infection had to be placed in the lateral sinus so this, at the third operation, was still further exposed and another disintegrated clot removed until the current was again re-established. On the following days the temperature showed no further variations, but remained between 102° and 103°, while symptoms of meningitis became manifest and patient died.

At autopsy a diffuse purulent meningitis was found. The cerebral side of the sigmoid and lateral sinuses showed no macroscopic lesion indicative of an extension of the purulent process. The sinuses contained fluid blood except the left lateral sinus, which in the unexposed area between the wound and the torcular showed a disintegrating clot and distinct disease of the internal sinus wall. One of a group of veins
ramifying in the tentorium was thrombosed. The bulb was carefully examined and was found to contain a slightly disintegrated clot without advanced signs of disease in the walls.

It seems to me that this case is instructive from the following points: The first is the confirmation of Leutert’s assertion that a rise of temperature persisting for more than a day or two in the usually afebrile course of an aural suppuration is always connected with disease of the sinus if we can exclude a superficial infection, pus retention in the tympanum or purulent meningitis, and we unquestionably erred gravely in not opening the sinus sooner than we did.

Second, the macroscopic appearance of a clot does not always indicate its harmlessness. Though it seems hardly proper to consider every clot as septic, for we must remember that the formation of a thrombus is a natural process to protect the body from infection by way of the blood vessels, still by so doing possibly less errors of omission would be committed.

As to the value of the so-called re-establishment of the circulation. It is generally stated that in dealing with a thrombosis the thrombus has to be removed with the curette until the return flow of blood is re-established. This may remove all of the infectious material in many cases. at the same time it does not necessarily cure a parietal thrombus or localized disease of the sinus wall, and arrest the pyemic process. In the above described case, notwithstanding the re-establishment of the circulation at two operations, infectious clots reformed from a diseased sinus wall in the unopened part of the sinus near the torcular, as was shown at autopsy. It would seem to me much safer in cases of unquestionable infective thrombosis in the lateral sinus, to expose this sinus to the torcular, then shut off the circulation at that point by firm pressure and to excise the entire external wall of the sinus. Any remaining disease of the inner sinus wall can then be most readily observed and treated, additional infectious clots cannot form, and on the other hand the danger of a meningeal extension is diminished.
Infective Thrombosis of the Sigmoid and Lateral Sinuses.

New York Ophthalmic and Aural Institute
48 East 12th Street

Diagnosis: Ac. Mastoidi Sinus Thrombosis
Meningitis

| Day of Disease | Jan. 26 | 27 | 28 | 29 | 30 | 31 | Feb. 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---------------|--------|----|----|----|----|----|--------|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Hour          |        |    |    |    |    |    |        |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |

| Pulse         |        |    |    |    |    |    |        |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| Respiration   |        |    |    |    |    |    |        |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| Oral          |        |    |    |    |    |    |        |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| Urine         |        |    |    |    |    |    |        |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |
| Nasal         |        |    |    |    |    |    |        |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |   |

Date: Jan 26

John Ambrosia
SYMPOSIUM.

Intracranial Complications of Middle Ear Suppuration.

PAPER:

MENINGITIS: ITS SYMPTOMATOLOGY, DIAGNOSIS AND TREATMENT, WITH REPORT OF A CASE.

S. MacCuen Smith, M. D.

The clinical picture of meningitis was well known to the physicians of antiquity, but owing to a lack of anatomic study, it could not well be differentiated from other diseases of the brain. These studies were begun and completed in the middle of the eighteenth and, in the main, at the beginning of the nineteenth century. Robert Whytt, of Edinburgh, in 1768, was probably the first to clearly differentiate the clinical picture, and he described a number of cases in children of acute diseases of the meninges which coincided quite accurately with our knowledge of tuberculous meningitis. By succeeding study, particularly on the part of the French and German investigators, the pathologic anatomy and symptomatology were developed to the point at which we find them today. In comparatively recent times attention has been chiefly directed to the bacteriologic origin of the disease. The tubercle bacillus, after its discovery by Koch, was readily proven to be the pathologic agent of tuberculous meningitis, and quite a number of other micro-organisms were found in meningeal exudates and the cerebro-spinal fluid. Among these, the diplococcus intracellularis meningitidis and the pneumococcus play the most important roles. The diagnosis of the affection has been greatly facilitated by Quincke's ingenious invention of lumbar puncture. The method has not only been of value in diagnosis, but in the treatment of the condition as well.
Clinically we distinguish between epidemic, suppurative, tuberculous and serous meningitis. Meningitis from aural disease differs from that due to other causes chiefly in that the symptoms are more severe and may be relieved by operation. Jansen states that pachymeningitis externa purulenta is the most common variety. It occurs twice as frequently with chronic diseases of the tympanum, as it does with the acute form. In this variety of meningitis a large proportion of the cases are insidious and without symptoms aside from those of the ear, and therefore, are not discovered until after operation; but on the other hand, they may begin with a chill and fever. Localizing symptoms are rare. Extension to the meninges may take place in one of three ways: (1) through carious openings in the skull; (2) through the natural communications, viz., the cochlea and semicircular canals, and (3) the infection may travel along the blood vessels and connective tissue. The cerebrum is affected when extension occurs through the roof of the tympanum; the cerebellum when it travels through the inner wall of the labyrinth. The most common mode of infection is either through the inner wall of the mastoid or through the roof of the antrum or tympanum. Jansen states that chronic aural disease affects the posterior fossa twice as often as the middle, and that acute aural suppurations affect the posterior fossa almost exclusively.

Leptomeningitis often occurs with sinus phlebitis, brain abscess or pachymeningitis, but is usually complicated only by encephalitis. This latter occurs in two forms: (1) the apoplectiform, which is fatal in from a few hours to three days, and (2) the insidious form, lasting from two to three weeks. Diagnosis of the latter is very difficult until serious disturbances of the sensorium have presented themselves. According to Macewen, leptomeningitis may occur without any visible tract along which the inflammation has traveled. In these cases the infection has been carried by the vascular system. Acute processes less frequently extend into the interior of the skull because the mucous membrane of the tympanum remains intact, but when this complication does occur it is due to the fact that the process has been sufficiently acute to cause thrombosis of the vessels.

Macewen further gives the mode of extension from the tympanum in chronic cases as follows: caries of the tympanic cavity does not usually affect the bone equally on each side,
but extends in certain directions. When the roof is attacked by the ulcerative process, a perforation is likely into the middle fossa of the skull. This osseous ulceration may go on for some time and perforation occur only after some injury has been received upon the skull in that region. Suppurative leptomen- ingitis of the basal ganglia and cerebellum may occur from extension along the sheaths of the facial and auditory nerves. The cochlea and semicircular canals, being surrounded by harder bone, are seldom attacked, although they may be in the tuberculous variety and following this a tuberculous meningitis may be set up. Osseous ulceration may occur either in the carotid canal or in the roof of the jugular fossa. The most frequent points of perforation are the tegmen over the tympanum or antrum and the sigmoid groove. When the dura is exposed by these perforations it throws out granulations to protect itself and assist in the absorption of disintegrated bone. This granulation tissue, when seen through the external auditory canal, may be mistaken for an aural polyp and removed with a snare, thus setting up an irritation which will produce a meningitis.

Meningitis serosa is a form of meningitis which can be distinguished from other varieties only after it has suddenly cleared up, either spontaneously or following operation. Barker expresses himself as being of the opinion that hardly one-tenth of the intracranial complications of aural disease are brain abscesses and that more than nine-tenths are made up of meningitis, septic phlebitis and pyemia.

Meningitis manifests itself in a protean manner. Occasionally the symptoms are so typical that it is impossible to mistake the affection, and, at other times, they develop in such a latent form that only with the greatest difficulty and by the most careful attention to the etiology can a tentative diagnosis be made. This explains why, at the autopsy, the serous membranes of the brain are so often found involved when such a condition had not even been suspected intra vitam; and, on the other hand, the membranes are found pale and glistening in some cases in which the most marked cerebral symptoms have accompanied the affection. Since the disease, as a rule, represents a diffuse affection of the surface of the brain, it produces general symptoms; and, as in the preponderance of cases, certain portions of the cortex are implicated, or the affection is propagated to the cerebral substance, focal symp-
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toms also develop. The diagnosis, therefore, necessitates the proper appreciation of both of these groups of phenomena. The general symptoms which may precede or accompany the focal symptoms are headache, fever, vomiting, slow pulse, respiratory disturbances, jactitation, epileptiform convulsions, general hyperesthesia, delirium, involuntary discharge of urine and feces, and phenomena which are almost focal, such as tetany, grinding of the teeth, rigidity of the extremities and retraction of the muscles of the neck.

Headache is the most constant symptom. It is due to pressure upon the dura, to inflammatory edema of the brain substance, or to an accumulation of fluid in the ventricles. It is always decided, and while the patient is conscious his most persistent complaint is of excruciating and tormenting headache. Even when in a comatose condition we often note that the patient grasps his head with his hands. Only in exceptional cases is headache absent or even less intense.

Convulsions and muscular twitchings are prominent. The muscular twitchings may assume the form of epileptiform convulsions; delirium is common, and, particularly in children, a peculiar cry with which they sometimes start from their coma, is characteristic: it has been called the "hydrocephalic cry."

The pulse, especially at the onset of the disease, is slow and this is all the more significant when fever is present: in the later course of the affection the pulse becomes more frequent, irregular and smaller. The temperature fluctuates markedly, varying between 101° and 106° F. The respiration is early influenced; it is increased in frequency, sighing, and finally becomes intermittent and may assume the Cheyne-Stokes type. Vomiting is common and shows the peculiarity that it is most prone to occur when the patient assumes the upright posture; as a rule it is not accompanied by nausea and often, with quite persistent vomiting, the tongue is observed to be clean. Vertigo is also a frequent symptom. Occasionally there is inability to swallow. Contraction of the pupil is often very decided. The latter is probably a spastic myosis, due to an irritation of the cortical origin of the oculo-motor nerves.

A symptom which is almost invariably present is painful contraction of the muscles of the neck. This often confirms the diagnosis and is produced by an irritation of the nerve
supply of the muscles of the neck and particularly the spinal accessory nerves. Phenomena belonging to the same category as the rigidity of the muscles of the neck are trismus, grinding of the teeth and spastic contraction of the abdominal muscles. The latter condition gives rise to the scaphoid retraction of the abdomen. Rigidity of the muscles, particularly of the extremities, and convulsions restricted to definite portions of the body are common symptoms. Hyperesthesia of the skin and muscles must be grouped with the most important diagnostic phenomena. This is particularly noticeable in the muscles of the neck and of the calves. The reflexes are at first increased, later decreased and may finally disappear altogether towards the end of the disease. The presence of Kernig’s sign has, in recent years, been included among the symptoms of meningitis, although its value should not be overestimated, as it is sometimes absent in well-marked cases of meningitis and is occasionally found in other conditions. Trophic and vasomotor disturbances in the skin are sometimes met with, and among eruptions herpes is the most common.

Constipation is the rule; later in the course, involuntary evacuations occur. The urine is excreted in small quantities and sometimes contains albumin. Sugar has been demonstrated in a few cases, and by some authors a remarkable increase in the amount of phosphoric acid has been noted. Extreme emaciation, often very rapid, is common, and is probably due to the cerebral effect upon the processes of metabolism.

The focal symptoms relate to paralysis of the motor area; occasionally monoplegias and hemiplegias are observed. Motor aphasia is not infrequent. As soon as the meninges in the neighborhood of the optic nerve become implicated the clinical picture of optic neuritis develops.

The symptoms naturally vary according to the principal situation of the meningitic inflammation. The convex portion of the brain is generally affected by suppurative disease, while basilar meningitis is much more likely to be of a tuberculous nature. It must not be forgotten that the spinal meninges are in many cases involved with those of the cerebrum, so that symptoms referred to the spinal cord are superadded to those developing from the brain. Suppurative meningitis is most commonly produced by contiguity, by way of the lymph-
Meningitis.

vessels or of the veins, and is due to caries of the petrous portion of the temporal bone and purulent inflammations of the middle ear. It may also be due to purulent catarrhal inflammations of the frontal sinus, operations upon the nose, the orbits, or in the aural cavity, to trauma, particularly fractures at the base of the skull, to wounds, to furuncles and to abscesses of the scalp.

The following * differential diagnosis between meningitis, brain abscess and sinus thrombosis, compiled mostly from Barr, is interesting in this connection:

As to the treatment, apart from employing general methods, such as the use of rest and the application of cold, very little can be accomplished. Surgical interference is naturally indicated in most cases of meningitis complicating aural disease. This procedure however is satisfactory only in a very small percentage of cases, chiefly from the fact that the serious nature of the ear disease is not recognized until the meningeal inflammation has become well established.

Some authorities claim that all cases of infectious meningitis terminate fatally. The writer's experience would not only seem to confirm this observation, but also to establish the belief that cases which recover after operation are those which have been termed "meningeal irritation" rather than cases of true infectious meningitis.

A recent addition to our therapeutic resources is the operation of lumbar puncture. According to Quincke, the inventor of this method, the operation is indicated in the following conditions:

1. In cerebral pressure, with threatening symptoms, where it is desirable to relieve the pressure.
2. In moderate, long-continued pressure.
3. In conditions in which increased pressure is assumed or suspected.
4. In cases in which it is desirable to examine the cerebrospinal fluid independent of the cerebral pressure and thus obtain an opinion as to the nature of the meningitis.
5. In cases in which the fluid is to be examined for diagnostic purposes (blood, toxins, agglutinins, etc.).
6. For the purpose of injecting fluids into the spinal canal as therapeutic agents.

In the treatment of meningitis, lumbar puncture is employed largely for the purpose of relieving pressure, and in some cases

*See tables, pages 50 and 51.
### MENINGITIS.

**PAIN.**

Pain is an early, severe and persistent symptom. Generally frontal and extends towards the vault, although it may be localized and correspond to the affected area.

**TEMPERATURE.**

The fever in this condition does not attain a great height, nor is it characteristic.

**PULSE.**

The pulse is in the majority of cases very rapid, but if there is local pus formation it will become slow.

**RESPIRATION.**

The breathing is very short and rapid and takes on the Cheyne-Stokes variety.

**RIGIDITIES.**

Rigidity of the muscles of the back of the neck and retraction of the head usually accompany meningitis. There may be convulsions with loss of consciousness to a greater or less degree.

### BRAIN ABSCESS.

**Onset marked by sharp, severe pain in ear, which extends over side of head and develops into exacerbating head pains, increasing on pressure or percussion. It does not disappear as long as patient remains conscious.**

**Temperature**

Temperature is at first high, then drops to normal and so continues until abscess ruptures, which is followed by a rise.

**Pulse**

In early stages pulse is rapid, but after 2nd or 3rd day becomes very slow and again in the final stages increases greatly in rapidity.

**Breathing**

Breathing here is very slow, deep and stertorus.

**Respirations in this condition are not affected.**

### SINUS THROMBOSIS.

**Pain**

Pain is produced in this condition by pressure or percussion over the posterior part of the mastoid. This may extend down the neck along the course of the jugular vein. Headache is generally present but it is not characteristic.

**Fever**

Fever is very high, with great oscillations, ranging between 100-102°F. and 105-106°F.

**Here the pulse is exceedingly rapid and as the condition continues it becomes very small and weak.**

**Respirations in this condition are not affected.**

**Rigidity is not, as a rule, present in uncomplicated cases.**
Sensations of chilliness and shivering are present, but not to a marked degree, although the onset may be shown by a distinct chill.

Rigors present to about same extent as in meningitis.

Chills in this condition are very severe and are frequently repeated and may be of one-half hour duration. They are followed by profuse perspiration.

Vomiting is almost invariably present. It is of the cerebral type and does not depend upon the taking of food. The accompanying digestive symptoms are constipation, and anorexia.

Vomiting of same character, but more severe and persistent. Digestive disturbances are likewise sympathetic and abdomen may be retracted.

Vomiting in this condition is generally present in the early stages, but is not severe. The tongue is dry and heavily coated and there is severe diarrhoea. These symptoms somewhat simulate enteric fever except that headache is more severe.

Optic neuritis is not uncommon, but cannot be depended upon as a symptom of value.


No special ocular phenomena.

Dizziness may be present in the early stages. The patient is extremely restless and often lapses into an excited delirium.

Drowsiness and slowed cerebral action. Dizziness is usually present, being especially marked in abscess of cerebellum.

Dizziness is not infrequently found. The intellect is not, as a rule, interfered with except in complicated cases.

It may end fatally in three or four days, or it may last for two or three months. The average case is probably about two weeks.

Abscesses usually continue for from 2 to 3 weeks, but may extend over longer period. Death comes on by coma unless in later stages it is complicated by meningitis.

This condition usually terminates in from two to three weeks, although the period may be much shorter. Death is usually due to pneumonia or metastatic abscess of liver, lung, kidney or brain.
of non-infective meningitis, uremia, etc., actually startling results have been reported.

The writer's own experience leads him to believe that lumbar puncture is of value chiefly as a means of diagnosis. The cerebro-spinal fluid has a normal specific gravity of about 1.010 and contains little or no albumin. In meningitis the albumin is greatly increased, while in cerebral abscess it is only slightly increased. It is claimed that the presence of more than one per cent is pathognomonic of meningitis.

The history of one case which I desire to report is as follows:

A. S., female, white, aged 6 years. Three years ago the child had an attack of pneumonia, complicated by an acute suppurative otitis media involving both ears. The discharge ceased in about two weeks.

Six weeks previous to admission to the hospital the patient became peevish and irritable; complained of pain over the eyes, in the frontal region, and in the right ear. After three weeks of more or less severe pain, a spontaneous rupture of the right membrana tympani occurred, relieving the aural pain, which, however, exerted no favorable influence upon the suffering referable to the frontal and occipital regions. Prior to, or immediately following the appearance of the suppuration, the attending physician noticed some tenderness and swelling over the mastoid region; this however, subsided within a day or two so completely as not to attract further attention.

Following irrigation, the discharge ceased at the end of one week. By this time the headache had become general, the pain being especially severe in the occipital region and the neck.

On admission the temperature was 103° F.; pulse, 120; respiration, 24. The child was drowsy, stupid, and not easily awakened. Examination of the right ear failed to disclose any discharge or other evidence of tympanic or mastoid disease except slight redness and bulging of the superior and posterior wall of the canal. Traction on the auricle or pressure over the mastoid failed to elicit any outcry or other evidence of pain. The patient rested quietly that night and during the ensuing day, but on the second night became restless and started up from time to time with a shrill scream, relapsing into stupor. This condition persisted for most of the second day, when the patient became more quiet, but developed marked rigidity of the muscles of the neck with strong retraction of
Meningitis.

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the head. Marked and almost continuous twitching of both arms and legs now became prominent symptoms, as well as involuntary evacuation of bladder and bowels.

In this condition the writer saw the patient and advised an immediate mastoid operation, his diagnosis of mastoid involvement being based on the history of the ear having previously discharged, more especially, however, upon the characteristic drooping of the superior and posterior wall of the canal. The cortex was somewhat harder and thicker than usually encountered in a child of her years; the tip was not involved. Neither pus nor other inflammatory debris was found until the antrum was reached. A small carious opening through the roof of the antrum exposed a moderately inflamed and pulsating dura. The radical operation was performed, but no evidence of further intracranial involvement was discovered. For two days following the operation the patient improved only in one respect, namely, the reduction of the temperature by two or more degrees. However, on the third day after operation the patient attained a gradual rise of temperature, starting at 103 degrees F., at two a. m., reaching 107 degrees F. and a fraction by eight p. m., when death relieved her suffering. The moribund condition of the patient was so far advanced that little or no anesthetic was required. The post-mortem findings would have been interesting, but unfortunately an autopsy was refused.

In conclusion, the writer would strongly urge on the part of the medical profession a more careful and better conception of the serious complications that frequently develop from diseases of the tympanic cavity that are regarded, from the symptoms presented, as simple in nature.

All suppurative processes of the organ of hearing should be considered a menace not only to the health but actually to the life of the individual thus afflicted. The importance of this doctrine is not in the least lessened from the fact that we see many cases of otorrhea that have persisted for years without having caused appreciable harm. The ultimate outcome of many such cases is too well known and appreciated to admit of any controversy. After all, the most reliable treatment for meningitis complicating aural disease, and other intracranial lesions from the same cause, is to promptly recognize and properly treat the initial ear disease.
The term encephalitis seems to have several distinct meanings. In the first place, there is the so-called polio-encephalitis, superior and inferior, in which the cranial nerve nuclei of the pons and medulla respectively are destroyed either suddenly (acute polio-encephalitis) or gradually (subacute and chronic polio-encephalitis). With this form allied to polio-myelitis or infantile paralysis, otologists have little to do.

In the second place there is the acute exudative encephalitis (hemorrhagic encephalitis) described by Dana as following influenza, cerebro-spinal meningitis, typhoid and other infectious fevers. This apparently never results in suppuration.

Thirdly, and of special interest to otologists, comes the acute suppurative encephalitis, a term synonymous with cerebral abscess.

This form of encephalitis, an end result of the extension from the ear cavities of pyogenic micro-organisms either directly, or along the blood vessel, furnishes together with meningitis, a diffuse result of similar infection, the principal cause of fatal outcome in the cases with which we have to deal.

Dana states that abscess occurs oftener between the ages of ten and thirty, and this corresponds with my experience. I have tabulated according to the age of onset, forty-three cases occurring at the Massachusetts Charitable Eye and Ear Infirmary, the Boston City Hospital and the Massachusetts General, and find that thirty-two cases occurred between ten and thirty, and eleven between thirty and sixty.

Prior to the appearance of Macewen's treatise, the subject of suppurative infection of the meninges and brain, resulting from disease of the middle ear, had not received the system-
Encephalitis and Brain Abscess.

atic attention it deserved, though many cases had been reported and the subject of brain abscess had been by no means neglected in the literature. This is not surprising in view of the universally hopeless prognosis of these conditions, both with and without operation.

A new impetus to the study and a fresh incentive to operation were aroused in 1893 by the work of this author, whose elaborate presentation of the subject from the pathological, symptomological and operative point of view, placed it for the first time on its proper plane, whether regarded from the scientific or from the purely practical standpoint. The increasing interest in this subject as well as the improvement in prognosis appears from the statistics gathered by various writers. Up to 1889 von Bergmann found only eight successful operations on brain abscess of otitic origin; up to 1894 Koerner had collected only 55 cases of operation both successful and unsuccessful; in the following year he had increased this number to 92. In 1898 Marsch found reports of 60 successful operations upon temporal and 12 upon cerebellar abscess.

The prominent symptoms of brain abscess are headache and vomiting, with normal or subnormal temperature in uncomplicated cases, slow pulse, progressive mental deterioration, mental dullness passing into apathy and eventually into coma, preceded or accompanied by convulsion. Pupillary changes, ocular paralysis and optic neuritis may appear, the latter less frequently than in tumor. Hemiplegia sometimes completes the picture, and generally denotes extension from the temporal lobe inwards upon the internal capsule.

The usual seat of abscess is in the tempo-sphenoidal lobe over the tegmen tympani, and in this direction the exploratory operation proceeds unless definite symptoms of cerebellar disturbance point to invasion of that organ. Such symptoms following ear disease demand prompt surgical interference. It is true that in rare instances a small abscess may be absorbed, or a large one near the surface may discharge spontaneously, but this chance is too remote to justify expectant treatment.

Trephining over the squamous portion of the temporal bone is not always necessary for the evacuation and complete discharge of the abscess and removal of all symptoms. This point is of practical interest in view of the following conclusion of Macewen with regard to the operation through the tegmen tympani: "Such an opening into the cerebrum suffices
for temporary purposes, but though it always ought to be
made in order to eradicate the source of the infection, it is
not safe to trust to it alone, as in many cerebral abscesses there
are sloughs of brain tissue which cannot be easily removed
in this way, but require a larger opening in the skull for
their evacuation."

The case which forms the basis of this opinion is sufficiently
important to place on record.

J. W., newspaper reporter, married, 25 years old, of Boston,
presented himself at the clinic of the Massachusetts Charita-
table Eye and Ear Infirmary July 31, 1901.

History: The left ear had troubled him for three years.
There was a discharge last winter which ceased up to six
months ago, when it reappeared. During the last six weeks
he suffered with frontal headache, but there was no pain in
the ear until two days before admission to the In-
firmary, when he awoke from a sound sleep with a
severe headache.

Examination showed a small amount of pus in the auditory
channel. The walls of the canal were slightly swollen, but not
especially tender to pressure. Landmarks of the drum mem-
brane were obscured by swelling. The posterior segment
of the drum was red and bulging. The mastoid was tender
to touch over the tip and antrum, but not swollen.

The hearing tests were as follows: Watch not heard; the
hearing for the voice was reduced about one-half. The tuning-
fork by air conduction was only heard one-twelfth of the nor-
mal time (T. F. 512 V. S. A. C. = 20 "heard 1"). Bone
conduction was normal (B. C. = 10 "heard 10"). Tuning-fork
applied to the skull was heard louder in the affected ear
(Weber F. 256 V. S. louder in the left ear). The test by Gal-
ton's whistle was normal. The low tuning-fork was not heard
(V. S. 192).

Severe headache appeared in a few days. The mastoid ten-
derness, however, gradually disappeared and also the swell-
ing in the canal. The temperature fell from 101°F. on
August 1 and remained at 99°F. for several days. The pulse
during this time varied between 60 and 70. On August 7,
seven days after opening the drum, the patient had a chill
and complained of intense frontal headache. The tempera-
ture quickly rose to 102°F., pulse 90.

Extradural Operation: Under ether the usual mastoid in-
cision was made and the periosteum was divided. A deep opening was necessary through sclerosed bone the entire distance. The antrum was found filled with pus. On enlarging the opening above, and posteriorly, softened bone with granulations and purulent matter were found. With chisel and curette the bone was removed from the middle fossa for over a distance of one inch in length, and a half-inch in breadth. The lateral sinus was also exposed about an inch. This was necessary in order to thoroughly remove all diseased parts.

The dura was normal in color and without bulging. The wall of the sinus showed nothing abnormal. The neck of the antrum was enlarged and the middle ear carefully curetted, removing the incus together with masses of cholesteatoma. The wound was irrigated with a bichloride solution (1 to 3,000) and sterile water and dressed in the usual way.

*Bacteriological Report*: Mixed infection.

For a few days after the operation the patient's symptoms improved. The temperature on the following morning was 100° F., the pulse 80. He complained, however, of severe headache (frontal). The ice bag afforded some relief.

August 16, at 4 a. m., on the eighth night after the operation, the patient was found pulling and pushing the bedclothes and could not be roused. The pupils were equal and contracted, but reacted to light. Temperature 98° F., pulse 102, thin and wiry. The temperature suddenly rose to 103° F., and the pulse fell to about 60. The patient was perfectly quiet and deeply comatose for four hours before operating.

*Intradural Operation*: The wound was reopened upwards over the squamous bone and posteriorly for about two inches towards the occipital protuberance. The skin and periosteum were retracted so that the skull above the mastoid was fully exposed. With chisel and rongeur forceps, bone was removed so that a larger surface of the middle cranial fossa was exposed than at the previous operation.

There was bulging outwards of the dura most marked over the tegmen tympani. No opening could be found in the dura. A hypodermic needle was passed twice upwards into the brain before pus was drawn into the syringe. A narrow knife was then entered at a point over the tegmen and passed upwards about one inch into the brain. The opening was enlarged by forceps and over four ounces of foul pus and sloughing brain tissue were evacuated.
The abscess cavity was thoroughly irrigated with a solution of carbolic acid (1 to 40), then one of bichlorid (1 to 3000). After all necrotic material had been removed the dural wound was wicked with a small piece of iodoform gauze. The wound over the skull was partially closed by sutures, and the cavity of the mastoid covered with thin rubber sheeting packed with plain gauze and dressed.

August 17.—The temperature rapidly fell to 99° F. in twelve hours, and the pulse ranged between 60 and 70. The patient was quiet during the night and seemed rational at times. Answered when asked if he had any pain. The wound was dressed, and upon removing the wick about one-half ounce of fetid pus discharged from the abscess cavity in the brain. The cavity was washed out and dressed.

August 18.—The patient recognized his attendants this morning. Temperature 100° F., pulse 75. The wound was dressed daily, and every possible care taken of his general condition.

August 22.—During four days the patient had complained of headache (frontal). The temperature varied slightly between 98° and 99° F., pulse good. He had been less rational, and at times was roused with difficulty. The discharge of pus from the abscess cavity was becoming less in amount, and the brain was found somewhat bulging into the mastoid wound.

**Examination of the Eyes:** Pupils react normally to light. No hemianopsia. With homatropine the fundus of the right eye showed a slight swelling of the disc and tortuosity of veins, the left eye marked swelling of disc and tortuosity of veins. There was paralysis of left abducens muscle (eye would not rotate outwards beyond the median line). The patient stated, however, that the left eye had always turned inwards. The movements of the right eye were normal. In a few days showed signs of aphasia, which persisted for some weeks. When shown an object he was unable to name it, although he repeated the name when told. He also recognized a relative whom he had not seen for four or five weeks, but could not call her by name.

August 23.—Symptoms of imperfect drainage appearing, blunt scissors were inserted into the cavity of the abscess, and upon enlarging the opening there was a discharge of about two ounces of very foul pus. The cavity was irrigated and a rub-
ber drainage tube was inserted in place of gauze. The aphasia continued the same.

Recovery was uninterrupted, and the patient was discharged practically well September 12.

Remarks: Should the brain have been explored for the abscess at the time of operating upon the mastoid? Against such a step were absence of bulging of the dura or congestion and no visible erosion of the dura after careful inspection, especially over the area of the tegmen tympani. It is true that Wallace\(^6\) reports a similar case in which an abscess involving the greater part of the temporo-sphenoidal lobe failed to produce bulging of dura into the opening made by operation. It is perhaps, therefore, unsafe to regard this failure as an absolute contra-indication.

Up to the time of the operation all of the symptoms could be accounted for by the condition found, and it did not seem advisable to injure brain tissue. The abscess, however, undoubtedly existed at that time and was the cause of the headache.

This question was discussed at a recent meeting of the Société Française d'Otologie de Rhinologie et de Laryngologie in 1897.\(^7\) The prevailing opinion seemed in favor of delaying for a day or two after operating upon the extradural abscess. The suggestion was made, however, that the danger of infection through continuing the first operation into the brain might be obviated by applying the thermocautery to the spot through which the puncture was made.

The opinion of Macewen regarding the necessity of opening the squamous portion as well as opening through the tegmen tympani seems to be very generally shared. Review of available literature shows that the practice of trephining (or of opening by the chisel over the ear is practically, perhaps quite, universal, and it would be presumptuous to assume from this one case that the prevailing opinion was erroneous. That such an opening is not invariably necessary is certainly demonstrated.

A certain advantage is gained by avoiding the external opening, in that the danger of hernia is reduced to the minimum, though this consideration should not deter the operator if any question exists as to the complete evacuation of the contents of the abscess.

The opening through the tegmen sufficed not only for the
removal of a large amount of pus, but also of considerable sloughing brain tissue. That the evacuation and drainage were complete is shown by the perfect recovery.

The loss of brain substance resulting from sloughing of hernia of the brain seems not necessarily to impair the mental condition of the patient recovering from a brain abscess. Epileptic seizures at variable times after recovery have been noticed and reported. These attacks are undoubtedly due to pressure from cicatricial tissue. In one case under my observation the attack appeared six months after the operation, gradually growing less in severity and frequency.

Lumbar puncture is of undoubted diagnostic value in many cases. In my cases at the Infirmary, puncture made at the time of operation has shown an opaque, cloudy fluid, and this not only in cases of meningitis, but also in cases of sinus thrombosis. The same has been observed recently in cases of brain abscess; one reported by Grossman of Berlin, and another a recent one of my own, of recovery after operation.

This fact seems to indicate that finding of a cloudy fluid (per se) is not conclusive evidence of meningitis.

Micro-organisms may be primary or secondary considered in their causative relation. The diplococcus intracellularis of cerebro-spinal meningitis may be considered as primary, and is rarely seen by the otologist unless ear disease intervenes. The more common forms, streptococci, or mixed infection, are observed as secondary.

The abscess caused by ear suppuration, as has been already said, is almost invariably situated in the temporo-sphenoidal lobe from one-fourth inch to an inch within the substance of the brain, and directly over the roof of the middle ear, sometimes in the cerebellum from peri-sinusitis and rarely there is one in both regions.

The fatality is very great from failure in finding the abscess, from meningitis, secondary abscess, etc.

In the forty-three cases mentioned, a large percentage of the abscesses were situated in the temporo-sphenoidal lobe; the cerebellum was next in frequency, and rarely there was one in the frontal lobe. Of the whole number, all were operated upon, and there were seven complete recoveries.

Imperfect drainage seems often the cause of a fatal result, and in my experience gauze wicks are much less satisfactory than a rubber drainage tube. In the two cases of recovery mentioned the tube was used.
LITERATURE.

PAPER:

SYMPTOMATOLOGY, DIAGNOSIS AND TREATMENT OF Sigmoid Sinus Thrombosis.

JAMES F. MCKERNON, M. D.

In speaking of the symptomatology of this disease I shall do so under three heads; first the symptomatology in the typical cases, second in the atypical, and third in those where the bulb and sinus are primarily involved without macroscopic disease of the mastoid process. As most of the cases coming under our observation are those secondary to a mastoid involvement, or developing after the mastoid operation has been done, there are certain definite symptoms present which are fairly constant, and without much delay enable us to recognize this condition.

Temperature: The symptom which I consider by far the most important is that of temperature. This depends upon the amount of septic material entering the general circulation, which if it be large, is immediately followed by a rise from normal to 104, 105, 106, or even higher, and is quickly followed by a remission to normal or below. There may be only one rise during a period of twenty-four hours, or several may take place, depending upon the rapidity with which the poison is entering the general circulation. If the patient is kept under observation for several days these exacerbations of temperature become more frequent, and the variations greater.

Chills: They are present in only a certain proportion of the cases seen. When present, they usually precede the rise in temperature, and are followed by profuse sweating. Many of the cases coming under our observation exhibit no definite chill. They merely complain of a slight chilly sensation, and oftentimes this is overlooked, unless the nurse in attendance is on her guard and watching for such a manifestation. In a post-operative mastoid case with numerous temperature
variations, these chilly sensations are quite as important as though a decided chill were present.

Pulse: In cases of thrombosis, where there is a sudden and high elevation of temperature, there is a corresponding rapidity of the pulse rate, ranging from 120 to 170 per minute. In those of a lower temperature range, the pulse is often between 100 and 120, and when complicated (as oftentimes is the case) by a collection of pus in the brain, it is very much slower.

Respiration: During the earlier stages of thrombosis the respirations are little affected, becoming only slightly increased during the high temperature ranges.

Pain: In most cases of thrombosis coming under our notice the degree of pain is greater than that present when only an ordinary mastoiditis exists, or than that following the average post-operative case. The pain is usually referred to the side of the head, and to the occipital region, and is very frequently localized in the region of the torcular. When pain is present in the neck, I think it is usually due to the infected chain of lymphatic glands in this region, rather than to any obstruction in the vein.

Nausea and Vomiting: These symptoms are usually present at some stage of the disease, in a greater or less degree. The vomiting usually takes place at first, following the drinking of some fluid, but later on may occur at any time independent of the ingestion of solids or fluids.

Intra-Ocular: In about one-third of the cases coming under our observation the eye symptoms have been present, in the remaining two-thirds the eyes are negative. When puffiness of the eyelid on the affected side is present, it sometimes is caused by extension of the clot to the cavernous sinus, and also by an interference with the return ophthalmic circulation.

Vertigo: I have observed its presence only when the meninges are involved.

Cerebration: This has been normal except in advanced cases. We were formerly told to look for cerebral manifestations and believed they should exist in the majority of cases. This has not been my experience, for while the patients are drowsy, yet they answer questions intelligently when aroused, but do not wish to be disturbed. This drowsiness increases, however, if the disease is allowed to go on unchecked, and later there are distinct evidences of impaired cerebation.
Local Symptoms: We occasionally find the presence of edema in the mastoid region, and edema over and around the exit of the emissary and occipital veins. The symptom described by Gerhardt, and to which has been given his name, namely, that when pressure is exerted over both the external jugular veins it will show a marked increase of blood passing through the vein of the unaffected side, I have never seen demonstrated. In a fair proportion of the adult cases there is a marked stiffness of the muscles of the neck on the affected side, and in several instances aside from this stiffness I have observed a marked rigidity present.

Constipation: In all the cases coming under my observation, this symptom was present, and while a very common one, it is one that I believe coincided with the earlier stages of the disease. In the later stages of the disease, or when there is an advanced general sepsis, diarrhea is frequently present.

General Symptoms: Among some of the general symptoms at the outset of the disease may be mentioned malaise, loss of appetite, a dry and heavily furred tongue and a foul breath. The face wears an anxious and pallid look, the skin is dry, and later presents a yellowish tinge, indicative of sepsis.

Physical Signs: One of the physical signs which we have been told to watch for has been a hard cord-like swelling in the neck, along the course of the internal jugular vein, and when such a sign was present it denoted a thrombus of the vein. While unquestionably such a physical sign does occur, in the experience of the writer, it is a very infrequent one, as I have never been able to demonstrate such a condition along the course of the vein, though I have tried to do so repeatedly prior to operation.

The Atypical Cases: These are cases invariably following a mastoid operation, and usually do well for a few days after the mastoid has been opened. Then the patient becomes restless, irritable and disinclined to take food. The tongue, which before was clean and free from any coating, becomes dry around the edges and presents a whitish, glazed appearance in the center. The pulse increases from 100 to 130 per minute, and there is a slow, gradual rise of temperature to 103, 104, 105, or even higher, remaining so for several days. In some of the cases it will not vary a degree in twenty-four to forty-eight hours, while in others there is a little more varia-
tion in the temperature, but there are no sudden drops and no sudden rises. The patients complain of headache, and occasionally of nausea, but very few reach the vomiting stage. They are unable to sleep for any considerable period of time, and if surgical measures be not instituted they later show all the signs of pyaemia. There is no chill or chilly sensation present. Cerebration is clear, the only evidence of any mental disturbance being an occasional irritability of temper.

In the third class of cases there is an acute purulent otitis present, with the usual symptoms found accompanying this condition, and the subsequent symptoms detailed are the result of a direct infection from the tympanic cavity to the blood current closely adjacent, namely, through the floor of the tympanum to the jugular bulb. The explanation of the possibility of this is quite clear if we bear in mind the fact that in a certain percentage of the skulls examined we find an unusually high dome, encroaching upon the middle ear cavity, or a dehissence may exist in this region. Under such conditions as these, it can readily be seen how an active purulent infection of the middle ear cavity can primarily affect the blood current without first having to travel its usual course through the venous structure of the mastoid bone, the course of infection being through the small communicating veins and lymphatics, or by a process of absorption directly through the thin wall of bone in this region. The symptom of greatest importance is an unusually rapid rise in temperature, from 99 or 100 to 104, 105, or even 106, and quite as sudden as the rise a fall to 97, 98, 99, or possibly 100. The temperature may remain low for several hours, and then quickly rise again to the points first mentioned, to be followed by a rapid remission, and this may go on indefinitely until the end. During the exacerbations of temperature the pulse rate is rapid, ranging from 120 to 170 per minute. There is no chill present. The only evidence of chill found in these patients is that if seen when the temperature begins to rise, they will be found to have cold hands and feet. They are exceedingly fretful and irritable, and later become drowsy. The eye signs are negative. If the temperature range is allowed to repeat itself for several days, the tongue becomes white and dry. During the temperature remissions these patients (and they are usually young children) feel remarkably well, will ask for food and wish to sit up and play with their toys. This is one of the
phases of the disease which the parents and uninitiated find hard to comprehend. They see such an apparent improvement in the little ones that they are misled as to the dangers existing, and often believe they are well on the road to recovery until the next temperature wave occurs. The respirations are only slightly increased.

Diagnosis: The first class of cases is easily recognized, our diagnosis being based upon the temperature changes, the presence of the chill or chilly sensation preceding the rise in temperature, and following an operation upon the mastoid. If most of the symptoms given in this class be present, it is, of course, a comparatively easy matter to make a diagnosis, but if several are absent the diagnosis can be made from those given above. In the cases where the sinus is operated upon at the same time that the mastoid operation is done, and we have no previous symptoms to guide us, we determine whether or not it is necessary to operate on the sinus at this time, by the physical signs which are found present when the mastoid is opened. They are briefly, the presence of a necrotic area of bone over and around the sinus, with usually an epidural collection of pus. The dura covering the sinus wall is either markedly thickened, and darkened in color, or it may present a lusterless appearance, darker at one point than another, and usually the lower end toward the bulb is white or grayish in color. The sinus in some cases is easily compressible, and does not fill readily when the pressure is removed.

Bacteriological examination of the discharge is of value only in that it gives us knowledge of the characteristic infection. Another valuable aid in diagnosis is the blood count, not so much for determining whether a leucocytosis is present, but to determine the polynuclear percentage; as for example, if we find a polynuclear count showing a percentage of over 80, no matter what the leucocyte count be, whether great or small, we are almost certain to find an infective process disturbing the patient's economy.

The diagnosis in the second class, after eliminating all other diseases, is made from the continuous high temperature, and the fact that the patient is not progressing as favorably as he should after an ordinary mastoid operation. A physical sign which I consider of the utmost importance in this class of cases is that when we inspect the wound we find every portion of it apparently doing well, and covered with gran-
Sigmoid Sinus Thrombosis.

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ululations, except one point, and that point is the bone forming the sigmoid groove. We will find the bone in this region darker in color than when it was first exposed at the time of operation, and there will be no granulations found upon any part of it. In other words, we have a mastoid cavity showing every evidence of healing except the bone over the sigmoid groove. I have seen this condition persist following a simple mastoid operation for between two and three weeks, where the sinus was involved, or had become involved subsequent to operation. The polynuclear count is of the same value here as in cases of the first class, and should always be made, as a high polynuclear percentage is of the greatest help in determining whether an infective process exists.

In the third class the diagnosis is made almost entirely from the wide temperature range, closely following, as it does, an acute purulent otitis. Bacteriological examination of the discharge is of value only as above stated. The same is true of the blood count, but the utmost importance should be attached to the polynuclear percentage, for if we find it between 80 and 90 it is, I believe, a distinct evidence that our patient is suffering from a septic process. All other diseases being eliminated, the cause of our patient's condition must be referred primarily to the ear.

Treatment: The treatment in the first and second class of cases does not materially differ. Where a diagnosis of sigmoid sinus thrombosis has been made, I believe it is wiser, provided the patient's general condition will admit of its being done, to primarily expose, ligate and resect the internal jugular vein from a point below at the clavicle, to its exit from the skull. Should any of its tributaries be found involved, they should also be ligated and resected well beyond any point of macroscopic involvement. All diseased glands encountered during the resection of the vein should be removed. After this has been done the sinus should be exposed from above the bend down to the region of the bulb, the dura should be opened freely with a scalpel, and the contents of the sinus evacuated. Should we be unable to obtain a flow of blood from the distal end of the sinus, then there should be a still further exposure in this region, and we should proceed backward toward the torcular, or even as far as this channel, until we secure a free return flow of blood, for it we do not obtain a blood current in this region sufficiently free to show that all
obstruction has been removed, our patients subsequently do badly, either from an extension of the infective process to other blood channels, or an encephalitis develops one or two weeks later, caused by an extension from the infective process that we have left in this region. When we remove the clot in the region of the bulb, we will find that in almost every case where the vein has been removed as the first step in the operation, that the so-called return flow is quite as free here as we would expect to find it if we had the internal jugular vein carrying on its usual function, the blood coming, no doubt, from the inferior petrosal sinus. If, as occasionally occurs in this region, we are unable to obtain a return flow of blood, it means that the inferior petrosal sinus is thrombosed, and when such a condition confronts us, we should, provided the patient's general condition will allow it, expose the sinus and remove the obstruction, as otherwise we are courting danger by allowing an infective process to remain here which may at any time cause further trouble for our patient.

The wound in the neck should be flushed with a warm saline solution, a large cigarette drain inserted its entire length, and the soft parts closed by a continuous suture, to within a very short distance of its upper end, and either a wet saline or bichloride dressing applied. This dressing should be renewed at the end of forty-eight hours. At the first dressing the cigarette drain should be drawn out for about an inch and cut off. Subsequently the neck should be dressed once every twenty-four hours in this manner, and at each dressing the drain should be drawn out about the same distance and the end cut off as before, so that at the end of four or five days the entire drain has been removed and primary union is accomplished.

In the third class of cases, the patients being nearly all very young children, the ideal treatment would, of course, be the same as in our other cases, but here we must remember that these cases are caused by a primary infection of the blood current, and when operated upon early the percentage of recoveries is in favor of removing the clot without ligating the vein. For these little patients do not bear prolonged operations well, and it is a matter of much more difficulty to ligate and resect an internal jugular vein in a very young child than it is in an adult, for we have a neck to deal with that is short and chubby, and usually a number of enlarged
glands to encounter, and up to the present time my experience has been not to ligate in these cases, or if ligation becomes necessary to do it at a subsequent operation, where the work can be done rapidly, and not subject these little patients to the added risk of a prolonged operation. It must be said, however, that in this class of cases, where a so-called free hemorrhage is obtained from below, we can never be sure that all infective material has been removed, for, so far, it has been an absolute impossibility to pass a curette from above into the jugular bulb, and in all probability a large number of our cases operated upon without ligation of the vein, have some infective material left in this region, not, however, in such quantity that the system cannot care for it, for were this so these cases would all be fatal. I believe that in the average case of sinus and bulb involvement, it is wiser to ligate and resect the vein, if the patient’s condition will admit of it. Certainly in the cases of infected sinus or bulb thrombosis I feel easier as far as the patient’s safety is concerned, if this port of entry is obliterated.

In the cases operated upon without ligation of the vein, where they show a varying post-operative temperature curve, it means that there is still some infective material being displaced from time to time. The patients improve notwithstanding, because the major portion of the infective material has been removed, and the system thus strengthened is enabled successfully to care for that remaining.

In young children the time element is one that enters largely into a favorable prognosis, for the shorter the time that we keep our patients on the operating table the quicker will be their convalescence. I am convinced that our results would be better did we operate during the temperature remissions, rather than when the temperature is at its height, for if operation takes place while the temperature is low, certainly the system has more reactive power, there is less depression and a more rapid convalescence will surely follow.

A word about delaying operation in these cases. Eliminate, if possible, all other diseases, and if this is done, then we must return to the original focus of infection, and follow this up in order to determine the cause of our patient’s condition.
When our secretary honored me with an invitation to present a paper on "Pathologic Findings" in connection with this symposium of the intra-cranial complications of ear affections, I was somewhat at a loss how best to proceed in order to avoid a more or less text-book presentation of the subject. After some reflection it occurred to me that an analysis of a considerable number of such cases in the hands of our most experienced American operators might offer food for study and discussion. We do not fail to remember the many valuable contributions along the same line from our European confreres, and especially Koerner's and Macewen's classical works, and yet it seems to us that an independent consideration of the subject might not be without value. To this end we addressed a letter of inquiry to a number of men connected with our largest special hospitals, asking for the following data:

1. Total number of cases of intra-cranial diseases treated, divided as follows:
   (a) Sinus thrombosis.
   (b) Meningitis.
   (c) Encephalitis and brain abscesses.
2. Number of deaths and recoveries, including number of cases operated upon.
3. In how many cases was the pus from the ear examined bacteriologically with the results obtained.
4. Was lumbar puncture made, and if so with what results.
5. Situation and character of the lesion, as determined operatively or by post-mortem examination (meningitis, serous or purulent; thrombosis,—what sinus involved; abscess, single or multiple, where situated; character of pus of abscess when examined.
6. A brief abstract of each autopsy protokol.
Intra-Cranial Complications of Middle Ear Diseases.

7. Antecedent condition of the ear—whether otitis was acute or chronic; whether intra-cranial involvement followed a middle ear or mastoid operation.

8. Result of blood examination when made.

9. Mode of infection, where determined.

In most instances the lateness of the hour at which the letter was sent and the amount of work involved prevented compliance with our request. We desire, however, to publicly express our thanks to Dr. James F. McKernon for his prompt response, and for the statistics furnished by him from the records of the New York Eye and Ear Infirmary, representing, without doubt, the largest amount of such cases treated by any one institution in this country. This report must be, then, of necessity an incomplete one, and is to be viewed rather in the nature of a preliminary one only. It has to do chiefly with the records from the ear department of the Manhattan Eye, Ear and Throat Hospital, and some of the various points considered can be included under “Pathologic Findings,” possibly only by the broadest construction of the term.

During the past ten years, 1895-1905, there have been treated in that institution 41,799 cases of ear disease. Of these, 32,486 suffered with disease of the middle ear, and 12,744 cases were of a suppurative nature, acute or chronic. Of these, 32,000 odd cases of middle ear disease, there are records, more or less complete, of 60 cases of intra-cranial disease, divided as follows:

(1) Sinus thrombosis .........................23
(2) Brain abscess ..............................7
(3) Meningitis .................................30

I. SINUS THROMBOSIS.

Of the 23 cases, 14 died, 9 recovered.

The jugular vein was ligated in fifteen cases, not ligated in eight. Of the fifteen cases where the vein was ligated, six recovered, nine died, all but two from one to twelve hours subsequent to the sinus operation. Of those not ligated, three recovered and six died. It will be seen that in this small series of cases there was no great difference as far as recoveries are concerned, between those cases where ligation was practiced and those where it was not practiced.

In this connection it will be interesting to recall the statistics of Koerner. He has collected 308 cases, with 180 recoveries,
or 58 4-10%. The vein was not ligated in 132 cases, of which 77 recovered, or 58 3-10%. In 94 cases the vein was tied before the sinus was opened, with 56 recoveries, or 53%. In 68 cases the vein was tied after the opening of the sinus with 38 recoveries, or 55%.

While it is true that statistics may be very misleading and the particular conditions under which ligation or non-ligation were practiced in these cases are not stated, it is not without significance that in these cases collected from all sources there is virtually no difference in the results by the different methods of treatment.

Character of the Disease in the Middle Ear.

Acute suppuration existed in seven cases. Chronic suppuration in twelve cases. In one case an acute non-suppurative process alone existed. In three cases the condition of the ear is not stated. In other words, chronic disease was found present in almost twice as many cases as acute disease. This is in line with Hessler's statistics, who found that in 130 cases 99 had chronic middle ear suppuration and 31 acute. Koerner states that his experience is just the reverse. As regards the age, it is noticeable that in only one case was the patient more than 29 years.

Optic Neuritis.

Optic neuritis existed in three cases. This is quite at variance with Koerner's experience, who states that he has never met with a case of optic neuritis in an uncomplicated sinus thrombosis.

In the first of the three cases (case 21) an acute suppuration process had existed for three weeks. Six days after admission to the hospital the patient became stupid and the optic neuritis developed.

In the second case (case 3) the neuritis appeared on the day after admission to the hospital, and was followed by the operation on the next day.

In the third case (case 4) it appeared twelve days after the operation. This was a case of Dr. T. P. Berens, and was regarded by him as a manifestation of hysteria. The group of symptoms, unconsciousness, optic neuritis, vomiting, dilatation of the pupil of the side affected and twitching of the left arm and leg, would point strongly, however, to a meningeal irritation. The case recovered.

Temperature: There was nothing particularly significant in
the temperature curves in the different cases. Usually the temperature was high. This, according to Köerner, would be indicative of the septic state, and is borne out by the fact that in ten cases the disease was of such an advanced type that upon admission into the hospital they were in a more or less unconscious state. This would clearly point to the fact that the significance of the symptoms of this dread complication of middle ear disease is not yet sufficiently known to the profession at large.

Chills: Chills were noted in only eight cases. Doubtless careful inquiry would have brought out the fact that the chilly sensations to which McKernon has called attention were present at some stage of the disease in all.

Dysphagia: In two cases difficulty in swallowing was a prominent symptom. A case of Beck is quoted by Koerner where there was paralysis in swallowing due to pressure on the glosso-pharyngeal nerve. This must, however, be a rare symptom.

Complications: Three cases were complicated by cerebellar abscess. Metastasis in the arm was noted in one case. In one a cyst of the liver, not regarded as septic, was found, and in one case an abscess in the pleural cavity. One case (case 4) that of Berens, just referred to, had a paralysis of the trochlea. This, as far as I can find, has never been encountered save in thrombus of the cavernous sinus, which was clearly not present here. It is difficult to account for it. As was stated, the case recovered. Finally, death occurred twice upon the table. These fatalities ought to emphasize the importance of early operation as advanced by von Bergman many years ago. In scarcely one case can it be stated that the operation was performed at an early stage of the disease.

II. Brain Abscess.

Seven cases with seven deaths.

Situation: In temporo-sphenoidal lobe, six times.

In cerebellum, once.

In three cases there was an antecedent acute suppuration of the middle ear; in the remaining four the process was a chronic one.

This is at variance with Grunert's statistics, where in 91% of cases the abscess followed a chronic otorrhea.

Jansen found in 2,650 cases of acute middle ear suppuration,
brain abscess once, in 2,500 of chronic suppuration, six times. The increased proportion of acute cases in the Manhattan records is to be noted, viz.:

In 3,078 O. M. S. A., three cases.
In 8,722 O. M. S. C., four cases.
Or one in every 1,000 of acute suppuration as compared with one in 2,300 of chronic

The classical mastoid operation was primarily performed in six of the cases, to be followed later by an exploration of the brain on account of the symptoms which developed.

Symptoms: Of the symptoms which were chiefly complained of, pain in the head was a prominent one, and is mentioned in five of the seven cases. In two of these the pain was on the side of the head corresponding to the abscess. In one it was referred directly to the ear.

Vomiting: Vomiting was a prominent symptom in only three, according to the notes of the cases. Whether present in the others, we can not say.

Epileptiform Convulsions: One case had a striking symptom which for a time baffled diagnosis. The history of this case is briefly as follows: (Case 3, H. A., adult, service of Dr. Clemens, admitted April 2, 1902, for pain in her ear of nine day's duration.) A simple mastoid operation had been performed two years before on that side. At the operation which was performed at once on admission, some rough bone was discovered in the antrum, but nothing else, and the wound was closed by silk sutures. Upon the first dressing three days after the operation, the wound was found clean. Three days later the patient became restless, complained of pain in the head, and ten minutes after the dressing had an epileptiform fit. These fits occurred daily. On the ninth day after admission she had nine attacks. The fifteenth day she became stupid and died on the sixteenth day after admission. The autopsy revealed an abscess in the temporo-sphenoidal lobe, containing 21/2 ounces of pus. This was located but half an inch from the surface, and communicated by a sinus externally with an erosion discovered on the left temporal lobe near the base. Here an oval spot 1x1/2 inch was found showing cerebral softening. The abscess was lined with a pyogenic membrane, which showed numerous fresh hemorrhages. From this cavity another sinus extended to another large abscess just above the fissure of Silvius. A small perforation 4 mm. in diameter was
found in the tegmen tympani. It is to be added that the temperature was normal upon admission and until five days after the operation and then rose to 101. The pulse ranged between 80 and 100, and from 66 to 90 at the time of death.

Koerner regards convulsions as in no way characteristic of brain abscess. They are usually present in abscess of the cerebrum, and are limited to the extremities and the face of the opposite side. Such marked seizures as occurred in the case just stated we believe, however, are exceptional.

Temperature: Temperature in two cases was normal on admission. According to Koerner again, it can remain so through the entire disease, which is especially wont to be met with in the latent period. The pulse in every case was slow, below 100, even when high fever was present, and below 70 in four of the cases. Koerner regards this symptom as a valuable but unreliable one. This agrees with Schmiegelow, who in a recent contribution on this subject to the Archives Internationales de Laryngologie for April, 1905, in which he reports 19 cases of brain abscess of his own, does not find hyperpyrexia a characteristic sign of disease. It may be added that even pain which he regards as the most usual symptom to be met, was absent in two cases.

Cessation of Respiration: In two cases the interesting phenomenon occurred of cessation of the respiration during operation at the time the brain was punctured. In one of the cases the abscess was located in the cerebellum, and in the other in the tempero-sphenoidal lobe. In the first case respiration was maintained artificially for some time, and the heart continued to beat for five minutes. In the second case, one of Dr. Berens, a tracheotomy was performed, and the breathing so restored for three hours. Schmiegelow in the article just quoted, refers to a case of his own where a similar accident occurred. Macewen, in his well known work upon "Pyogenic Disease of the Brain and Spinal Cord," reports two cases of cerebellar abscess where this occurred. Besides these, Schmiegelow refers to one case reported by Barker, three by Sir Dyce Duckworth, one by Hoffer and one by Flies, making in all, including the two cases reported by ourselves, eleven cases where this phenomenon occurred, with only two exceptions the abscess being located in the cerebellum. The cause of this would seem in all probability to be due to a great increase of intra-cranial pressure paralyzing the respiratory center.
Finally one other case is of such unusual interest that we desire to refer to it somewhat at length. Case 4, G. M., age 14, a case of Dr. Kenyon, was admitted March 29, 1900, to the hospital with the history of pain and discharge from the ear for three weeks. The following day a mastoid exenteration was performed. Pus was encountered and a free opening was made into the middle ear through the antrum. In the course of the operation the dura was exposed. The wound was closed by sutures to heal by the contained blood clot. Upon June 2 there was some suggestion of pus in the dressing, and the wound was not uniting properly. June 4 the stitches were removed under ether, the wound cleansed of the granulations which had formed, and packed with sterile gauze. Upon June 10 severe pain was complained of in the forehead and in the side of the head. Ether was again administered and the dura found bulging at the spot previously exposed at the first operation, and was opened. A free discharge of foul pus was obtained. A counter opening was made through the temporal bone and the brain cavity packed. Previous to the operation the right pupil was found dilated to twice its natural size. This phenomenon disappeared after the operation. The wound was dressed by means of gauze drainage, and the boy discharged from the hospital July 30, two months after admission, about well. The bacteriologic examination of the smear from the ear showed a few streptococci. Temperature before abscess was opened was 101 F., and so continued for one week afterward. The pulse before the operation ranged from 96 to 92, gradually falling from 80 to 76, at one time to 66 after the operation. On October 2 of the same year, two months after his discharge from the hospital, he was readmitted because of a return some weeks before of the ear symptoms, and a second operation upon the brain was performed the following day, and pus was found beneath the dura extending forward to the frontal lobe; 2 ounces were evacuated. The wound was packed with plain gauze. The following day the patient was restless and noisy. Three days after the operation of. At the time of dressing, the wound was found clean. For he was delirious, on the eighth day headache was complained the next two weeks constant pain in the head was complained of, requiring the use of morphine. Chills now developed. On about the 31st of October, one month after admission he died.
Intra-Cranial Complications of Middle Ear Diseases.

The temperature was high and of a septic character throughout the disease. Pulse ranged from 30 to 140. No autopsy.

Remarks: Here without much question was a case of infection due to imperfect drainage at the time of the original mastoid operation. Reference will be made later to immunity to danger in most cases where the brain is exposed. This must be regarded as an exception. The second point is the character of the dressing, namely, packing with gauze. Most of our successful operators condemn this as a dangerous procedure. Finally the remarkable slowness of the development of the symptoms must be noted. Such improvement as to warrant discharge from the hospital and the remaining away for two months is certainly a surprising phenomenon.

III. MENINGITIS.

Of the 30 cases of which records are given, 29 died, 1 recovered. Of these six were those of children, two years or under. One was in a child of six and one in a child of eight. The rest were adults. In 15 cases there was a chronic suppuration of the middle ear, in 10 an acute suppuration, in 4 the condition was not given, and in 1 it was apparently healthy.

The bacteriologic findings can be regarded in no way conclusive. In three cases the streptococcus was found, in six the diplococcus, and in six there was a mixed infection. It would only be suggested from this small number of fifteen cases where the results are stated that the mixed infection is of as common occurrence as the diplococcus, and twice as common as the streptococcus.

The lumbar puncture was not practiced in enough cases to permit of any report.

Symptoms: In fourteen cases the temperature upon admission is stated. In nine of these it was normal.

Vomiting was a characteristic symptom in four cases.

Headache was present in nine cases.

Vomiting, according to Barber, can be regarded only as a symptom of intra-cranial disease, and is never solely characteristic of brain abscess, nor yet of meningitis. Among the numerous symptoms a sudden blindness developed in one case the day before admission. At the autopsy miliary tubercles were discovered lining the pia,—the blood vessels of the brain were generally congested.
In one case the symptoms followed a furunculosis of the auditory canal. The *channel of infection* is not definitely stated, except in two cases where it occurred through the tegmen tympani. In one case the symptoms followed an acute abscess of the middle ear, the result of infection through the nose following the use of a Birmingham nasal douche.

*Optic Neuritis:* Optic neuritis was met in one case.

The single case of not fatal result is of sufficient interest to be briefly referred to.

(Case 29.) It concerns a child of two, a patient of Dr. Haskin, who was admitted to the hospital July 7, 1902, for a secondary mastoid operation. A discharging sinus was found over the right mastoid near the tip. At the time of the operation granulations were found in the attic and antrum. The sinus was exposed and found healthy. The case eventually recovered, and was discharged from the hospital three weeks after operation. Two weeks later he was readmitted with a temperature of 104, very restless, with twitching of the muscles of the right arm. The right pupil was dilated and there was slight facial paralysis. The following day, he vomited, and there was a paralysis of the right side. On the 17th he was apathetic, but on the 19th appeared brighter. The mastoid wound looked better. Upon the twenty-third day the paralysis had about disappeared. Upon the 20th of September he was discharged. Later he was readmitted for skin grafting. In personal conversation with Dr. Haskin, this case which he has previously reported, he regards as of a tubercular nature. The child is still under observation. This case suggests the possibility of recovery after the serous form of meningitis. Up to recently such a termination was not entertained, but in the last few years several authorities, Koerner among others, have called attention to this, and a number of cases are on record where such a result apparently has taken place.

*Meningitis Following the Radical Operation:* Of great interest is the number of cases following the radical operation, ten in all. In these the temperature was normal at admission in all but two. It is a striking fact in what a large number of cases of simple mastoid operations, as well as in the so-called radical operations, the dura is exposed with no unpleasant sequelæ. Rarely is another thought given to it. Indeed it is the practice of some surgeons to go so far as to apply skin grafts
upon the dura at the time of the primary operation. That this
can be followed by disastrous results is witnessed by these
ten cases. This is still more clearly evidenced by the fact that
in cases 4 and 19 the post-auricular wound was not closed at
the primary operation, and no symptoms of meningitis de-
veloped until two days after the second operation, when skin
grafting had been practiced and the wound closed. In the
second of these two cases rubber tissue was used for packing
the wound at the first operation. Both the sinus and dura were
exposed at that time.

That this experience is not limited to the institution in
question is shown by the statistics from the New York Eye
and Ear Infirmary, where out of twenty-two cases of menin-
gitis, seven followed the radical operation. The writer in a
paper read before the Eastern section of this society here in
Boston two years ago took occasion to state that this operation
must "not be regarded as free from risk to life." This warning
note seems amply justified in the light of these nineteen deaths
in two institutions following the operation. In the ten years
from 1895 to 1905, 1195 mastoid operations were done at the
Manhattan Eye, Ear and Throat Hospital, of which some
eighty-three were of the radical type.

These startling figures, viz., out of eighty-three radical op-
erations ten cases of fatal meningitis, or one in eight, developed
is enough to give us cause for thought, and bids us exercise
the greatest care in selection of our cases, in our technique,
and in employing the most perfect asepsis. At the same time
it is only fair to add that meningitis also followed the simple
mastoid operation in twenty cases, or one in thirty-six.

This shows that the simple Schwartze operation can be fol-
lowed by fatal consequences, but in the case of the radical oper-
ation the proportion is vastly greater. The grave question is
also raised of the wisdom where the dura is exposed of closing
the wound at the first operation, and especially of skin grafting
at those points.

Conclusion: In conclusion the writer desires to emphasize
the importance of greater attention on the part of the surgeon
in charge to the taking and preservation of the histories of his
mastoid cases. Too often this is left to the junior house officer,
who has had little or no experience, and who is apt to make
records of observations which are of little or no value. The
only one competent to make the records is the surgeon himself,
and this he can easily do by dictation to the house officer at the time of his daily visit.

Three recommendations in this direction suggest themselves:

First, every special or general hospital with an ear service should have an ear registrar with whom the responsibility for the compilation and preservation of all records should rest.

Second, a card catalogue index should be provided with a cross index according to disease. The following letter will illustrate the difficulty of following out an investigation like this, without some such index catalogue:

"I have delayed answering your letter of March 30 because I wished to see whether it would be possible for me to comply with your request. I am sorry to say that after looking into the matter I find that the data I could give you would be so incomplete and really valueless that it would not be worth the labor necessary. In both the Pennsylvania and Polyclinic Hospital there is no record of cases kept in such a manner as to permit looking up under the nature of the disease, they are all indexed by the names of the patients. One of the assistants in my clinic started to look up the matter, but found that it would involve going over all the different cases admitted to the hospitals in recent years in order to find records of those cases presenting intra-cranial complications. We have no special hospital in this city devoted to ear, nose and throat work, and in the general hospitals the records of the ear cases are mingled with those of the others.

Third. Greater zeal and earnestness should be exercised on the part of the surgeon in charge toward securing autopsies. In this way, and in this way alone can the valuable material of the various institutions where otology is practiced be brought together for study and scientific research."
MENINGITIS.

Mode of Infection

From M E

In

Nauseated, Headache, beyas, dyspnoea, injected.

From M E

Forehead, temporal area, occipital area, 6th and 14th after Delirium

From M E

Vomiting, Speech, Chills

Pain in EYE

Complications by Labor

Epidural abscess

5th day after operation

Resistant to treatment

Later complications

P forgot Tympanum

Pulmonary Exudate beneath entire diaphragm

Pretoracic Pain in head

Seasonal Pain in head

Vomiting

History of tumour of canal Coe Mt.

Pupillary

Pupil

Followed by patch

104° on admission

E

Before op. only headache, Optics Neuritis

Shooting pain, behind ear, 1st day after vomiting

Suddenly blind day

Sudden

Blood vessels of brain congested

Diabetes

Cured with sugar

History of diabetes

Pain and delirium on admission

Diabetes Mellitus

M E

No

Hypersensitiveness

Meningitis followed rapidly

No

E

Followed up on acute complication on admission

Infection from bacterial scar

Followed Radical

E

Marked bony kyphosis

Marked bony kyphosis

In June, pansy, back pain, neck and disc

At the 2nd admission

E

No

Delirium

M E

Redness, tenderness

Diabetes, peptic ulcer

Wound closed at 2nd op. graft

Digital signes of infection

Plaue, evulsion, on margins, Blotches, tracked

Before

Ears and throat 6 days after operation

Pulse 172

Skin normal

1 day after

1 E

M E

Orchite

M E

K M

Fever

Negligible

Fever

Complications by Labor

Episcleritis

2nd day after operation

Pretoracic Pain in head

Vomiting

Pretoracic Pain in head

Pretoracic Pain

M E

Pretoracic Pain
my own 
following: 

in which 

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frequency of 

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cases in 

the fact
<table>
<thead>
<tr>
<th>Case</th>
<th>Date</th>
<th>Age</th>
<th>Duration</th>
<th>Ear Condition</th>
<th>Abscess Location</th>
<th>Ear Status</th>
<th>Exam' of Ear Pat.</th>
<th>Operation</th>
<th>Result</th>
<th>Symptoms</th>
<th>Temperature</th>
<th>Pulse</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>43</td>
<td>O M S A</td>
<td>1 Month</td>
<td>O M S C</td>
<td>Temporo-sphenoidal lobe</td>
<td>Dura exposed and found to have granulation</td>
<td>2nd. Brain opened</td>
<td>1st, Schwartze Dura Death</td>
<td>Vertigo, vomiting. Hemiparesis. Eye symptoms. Lacking.</td>
<td>48.56</td>
<td></td>
<td>One ounce of pus found in abscess at 2nd operation.</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>9</td>
<td>O M S C</td>
<td>1 Week</td>
<td>Cerebellum</td>
<td>Temporo-sphenoidal lobe</td>
<td>Dura exposed and found to have granulation</td>
<td>2nd, Brain opened</td>
<td>1st, Schwartze Dura Death</td>
<td>Hemiparesis. Vomiting. De 100 bm. Twitching.</td>
<td>52.88</td>
<td></td>
<td>Respiration ceased on puncturing cerebellum. Heart continued to beat for 3 minutes.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>30</td>
<td>Schwartze 2 yrs. ago</td>
<td>O M C A</td>
<td>Temporo-sphenoidal lobe</td>
<td>Dura exposed and found to have granulation</td>
<td>2nd, Brain opened</td>
<td>1st, Schwartze Dura Death</td>
<td>Pain in ear 8 days after operation. Restless. Pain in head for 8 days. 9 epileptic fits in one day.</td>
<td>80-90</td>
<td>66-90 at death.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>O M S A</td>
<td>3 Weeks</td>
<td>Temporo-sphenoidal lobe</td>
<td>Streptococcus</td>
<td>Dura exposed and found to have granulation</td>
<td>2nd, Brain opened</td>
<td>1st, Schwartze Dura Death</td>
<td>Pain in ear on admission. 102</td>
<td>96-100</td>
<td></td>
<td>Breathing stopped during operation. Tracheotomy. Respiration artificially produced 3 hours.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>46</td>
<td>O M S C</td>
<td>7 Years</td>
<td>Temporo-sphenoidal lobe</td>
<td>Dura exposed and found to have granulation</td>
<td>2nd, Brain opened</td>
<td>1st, Schwartze Dura Death</td>
<td>Pain 2 days before admission. 99-99</td>
<td></td>
<td></td>
<td>Patient discharged from hospital 3 months after Schwartz operation. Re-admitted 6 weeks later.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>31</td>
<td>O M S C</td>
<td>7 Years</td>
<td>Temporo-sphenoidal lobe</td>
<td>Dura exposed and found to have granulation</td>
<td>2nd, Brain opened</td>
<td>1st, Schwartze Dura Death</td>
<td>Pain 3 days following.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>O M S A</td>
<td>7 Years</td>
<td>Temporo-sphenoidal lobe</td>
<td>Dura exposed and found to have granulation</td>
<td>2nd, Brain opened</td>
<td>1st, Schwartze Dura Death</td>
<td>Pain in head. Bad odor to dressings. Pain in neck. Delirium.</td>
<td>92-118</td>
<td>80-90</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Discussion.

In my own cases the following is my own temperosymphysis thrombosis, of which there were eighty-five, excepting heading operated.

Frequency of this as follows: sinus in 36.8%, of the 5%, and fifty cases, thirty-five of these cases twenty-two he jugular and operated.

Considering, in this process by way

Notated fact...
<table>
<thead>
<tr>
<th>Age</th>
<th>Sex</th>
<th>Condition of Ear</th>
<th>Duration</th>
<th>Pos. Findings</th>
<th>Sinus Operation</th>
<th>Result</th>
<th>Was Vein Tied</th>
<th>Condition of Mastoid</th>
<th>Was Neck Closed</th>
<th>Character of Clot</th>
<th>History</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>O. M. B. C.</td>
<td>3 Years</td>
<td></td>
<td>Double Extra-cell</td>
<td>Yes</td>
<td>Yes</td>
<td>Recovery</td>
<td>No</td>
<td>Disseminated</td>
<td>Partial</td>
<td>Chills</td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>O. M. S. A.</td>
<td>2 Years</td>
<td></td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>Death</td>
<td>Yes</td>
<td>Disseminated</td>
<td>Partial</td>
<td>Chills</td>
</tr>
<tr>
<td>3</td>
<td>4</td>
<td>O. M. S. C.</td>
<td>5 Months</td>
<td></td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>After ligation</td>
<td>Death</td>
<td>Yes</td>
<td>Partial</td>
<td>Chills</td>
</tr>
<tr>
<td>4</td>
<td>5</td>
<td>O. M. S. A.</td>
<td>6 Weeks</td>
<td></td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>Recovery</td>
<td>No</td>
<td>Opened, Punctured</td>
<td>Healthy</td>
<td>Septic</td>
</tr>
<tr>
<td>5</td>
<td>6</td>
<td>O. M. S. A.</td>
<td>7 Days</td>
<td>1st opera.</td>
<td></td>
<td>Yes</td>
<td>Yes but not resected</td>
<td>Death</td>
<td>Yes</td>
<td>Disseminated</td>
<td>Partial</td>
<td>Chills</td>
</tr>
<tr>
<td>6</td>
<td>7</td>
<td>O. M. S. C.</td>
<td>1 Week</td>
<td></td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>Recovery</td>
<td>No</td>
<td>Disseminated</td>
<td>Partial</td>
<td>Chills</td>
</tr>
<tr>
<td>7</td>
<td>8</td>
<td>O. M. S. C.</td>
<td>2 Weeks</td>
<td></td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>Recovery</td>
<td>No</td>
<td>Disseminated</td>
<td>Partial</td>
<td>Chills</td>
</tr>
<tr>
<td>8</td>
<td>9</td>
<td>O. M. S. C.</td>
<td>3 Weeks</td>
<td></td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>Recovery</td>
<td>No</td>
<td>Disseminated</td>
<td>Partial</td>
<td>Chills</td>
</tr>
<tr>
<td>9</td>
<td>10</td>
<td>O. M. S. C.</td>
<td>4 Weeks</td>
<td></td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>Recovery</td>
<td>No</td>
<td>Disseminated</td>
<td>Partial</td>
<td>Chills</td>
</tr>
<tr>
<td>10</td>
<td>11</td>
<td>O. M. S. C.</td>
<td>5 Weeks</td>
<td></td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>Recovery</td>
<td>No</td>
<td>Disseminated</td>
<td>Partial</td>
<td>Chills</td>
</tr>
<tr>
<td>11</td>
<td>12</td>
<td>O. M. S. C.</td>
<td>1 Week</td>
<td></td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>Blood-cloth</td>
<td>Blood clot turned out of Sinus</td>
<td>Disseminated</td>
<td>Partial</td>
<td>Chills</td>
</tr>
<tr>
<td>12</td>
<td>13</td>
<td>O. M. S. C.</td>
<td>2 Weeks</td>
<td></td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>Blood-cloth</td>
<td>Blood clot turned out of Sinus</td>
<td>Disseminated</td>
<td>Partial</td>
<td>Chills</td>
</tr>
<tr>
<td>13</td>
<td>14</td>
<td>O. M. S. C.</td>
<td>3 Weeks</td>
<td></td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>Blood-cloth</td>
<td>Blood clot turned out of Sinus</td>
<td>Disseminated</td>
<td>Partial</td>
<td>Chills</td>
</tr>
<tr>
<td>14</td>
<td>15</td>
<td>O. M. S. C.</td>
<td>4 Weeks</td>
<td></td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>Blood-cloth</td>
<td>Blood clot turned out of Sinus</td>
<td>Disseminated</td>
<td>Partial</td>
<td>Chills</td>
</tr>
<tr>
<td>15</td>
<td>16</td>
<td>O. M. S. C.</td>
<td>5 Weeks</td>
<td></td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>Blood-cloth</td>
<td>Blood clot turned out of Sinus</td>
<td>Disseminated</td>
<td>Partial</td>
<td>Chills</td>
</tr>
<tr>
<td>16</td>
<td>17</td>
<td>O. M. S. C.</td>
<td>6 Weeks</td>
<td></td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>Blood-cloth</td>
<td>Blood clot turned out of Sinus</td>
<td>Disseminated</td>
<td>Partial</td>
<td>Chills</td>
</tr>
<tr>
<td>17</td>
<td>18</td>
<td>O. M. S. C.</td>
<td>7 Weeks</td>
<td></td>
<td></td>
<td>Yes</td>
<td>Yes</td>
<td>Blood-cloth</td>
<td>Blood clot turned out of Sinus</td>
<td>Disseminated</td>
<td>Partial</td>
<td>Chills</td>
</tr>
</tbody>
</table>

**SINUS THROMBOSIS.**

1. **Chills.**
   - Neck paraesthesia showed a generous wound on face above left parotid, scalp and neck.
   - Optic neuritis.
   - Symptoms on ad-Temp., on admission. Optic: 101.6 P. F., pain, vomit.

2. **Mastoid.**
   - Partially unconscious. Died 23rd day Pupil dilated. Partially unconscious.
   - Chills, mastoid pain.

3. **Recovery.**
   - Pupil dilated.
   - Pain one week. Temp. 104. 23rd day of 3rd op. labial abscess.

4. **Died Schwartze.**
   - Complicated by staphylococcus. labial abscess.
   - died. tragic death.

5. **Complicated by staphylococcus.**
   - labial abscess.
   - Labial abscess.
   - died. tragic death.
   - Complicated by staphylococcus. labial abscess.

6. **Complicated by staphylococcus.**
   - labial abscess.
   - Labial abscess. labial abscess. labial abscess.
   - died. tragic death.

7. **Complicated by staphylococcus.**
   - labial abscess.
   - Labial abscess. labial abscess. labial abscess.
   - died. tragic death.

8. **Complicated by staphylococcus.**
   - labial abscess.
   - Labial abscess. labial abscess. labial abscess.
   - died. tragic death.

9. **Complicated by staphylococcus.**
   - labial abscess.
   - Labial abscess. labial abscess. labial abscess.
   - died. tragic death.

10. **Complicated by staphylococcus.**
    - labial abscess.
    - Labial abscess. labial abscess. labial abscess.
    - died. tragic death.

11. **Complicated by staphylococcus.**
    - labial abscess.
    - Labial abscess. labial abscess. labial abscess.
    - died. tragic death.
Intra-Cranial Complications of Middle Ear Diseases. 81

DISCUSSION.

DR. EDWARD BRADFORD DENCH OPENED THE DISCUSSION.

For the discussion of the subject I have gone over my own operating book rather carefully, and have collected the following statistics:

I have observed twelve cases of brain abscess (nine temporo-sphenoidal, three cerebellar), thirty-eight cases of sinus thrombosis, (primary bulb infection in two), in thirteen of which the internal jugular was excised; twenty-eight cases of epidural abscess, and four cases of meningitis operated upon, eighty-two cases in all. These statistics are fairly accurate, excepting as regards the statistics for meningitis. Under this heading many cases have escaped observation, as only those operated upon have been recorded.

From these statistics we find that the relative frequency of occurrence of the various intra-cranial lesions has been as follows: Epidural abscess, 34.1%; brain abscess, 14.6%; sinus thrombosis, 46.3%; general meningitis, 4.8%.

Of the sinus thrombosis cases the jugular was tied in 36.8%.

Regarding the mortality of the various conditions, of the twelve cases of brain abscess, three were cured, 25%, and nine died; of the thirty-eight cases of sinus thrombosis, thirty-two, 84.3%, were cured and six, 15.7%, died. In twenty-five cases the internal jugular was not excised, and of those cases where excision was not performed there were twenty-two cures, 88%, and three deaths, 12%. In thirteen cases, the jugular was excised, and of these ten cases, 77%, recovered and three, 23%, died. Of the four cases of meningitis operated upon, one, 25%, was cured and three died, 75%.

Going over these statistics more in detail, and considering, first, the cases of brain abscess, the fatal termination in this class was due to an extension of the inflammatory process to the meninges, either through the subdural space or by way of the ventricles, usually by the latter route.

Of the two cases of epidural abscess which terminated fatally, one case died of diabetes, which existed before the operation was performed, and the second case died of general meningitis, and is reported under the cases of meningitis operated upon. It, therefore, strictly speaking, should not appear in this category.

The greater mortality which appears in the series of cases in which the jugular was excised, simply depends upon the fact
that these cases were much more severe than the cases in which jugular excision was not performed. Of the three fatal cases, which followed excision of the jugular, one died of septic pneumonia, which developed the evening after the operation was performed, the case having been under observation only thirty-six hours. A second case died of general sepsis, in which a previous pneumonia prevented early operative interference. The third case died of hemorrhage into the spinal canal, all symptoms of sepsis having disappeared at the time of death, and the wound in the neck having entirely healed by first intention.

Of the three fatal cases of sinus thrombosis, in which excision of the jugular was not performed, one died of diabetes, a second died of pneumonia, and in the third case the cause of death is not recorded.

Of the meningitis cases, one was cured by operation, simply by drainage of the subdural space. In the three other cases, drainage of the ventricles was attempted, and all the cases died.

It should be stated, in regard to these statistics, that three of the cases are repeated in the history; that is, one of the fatal cases of sinus thrombosis, which suffered also from an epidural abscess, is reported as a fatal case in both instances. The same is true of another fatal case of epidural abscess, which was also operated upon later for serous meningitis. The third case, reported in two places, is a case of sinus thrombosis, with excision of the internal jugular, which later developed a meningitis, and which was drained successfully, but the patient subsequently died of hemorrhage into the spinal canal.

From these statistics we find that the two classes of cases which are attended by the greatest fatality, are brain abscess and diffuse meningitis, either of the purulent or serous variety. Epidural abscess and sinus thrombosis, including those cases where the jugular demands excision, need not be looked upon as being of such a very serious character, if the cases are operated upon early.

Regarding the necessity of interference with the jugular vein, in cases of sinus thrombosis, this, I think, must depend upon the condition present in each individual case. In most of the cases which I have seen, the jugular has been excised at the first operation, where extensive thrombosis of the sinus was present, that is, a thrombus extending down into the
jugular bulb, and where it was impossible to obtain a free return current of blood after the introduction of the curette deeply into the *bulbus jugularis*. In one instance this was not done because the sinus was completely obliterated, evidently as the result of an old inflammation. This patient made a complete recovery. In a second case a thrombus was found in the sinus during the course of a mastoid operation, the patient having exhibited at no time symptoms of sinus thrombosis. In this instance free curettage was instituted, and although no hemorrhage was obtained from the proximal extremity of the sinus, it was decided to wait for several days to see if any temperature developed characteristic of septic infection. This patient made a complete recovery, and never had a rise of temperature above 99°, showing that the thrombus in the bulb had become organized, and was not infectious in nature. In a third case, owing to the weakness of the patient at the time of operation, it was deemed inexpedient to excise the jugular at the time of the primary operation. The patient was returned to bed, stimulated freely, and twenty-four hours later, there having been a slight rise in temperature, the jugular was removed. This case made a perfect recovery.

As a general rule, therefore, it has been my practice to consider hemorrhage from the proximal end of the sinus as a contraindication to immediate interference with the jugular.

I am perfectly well aware of the fact that free proximal hemorrhage does not necessarily mean that the jugular bulb is free, but it is rather strong presumptive evidence of this fact. Hemorrhage may, of course, come simply from the petrosal sinus, but certainly, in my own experience, it has seldom been necessary to excise the jugular in cases where there was a free hemorrhage from the proximal end of the sinus at the time of operation.

The statistics must vary, of course, according to the practice of each individual operator. Supposing, for example, that I had excised the internal jugular in the twenty-two acute cases of sinus thrombosis, which were cured without interference with the vein. As the operation upon the jugular is not particularly difficult, although sometimes tedious, these cases would undoubtedly have recovered, and the statistics would have been overwhelmingly in favor of interference with the vein. It seems to me therefore, that the advisability of ex-
cision of the jugular must depend upon the conditions present at the time of operation, in any individual case. Where there is evidence of extensive involvement, as shown either by the condition of the patient or by the condition of the sinus, at the time of operation, immediate interference with the jugular is not only advisable, but is strongly indicated.

In cases where but a small thrombus is present, I think it is better surgery to remove the clot, and wait for the development of symptoms.

As to the advisability of suturing the wound in the neck at the time of operation, I have done this in most of my cases. In fully 50% the wound has healed by first intention throughout; in fully 75% of the remainder, most of the wound has healed by first intention, a small sinus remaining at the inferior angle of the wound for several weeks after operation. In only three cases that I can remember, has it been necessary to reopen the wound in the neck, for its entire length. It has usually been my practice to insert a small drain at the lower angle of the wound, and not to attempt complete obliteration of the "dead space" in the neck caused by the removal of the vein. The upper end of the wound, just beneath the mastoid, is also left open, and a firm packing of iodoform gauze introduced here, in order to isolate the upper extremity of the divided vein from the neck wound, and thus prevent infection of the freshly incised surfaces. I believe, therefore, that excepting in very septic cases, primary suture of the wound in the neck is indicated.

Regarding the frequency of occurrence of sinus thrombosis in acute and chronic inflammations, I can only say that I have seen thrombosis of the sinus in both conditions. While it is impossible for me to give the exact figures from my statistics, I would say that the condition occurred with about equal frequency in chronic and acute inflammations. Some of the most severe cases that I have seen have followed acute inflammation of the middle ear, and I think that this is rather the rule, where the bulb is primarily affected, although I have seen cases of primary bulb involvement in an acute exacerbation of a chronic middle ear inflammation.

Concerning the symptomatology of sinus thrombosis in the typical cases, very little need be said. The characteristic temperature curve is sufficient, in most cases, to enable one to make a certain diagnosis.
The blood count, in these cases, is rather interesting, in that in no case has the leucocytosis been very high unless there has been some secondary septic deposit, either in the viscera or superficial tissues.

Regarding the cases which present an atypical clinical history, that is, those cases which run a continuous high temperature, I have seen one or two such cases. Here the absence of other conditions to account for the high temperature, as indicated by symptoms referred to the abdominal or thoracic viscera, or to the joints, or to the meninges, would, I think, usually enable one to make a diagnosis, although the diagnosis must, of course, remain somewhat uncertain. In one case, where the only symptom was a continuous high temperature, excision of the jugular, together with clearing out of the lateral sinus, was followed by a complete recovery.

Concerning the advisability of either ligation or resection of the jugular, as the primary step of the operation, I should hardly be inclined, from my own experience, to endorse this procedure. The only reason why the vein should be interfered with, as a primary step, is the danger of air entering the general circulation, upon opening the sinus. This danger is reduced to a minimum if, before the sinus is opened, an assistant places his finger over the internal jugular in the neck. Remembering that the jugular in the upper part of the neck lies just behind the carotid, and that it crosses the common carotid at about the level of the cricoid cartilage, and also, that it is always superficial, firm pressure on the neck in this region will certainly prevent the aspiration of air into the vein at the moment of opening the sinus. While there is no objection to exposing the jugular just beneath the omohyoid muscle, and putting on a temporary ligature, before opening the sinus, such a procedure occupies considerable time. Not so much time is occupied in finding the vein as in preparing the neck, changing the position of the patient, and temporarily covering the mastoid wound, so as to prevent any infection of this from without. In some of these cases the more rapidly the operation is done the better for the patient, and as there are a certain number of cases in which interference with the vein is certainly not called for, it seems wise to me to explore the sinus first, rather than to interfere with the vein before finding out exactly what there is in the sinus.

Regarding the relative frequency of the occurrence of brain
abscess, in cases of acute and chronic suppuration of the middle ear, most of my cases have occurred either where there has been a suppurative inflammation of long standing, or where there has been a previous history of an acute inflammation, which, apparently, had entirely resolved. This latter statement seems to me one of no little importance. In one of the fatal cases there was a history of an acute inflammation of the middle ear ten years before. When I saw the patient she was suffering from what appeared to be an acute middle ear inflammation of about two weeks' duration, with a complicating mastoiditis, and yet when the brain abscess was subsequently opened the destruction was too great to be explained by so short a history. In another case, where the symptoms were apparently acute, there was a history of earache a year before, and a second attack about a month before the symptoms of brain abscess appeared. When the abscess is situated upon the right side, localizing symptoms are rare. It seems to me that there the diagnosis must be made upon the slow pulse, either a septic or a subnormal temperature, the septic temperature occurring in the acute and the subnormal temperature occurring in the chronic cases, together with the fact that the patient gradually becomes weaker and weaker, and steadily loses flesh. This gradual wasting away of the patient, without any sufficient reason, in cases of aural suppuration, should always be regarded, I think, with suspicion, particularly if the pulse is slow.

The blood count, in such cases, materially aids in the diagnosis. A high percentage of polymorphonuclear cells, that is, a percentage above 80% or 82%, pointing as it does, to the presence of pus in some part of the body, would be a strong indication for the surgeon to explore the brain, if a suppurative lesion in every other situation could be positively excluded. While a low pulse rate is a valuable diagnostic sign, it must be remembered that it is not always present, or occurs, in many cases, as rather a late symptom.

In cases of acute brain abscess, where the purulent focus is small, the pulse may be increased in rapidity.

Regarding the sudden failure of respiration, at the time of operation, I have seen this occur in one case, in which the diagnosis was only made post-mortem, the case having been operated upon for sinus thrombosis.

Epileptiform convulsions have occasionally occurred in some
of my cases, but, as a rule, only in the late stages, and I should hardly regard their occurrence as a symptom indicative of suppuration within the brain.

Regarding the proper method of operative interference in brain abscess cases, I am inclined to think that the otologist occasionally errs in his exploratory operations, from the fact that he seems to consider it necessary to interfere in the direct anatomical region of the ear. Where the localizing symptoms point to a brain abscess, remote from the ear, as for instance, an abscess in Broca's convolution, it seems absurd to attempt to open this abscess, either through the tympanic roof or immediately above the external auditory canal. Broca's convolution should be exposed and the abscess drained, independently of the mastoid wound. The same rule would apply to abscesses located in the motor tract, although, of course, these seldom occur, as the result of middle ear suppuration.

In cases where the localizing symptoms are indefinite, or where they are complex, that is, where there are certain ocular, auditory and motor symptoms combined irregularly, in other words, where no definite cortical lesion can be demonstrated, it seems more than probable that the lesion is located in the internal capsule. In such a case, the exploration would be most effective just above and behind the external auditory meatus, as the parts involved would be more easily reached from this region than from any other. It seems to me that cases of drainage through the tympanic and antral roof, should be restricted to those instances where on exposing the dura in this region, the dura is either discolored or presents a fistulous opening. To explore what may be a healthy brain, through a septic field, would seem rather unwise.

Regarding the drainage of these cases, gauze was used in two successful cases, and drainage tubes in another successful case. In future, I shall be rather in favor of the cigarette drain, that is, plain absorbent or iodoform gauze wrapped in rubber tissue, the purpose of the latter being to protect the incised brain tissue from infection by the pus as it passes from the abscess cavity to the surface.

Of the cases of meningitis reported, two followed chronic suppuration and two acute suppuration of the middle ear. In two cases overlooked in preparing the above statistics, meningitis followed a chronic middle ear suppuration.

The operative treatment of meningitis is the most difficult
and discouraging problem which presents itself. The character of the infection seems to be immaterial. In the successful case of which I speak in my statistics, the dura was opened and the subdural space drained immediately above the tympanic roof. In this case the temperature fell to normal in the course of two days after the operation, and the patient recovered with no complications. In the other cases reported, in which ventricular drainage was performed, death followed in every instance. In all of these cases, however, the ventricles were involved, so that ventricular drainage was demanded.

In two cases, not included in the above list, lumbar puncture was employed, but both cases terminated fatally.

In regard to what Dr. Harris says about meningitis following the radical operation, I would say that out of 150 radical operations, I have had but five deaths. In one case death was due to pneumonia, in two cases to meningitis, and in two cases to brain abscess. In one of the cases dying of meningitis a primary grafting was done, in spite of the fact that a small area of dura was exposed at the time of the operation. In the second case, dying of meningitis, no skin-grafting operation was performed. The wound was simply packed in the ordinary manner, and allowed to heal by granulation; so that, in this instance, the introduction of skin grafts certainly played no part in the production of the meningitis. In one of the fatal cases of brain abscess, the presence of the abscess being discovered only after death, a primary grafting had been done. The quantity of pus found in the brain, however, clearly showed that the abscess had antedated the radical operation. In the second fatal case of brain abscess following operation, the abscess was acute. In this instance, a secondary skin grafting was done fourteen days after the primary operation. At the time of the radical operation, the dura was not exposed in any locality.

The statistics of Dr. Harris, then, while valuable, seem to show that in a certain number of cases the radical operation is followed by death,—not as a direct result of the operative procedure, but simply from an intra-cranial lesion, which must have existed for a long time previous to the performance of the operation for the relief of middle ear suppuration.

Dr. Wendell C. Phillips, of New York, said that the series of papers just presented very completely covered the
subject, and little could be added in the way of criticism. The suggestions they contained and the methods outlined were entirely in harmony with the experience of men who were engaged in this line of work. There were one or two points, however, that the speaker said he wished to emphasize, and one was in connection with Dr. Smith’s paper. Statistics showed that injuries to the head were quite frequently associated with attacks of meningitis from middle ear suppuration. Dr. Phillips said he could recall one or two instances in his own series of cases of chronic middle ear suppuration going on for years until the patient received an injury to the head, and this was followed by an intra-cranial complication. Such a sequence was not difficult to explain. The only barrier between the suppurative process in the ear and the brain was a rather thin plate of bone, and it was quite probable that a severe injury to the head might be the actual exciting cause of the intra-cranial complication.

Dr. Smith, in his paper, tried to differentiate between the different varieties of meningitis, and Dr. Phillips thought that many of the points brought out were correct. As a general statement, it might be said that meningitis, in contradistinction to brain abscess and lateral sinus thrombosis, was more frequently associated with severe and long continued pain in the head. While pain might be present in all varieties, that accompanying meningitis was more intense than that complained of in the other forms of intra-cranial complication.

Temperature could not be relied upon as a characteristic symptom, except that associated with sinus thrombosis. In that condition it was quite characteristic when the sinus had become extensively diseased—not in the early stages. The speaker said he had recently opened a lateral sinus in which the diagnosis was based largely on the temperature variations, ranging from high to sub-normal.

Dr. Phillips said he did not regard the pulse as particularly characteristic of any of the conditions under discussion excepting sinus thrombosis. A rather well-marked chill could also be looked for in that condition, and this was not at all common in the meningitis cases. He did not think a chill could be regarded as one of the symptoms in differentiating between brain abscess and meningitis.

The speaker said he was surprised that greater emphasis was not placed upon the importance of lumbar puncture. He
had come to make use of it in practically all of his cases of meningitis, and by making a careful examination of the cerebrospinal fluid the exact character of the intracranial condition could often be determined.

In regard to hernial protrusions following large openings in the skull, the speaker said it was now generally recognized that the main portion of the protruding mass was not brain tissue at all, but granulation tissue, and it could be sliced off to the level of the bone with comparative immunity.

In differentiating between lateral sinus thrombosis and brain abscess, the mentality of the patient often proved a valuable and helpful symptom. As Dr. McKernon had pointed out, cerebration was rarely interfered with in the former condition, the mind usually remaining clear until a late stage, whereas with brain abscess we were very apt to get early signs of mental impairment, and the same was true of meningitis.

The fact could not be too strongly emphasized that serious intracranial complications were more frequently observed in connection with chronic than with acute middle ear disease, and this should be regarded as an additional reason why those cases should receive more careful consideration than they did. A minute examination of the histories of acute mastoid cases would often show that they were really complications of chronic suppuration of the middle ear. These patients not infrequently neglected to give a history of former ear discharge, or of previous milder attacks of mastoid involvement. This was an argument in favor of the radical operation in selected cases, where the opinion was well grounded that further local treatment would prove of no avail.

Dr. Harris' paper contained the statement that among thirty cases of purulent meningitis there was one recovery. In that single instance, Dr. Phillips said, the meningitis was probably serous in character. The purulent form he regarded as invariably fatal, and he thought it was useless to operate on such cases. In two instances of supposed purulent meningitis that came under his observation during the past winter, the condition proved to be epidemic cerebro-spinal meningitis. One of these recovered, the other died. These cases had been reported in full at the recent meeting of the American Otological Society.

Dr. Charles W. Richardson, of Washington, D. C., said there were some points that he thought were not sufficiently
emphasized in the paper on meningitis. One was, the improbability of any form of treatment being beneficial in pure lepto-meningitis. The Germans had reported good results from lumbar puncture, but those were probably not cases of pure lepto-meningitis. The speaker said he had operated on three such cases without any effect, the patients rapidly succumbing to the disease. This was not surprising, when we considered the character of the lesion in these cases. Masses of purulent exudate covered the surface of the brain, and invaded the interlobular fissures, rendering recovery practically impossible.

In Dr. Jack's excellent paper there was one point that was not sufficiently emphasized, and that was in regard to the aphasia that occurred in the left-sided cases. This aphasia was usually one of the earliest symptoms. Of course, it did not occur in the right-sided cases (excepting in left-handed patients), but when it came on in the course of suppurating ear disease, even without other symptoms, the occurrence of a brain abscess on the left side was very probable.

Dr. Richardson said that in the treatment of the radical mastoid wound, he did not look with favor upon the application of skin-grafts to the freshly exposed dura. He regarded that as a bad method of treatment. The application of skin-grafts was apt to give rise to the development of granulation tissue, and cause unpleasant symptoms. The speaker said he was also opposed to the treatment of the wound by the formation of a blood-clot, as that was another method by which infection could be readily carried into the cranial cavity.
My attention was called to this subject in the various aural clinics with which I have recently been connected, by seeing several patients who were seeking relief from imaginary voices.

Careful search in otologic literature has given very bare results upon the subject, but I have found the neuro-psychologic literature extensive. The search shows, moreover, that hallucinations of hearing are much more common and of greater psychologic importance than other hallucinations, and that they are usually the primary hallucinations. In the order of their importance, hallucinations are classified as hallucinations of hearing, of sight, of smell, and of touch.

As early as 1531, Donat (12) described a case of auditory hallucination. Bodin (6), in 1580, in his description of unilateral hallucinations of hearing, portrayed the first indication of a possible connection between the ears and auditory hallucinations, but he did not remark the significance of this phenomenon. A similar description was given by Dom. Calmet (13), in 1751. He also failed to note the importance of the phenomenon. Almost a century later, Baillarger (1), in 1846, makes specific reference to a possible relationship between the ears and auditory hallucinations. This relationship is made more explicit by Köppe (29), in 1867.

There is considerable evidence showing the association of ear disease with auditory hallucinations (1, 2, 7, 8, 10, 26, 29, 34, 46, 49, 51, 52, 55, 59). The results given by a number of observers shows that in the majority of cases of auditory hallucinations, the patients are also suffering from ear disease. In many of the hallucination cases, complaint of tinnitus is also found; in fact, very few cases of auditory hallucination are free from disturbed aural function of the kinds which are usually accompanied by tinnitus.
Tinnitus Aurium and Hallucinations of Hearing.

Unilaterality of some hallucinations of hearing suggest that they may possibly depend on a peculiarity of the ear on the affected side. On examination of the ears, defects are found on this side.

(1, 2, 4, 5, 6, 8, 9, 13, 14, 16, 18, 19, 21, 22, 25a, 31, 32, 33, 34, 35, 38, 40, 41, 42, 43, 44, 45, 46, 47, 51, 52, 53, 55, 58, 60, 61, 62, 63, 64, 65.)

Without exception, unilateral auditory hallucinations are lateralized on the same side as the constantly present ear lesions. Furthermore, in most of the cases in which tinnitus aurium is associated with the hallucinations, the dominance of the hallucinations increase with an increase of the tinnitus, and the hallucinations do not continue after the cessation of the tinnitus.

We have, therefore, good evidence that auditory hallucinations are often dependent on ear disease, and that some of the cases are due to stimulation of the auditory centers by peripheral tinnitus aurium.

The unstable condition and hypersensibility of the auditory nerve centers and cortex favor the pathologic interpretation of the stimuli given by the tinnitus aurium, and hallucinations of hearing are established. The gravity of the pathologic impressions depends chiefly on the degree of psychical instability. They vary from mere conscious illusions to hallucinations under the patient’s control, and from hallucinations to dominant delusions.

The psychic classification of tinnitus is as follows: I. The largest class, in which the tinnitus is not heeded by the patient. II. When it is the object of mental disquiet in psychopathic patients, tinnitus causes many nervous disturbances, as hypochondria, neurasthenia, or melancholia and quasi insanity. III. In this class the tinnitus causes auditory hallucinations.—group (a) hallucinations which are of slight import and are usually conscious, (b) unconscious hallucinations, but of no great psychic importance, (c) true delusion, usually with persistent delirium which finally becomes organized.

I quote Redlich & Kaufmann’s figures (49). His results are as follows: Number of insane examined 97; number of patients without hallucinations of hearing, 10; patients with normal ears, 11; hallucinations of hearing, 58; abnormal ears, 57; tinnitus, 26 cases; doubtful cases not otherwise tabulated, 29.
I have examined 56 insane at the Manhattan State Hospital, with the following results: Without hallucinations of hearing, 5; cases with normal ears, 4; with hallucinations of hearing, 41; cases with abnormal ears, 42 (mostly non-suppurative); cases with tinnitus aurium, 27; doubtful cases, unable to answer questions, 10.

A large amount of literature shows that auditory hallucinations are caused by stimulation of the sound perceiving apparatus (3, 7, 26, 30, 34, 54). The hallucinations may arise from external sound impression, or from primary stimulation of the auditory centers (22, 23, 24, 36, 43, 45, 60).

The hallucinations usually depend for their inception on stimuli received by the auditory center. The stimuli originating peripherally pass directly along the auditory fibers, or indirectly from other centers along the association tracts. In rare cases the auditory center itself may be subject to primary stimulation, which is due to pressure or to chemical irritants.

The sound perceiving apparatus is abnormally sensitive to electric stimulation, and probably to other stimuli in patients suffering from auditory hallucinations (10, 26). This irritability is often found in the deaf also. It is probably due, as a rule, to the exhaustion which follows the painful effort to hear, when hearing is difficult (17). Probably it also follows the fatigue which results from constant noises, chiefly tinnitus. In a few cases the irritability is due to exhaustion consequent on disease of the nerve centers and brain, as for instance, tumor, etc.

Though the predisposition to the production of hallucination is found in a psychopathic condition, an exciting cause is necessary. This has been illustrated by several authors who have produced artificial hallucinations by stimulation of the auditory apparatus (7, 26, 30, 39).

Tinnitus aurium is a common accompaniment of auditory hallucination and is probably its usual exciting cause. This conclusion is sustained by the number of cases having both tinnitus and hallucination (1, 2, 11, 20, 25, 26, 27, 29, 33, 33a, 34, 47, 49, 50, 52, 56, 57, 63, 65), and by the remarkable number of cases of ear disease associated with hallucination of hearing. These ear diseases in the physically sound would generally be associated with tinnitus. I have found that the hallucinations fluctuated, together with the
Tinnitus Aurium and Hallucinations of Hearing. 95

tinnitus. This has been noted by others (2, 51, 56). The hallucination follows the course of the ear lesions, unilateral, bilateral, intermittent and remittent, etc. The tinnitus often alternates with the auditory hallucinations. Sometimes they may occur together, in which case they fluctuate together.

The hallucinations which are provoked by external sounds very closely resemble paracusis or after-impression tinnitus aurium (56). They may be excited by any common sound such as a clock ticking or striking, etc.

Some hallucinations of hearing are induced by irritation of the peripheral nerves about the ears, that is; by the stimulation of the trigeminal nerve. This is doubtless the same reflex sensation as tinnitus excited in the same manner. Alterations in the circulation which are known to affect tinnitus also affect hallucinations (20). The condition of the naso-pharynx which is a very important factor in determining tinnitus is also relevant to hallucination. The congested, inflamed mucous membrane in the acutely insane fades out to its normal appearance during convalescence from the hallucinations. The purulent secretion ceases as the long standing cases of hallucination improve. Trauma of the ears has also been noted as an inducing cause of hallucination (2, 15, 26, 49, 52). It is usually accompanied by tinnitus.

Ear lesions causing tinnitus are an exciting cause of hallucinations on account of the exhaustion of the sound perceiving apparatus from the constant irritation of the tinnitus.

As we might expect from some of the preceding observations, ear disease is sometimes the precursor of hallucinations (1, 2, 8, 20, 25a, 34, 48, 51, 56). The insane whom I examined had chronic ear affection, which in all the cases of recent insanity must have preceded the hallucinations of hearing.

Ear disease both renders the sound perceiving apparatus more impressionable, and also furnishes the source of the impressions, namely, tinnitus; in addition, it shuts off from the mind some of the correction and occupation it might get from external sounds which are normally heard, but which, owing to the concomitant deafness, cannot now reach the auditory centers.

Prognosis. For the above reasons the prognosis of the hallucinations is bad in proportion to the deafness.

Prognosis is good in groups I and II of the psychic classification of tinnitus, and in classes (a) and (b) of group III.
It is encouraging in some of the cases of class (c) when the ear disturbance can be wholly overcome. Old age is an important factor as a bad indication in prognosis for hallucinations because of the steadily failing hearing, the concurrent tinnitus which is often due to progressive circulatory changes, and because of the steadily progressive mental deterioration (23, 28, 57).

Unilateral hallucinations do not have much psychic influence, because of their correction by the opposite side. Bilateral hallucinations with normal, or nearly normal hearing, and with remediable ear lesions have a good prognosis. When the hearing is much diminished, the prognosis is bad. For in these cases, the psychic disturbances increase progressively, Finally, the hallucinations become delusions (20).

A few cures of hallucination by ear treatment have been reported (2, 8, 34, 50). These cures were chiefly in suppurative disease of the middle ear and in trauma, besides impacted cerumen and foreign bodies in the meatus. It is difficult to find any mention of the cure of hallucinations of hearing by aural treatment in non-suppurative conditions, although such cures may have occurred.

The following cases of hallucinations are interesting because of their evident dependence on catarrhal conditions of the ears as shown by the cessation of the hallucinations when those conditions are corrected.

Case 1. I saw the patient in 1904 at the Vanderbilt Clinic, where she came for relief from the distress caused by hearing voices constantly speaking to her. People she knew across the sea spoke ill of her. Their voices were very real to her. Part of the time she was able to persuade herself that the voices were only imaginary. Occasionally she had visual hallucinations with vivid auditory hallucinations, and saw her brothers who were far away in Ireland, while they upbraided her.

The patient was a psychopathic, single woman of 31, and was not a teetotaler. Her eyes had a wild, restless expression. Her family history was negative. She was a housemaid. An examination of her ears showed a slight chronic otitis media catarrhalis, and also a slight obstruction of the Eustachian tubes. The mucous membrane of the naso-pharynx was congested. Treatment of the naso-pharynx and catheterization of the Eustachian tube stopped the hallucinations after a few times.
In the spring of 1905 the patient was seen by Dr. Michaelis. She had a mild recurrence of the auditory hallucinations. This time she complained of the men next door, who, she said, had designs on her. Again, the hallucinations soon yielded to catheterization.

Case II. The patient was a housemaid, thirty-two years old, and single. Her family history was psychopathic. I saw her at the New York Eye and Ear Infirmary in 1903. She came to the hospital for treatment and relief from auditory hallucinations which prevented her sleeping. The voices spoke chiefly about things in her mind. They said bad things about her. The voices were most annoying in a quiet place and in bed. At night she could not shake off the incubus of their reality, and would try to run away from them.

Inspection showed chronic otitis media catarrhalis and a moderate stenosis of the Eustachian tube. She said that she had buzzing and ringing tinnitus, principally in the right ear, and that the sounds of the elevated trains remained in her head long after they had passed. She heard voices in either ear when she put it on the pillow.

Treatment was given by the catheter and the Siegle speculum and by applications of a solution of silver nitrate. Considerable improvement followed. The hallucinations became entirely conscious, or they were only illusions. The voices became lower and gradually unintelligible, and in two months and a half the tinnitus finally ceased.

Case III. The patient, who was seen by Dr. Michaelis in 1905, was a young man and an epileptic. He had auditory hallucinations. His ears were affected by a mild tubal stenosis and by adenoids. He complained of mucous tinnitus. Treatment was given by applications of nitrate of silver solution, which quickly relieved his condition, and the hallucinations promptly ceased.

Case IV. I saw this patient at the Presbyterian Hospital. She was a married woman, thirty-four years old, and had one child. She was mildly alcoholic. Her antecedents were neurotic. Her father, brother and child were all psychopathic. The patient heard persecuting voices, and also complained of very loud tinnitus of varying character in the right ear and head. There was a history of a running ear. Inspection showed that the left membrana tympani was cicatrized. The right meatus was closed by a cicatrix just external to the po-
sition of the annulus. This ear had not discharged for three years. The nose was in a bad condition, irregularities and hypertrophies.

Treatment of the nose quickly lessened the hallucinations, but the tinnitus continued. An exacerbation of the hallucinations occurred in six weeks. The patient was then taken into a hospital, and in three days the hallucinations had ceased and in five days the tinnitus also.

Conclusions. The evidence points out a logical connection between ear disease and hallucinations of hearing.

In a susceptible, psycophatic individual, hallucinations may be excited by the irritation of subjective noises.

Improvement, or cure of the coincident ear affection may logically be expected to cause an improvement or cure of the auditory hallucination.

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FRONTAL SINUSITIS—DIAGNOSIS, TREATMENT AND RESULTS.

C. G. Coakley, M. D.

ACUTE FRONTAL SINUSITIS.

The basis of the following remarks is derived from a study of fifty-eight cases of acute frontal sinusitis, occurring in private practice between January 1, 1903 and January 1, 1905.

Diagnosis. The diagnosis of acute frontal sinusitis is made from a grouping of certain symptoms given by the patient, together with the observations of the physician as a result of his examination.

As acute frontal sinusitis seldom occurs alone, but with simultaneous involvement of some of the other sinuses, patients give a composite set of symptoms varying with the sinuses affected and the relative severity of each.

SUBJECTIVE SYMPTOMS.

First. Pain or Neuralgia. The most important symptom from the standpoint of patients is the pain or neuralgia for which they seek relief. It is most intense in the supraorbital region of the forehead. It may, however, radiate thence to the temporal region, ear, back of the eye, vertex or occiput. The pain is not always constant, but usually worse in the morning for the first hour after awaking. During the day there are frequent painful periods, lasting from a few minutes to an hour, and then there may be considerable diminution before the next paroxysm appears. During the height of the paroxysm, in addition to the lancinating, shifting, neuralgic pain, there is frequently a marked pulsation or throbbing referred to the region of the frontal sinus. Blowing the nose is usually such a painful act, and so greatly intensifies the pain over the eye that most patients perform this act as infrequently as possible. Percussion on the forehead over the affected
sinus is invariably painful and in marked contrast to the painless percussion over the corresponding area on the healthy side. Kuhnt, in his work, "Ueber die entzündlichen Erkrankungen der Stirnhöhlen und ihre Folgezustände," Wiesbaden, 1895, claims that the outlines of the diseased frontal sinus may be quite accurately determined by percussion over the forehead. We have not been able to verify this statement except in a general way. Unquestionably the larger the frontal sinus, the larger the area over which one elicits pain on percussion; more than this we cannot state. More typical, however, than the percussion over the frontal region is the pain produced by pressing upon the floor of the frontal sinus above the inner canthus of the eye. This pain is very marked and is quite analogous to the pain produced by pressure on the mastoid in acute mastoiditis. A less degree of pressure is necessary than in mastoiditis, as the floor of the frontal sinus is at this point thinner than the average cortex of the mastoid. In no single instance of acute frontal sinusitis has this sign been absent. In one case, cited below, there was present the intense neuralgic pain in the right supraorbital region, pain on percussion over the frontal surface of the frontal bone, and intense pain on pressure over the orbital plate of the frontal, and yet on operation we found that the patient did not have any right frontal sinus.

Second. Discharge from the Anterior Nares or into the Naso-Pharynx. Every case of acute frontal sinusitis was accompanied by a discharge from the sinus into the nose. While it is possible to conceive of a total occlusion of the naso-frontal duct, we have not met with one. In the upright posture the discharge enters the middle meatus, whence it drops down to the floor and is blown from the anterior nares. During the time that the patient is in the recumbent posture, the direction of the flow is backwards along the upper surface of the inferior turbinate into the naso-pharynx. Occasionally when some obstruction exists anterior to the opening of the naso-frontal duct, the discharge is entirely directed posteriorly, even when the patient is in the upright position. In the earlier stages of the inflammation the secretion is thick, glairy, whitish, mucoid in character; at this time, when examined microscopically, it consists of mucus in which are imbedded a considerable number of well-preserved leucocytes. As the disease progresses the discharge becomes yellowish, still remaining
tenacious, and the number of leucocytes greatly increases. With spontaneous or other cure, the discharge becomes less yellow, the number of leucocytes diminishes, and it takes on more of a serous character at its termination. As the disease passes from the acute to the chronic type, the discharge loses its mucoid character, becomes thinner, distinctly yellow, and the pus cells, many of which are disintegrated, predominate. The discharge from a frontal sinus cannot be distinguished from that which comes from an antrum or any of the other accessory sinuses in the nose. Discharge alone, therefore, from the nose or naso-pharynx is not sufficient evidence to warrant a diagnosis of frontal sinusitis.

Third. Nasal Obstruction. In a very large percentage of cases there is sufficient turgescence and swelling of the mucous membrane of the middle turbinate and the rest of the nasal mucosa, to prevent respiration through the affected side. This symptom is not peculiar to frontal sinusitis, but is a part of the history of acute rhinitis as well as that of acute infections of the other accessory cavities which are so often simultaneously involved.

Fourth. Anosmia. The loss of the sense of smell is directly due to the nasal obstruction above mentioned. While present in most cases of acute frontal sinusitis, it is by no means solely limited to affections of this sinus.

Fifth. Redness of the Alae Nasi, Eczema and Herpes Nasalis. The above-mentioned conditions are very common in acute suppurations of the frontal sinus, but like the two preceding may also exist independent of sinusitis. They are due to the frequent use of the handkerchief, to the softening and maceration of the skin and the infection of the same from the irritating discharge.

Sixth. Edema and Redness of the Upper Eyelid. In some of the more severe cases in which the outlet of the naso-frontal duct is greatly narrowed and the secretion within the sinus under considerable pressure, the interference with circulation in the bone and periosteum over the sinus manifests itself as an edema usually with some redness or ecchymosis of the upper eyelid and the skin over the forehead near the median half of the eyebrow. In our series of fifty-eight cases this symptom occurred eleven times.

Seventh. Bulging of the Walls of the Sinus. As a result of greater pressure of the contents within the sinus, the walls of
the frontal sinus bulge at their weakest point. This is usually at the floor of the sinus just above and posterior to the inner canthus of the eye. Palpation in this region, exquisitely tender under these conditions, always shows a convexity of the floor instead of the concavity as ordinarily found. Five of our series presented marked bulging of this kind. The anterior wall is said to have been the seat of bulging, but we have never met with a case.

**Eighth. Diplopia.** When the prolapse of the floor of the sinus is considerable, the eyeball may be displaced downwards and outwards with a consequent diplopia. Two cases presented this symptom. The eyeball not infrequently has the appearance of being displaced downwards and outwards when there is edema of the upper eyelid; one must be careful, therefore, to distinguish between actual and apparent displacement of the eye. An associated ethmoiditis may cause displacement of the globe of the eye. The differential diagnosis may be difficult, but in either case immediate operative treatment is demanded to relieve the pressure.

**Ninth. Fistula Formation.** Unless the tension within the frontal sinus is quickly relieved from the conditions mentioned under headings VII and VIII, the contents of the sinus break through the bony wall of the floor of the cavity, distend and necrose the skin of the upper eyelid, forming a fistula in this region. None of my acute cases developed a fistula. One of the series in the chronic cases had a fistula develop in the acute stage, a result of failure on the part of the attending physician to recognize the trouble.

**Tenth.** Instances are on record where the posterior wall of the frontal sinus has been absorbed from pressure and the contents evacuated into the cranial cavity with a resultant meningitis. It is possible that this happened in one of my cases (Case III), but as there was an associated ethmoiditis and sphenoiditis and no autopsy was allowed, the matter will always remain in doubt.

**OBJECTIVE SYMPTOMS.**

**Examination.** While some of these points have been given above, there remain the examination of the nose and nasopharynx. On inspecting the nasal cavity of the affected side the mucous membrane is usually found so red and swollen and the cavity so filled with tenacious muco-pus as to render
any exact diagnosis impossible without first contracting the tissues with cocain and adrenalin. When this has been accomplished muco-pus will usually be observed issuing from below the middle turbinate, or between it and the outer wall. Secretion in this region may have come either from the frontal sinus, ethmoidal cells or antrum. The antral source of secretion can usually be quickly eliminated by puncturing and washing out that cavity, thereby removing the secretion. If there is still secretion issuing from the middle meatus, the frontal sinus and ethmoidal cells remain to be considered. If pain on percussion and pressure over the frontal sinus has previously been obtained, and if in addition transillumination of the frontals shows considerable darkness on the affected side as compared with the healthy side, the presumption of frontal sinusitis is so great that one may regard it as practically certain. On account of the proximity of the middle turbinate to the outer wall of the nose, we have never been able to pass a probe or canula through the naso-frontal duct into the sinus in an acute case without having recourse to one of two measures:

First. The use of the medium sized Killian nasal speculum which is inserted, with the blades closed, between the middle turbinate and the outer wall and then the blades opened so as to spring the middle turbinate over towards the septum. While theoretically this may be done, in many cases it is practically impossible, in private patients, on account of the great pain produced even when the parts are thoroughly cocainized. If the septum is deviated to the affected side it may leave insufficient space for the pushing over of the middle turbinate. We have employed this method in some of our clinic cases and thus assured ourselves of its availability.

Second. The anterior end of the middle turbinate may be removed with forceps and snare sufficiently far back to uncover the outlet of the naso-frontal duct. It may then be possible to probe or catheterize the diseased frontal sinus. We have seldom found the naso-frontal duct so patent in acute cases as it is in chronic suppuration of the frontal sinus. At best, probing and catheterizing in acute cases is a very painful procedure, and of doubtful utility. Examination of the posterior nares reveals nothing typical of frontal sinusitis. The posterior ends of the inferior and middle turbinates are swollen and hyperemic; above the inferior turbinate
and stretching down to the upper surface of the velum there is often seen a thick, tenacious secretion. In the event of such obstruction in the anterior nares as to prevent the secretion passing forward below the inferior turbinate, the post-nasal secretion should excite one's suspicion of a sinusitis; such a secretion, however, may come from the antrum, ethmoidal cells, or frontal sinus or possibly the sphenoid.

**Acute Frontal Sinusitis Combined With Acute Inflammation of the Other Sinuses.** In some cases it is very difficult to determine the number of the other accessory sinuses involved at the first visit, owing to the intensely swollen condition of the nasal mucous membrane. Transillumination of the antra is a simple procedure, and shadows point to the probability of their being involved. Of the fifty-eight patients, seventeen had both of the frontal sinuses involved, while forty-one had only a single sinus, the right twenty-two times and the left nineteen times. Of the forty-one cases of unilateral frontal sinusitis the antrum showed clear on transillumination seven times and was not irrigated. In the thirty-four cases where there was a shadow on the face of the affected side, the antrum was irrigated and pus washed out in each case. Of the seventeen cases of bilateral frontal sinusitis, both antra were irrigated, owing to imperfect transillumination, and pus found in every case. The larger percentage of maxillary sinusitis associated with frontal sinusitis may be accounted for in the greater severity of the nasal inflammation, all being severe cases of influenza. In thirteen of the thirty-four unilateral cases, the antrum was irrigated but once, the shadow growing less and disappearing after three to seven days. In these cases there was probably but slight thickening of the mucosa, the antrum being mainly a reservoir for the pus from the frontals and ethmoids. In the other twenty-one cases the original shadow was darker and the antrum irrigated two or more times, the greatest number in a girl of sixteen who was irrigated every other day for two months. The seventeen cases of bilateral fronto-maxillary-sinusitis all had their antra irrigated more than once. The antrum was therefore involved in fifty-one cases of the fifty-eight.

Ethmoiditis was considered to be present when considerable swelling was found in the region of the bulla and posteriorly. In forty-seven cases the swelling was marked and ethmoiditis considered present. In twenty-six cases the sphe-
noid was involved as determined by irrigating the cavity. In the seventeen bilateral frontal cases, both sphenoids were involved in eight, the right sphenoid in two and the left in three, making thirteen cases in all. Of the remaining thirteen cases complicating the forty-one unilateral frontals, the right sphenoid was involved eight times and the left five times.

Prognosis. We feel confident that many cases of acute frontal sinusitis occur, fail to be diagnosed, and yet get well without any special treatment directed to the nose or sinus. Many of the chronic cases, provided the disease has not existed too long, can recall the beginning of their trouble, the intense suffering for a week or so, and then the discharge or “catarrh” as they term it, persisting till the true condition is discovered. Of the fifty-eight cases, fifty-five (95 per cent.) made complete recoveries as a result of intra-nasal treatment. One case treated intra-nasally died within twenty-four hours after I saw him. Two cases were operated on by the external method, one of which, a desperate one with beginning meningitis, died forty-eight hours later of meningitis and sepsis. The other recovered. One case (not included in the series) diagnosed as frontal sinusitis proved to have no sinus—she recovered.

So far as known only one case among the fifty-five had a return of the disease, in February, 1905, accompanying an attack of the grippe.

The average duration of treatment was nine days, the shortest four days (stopped treatment when pain ceased). The longest was under observation for two months on account of an associated acute maxillary sinusitis, the frontal discharging for five weeks at least, and possibly a little longer.

TREATMENT.

Constitutional. Patients suffering from acute frontal sinusitis should remain indoors and be given such drugs as would ordinarily be used in abating the general infection, as for example, influenza of which the sinusitis is but a complication. Quinine in suitable doses, salol or aspirin, belladonna or atropin pushed to their physiological effect have all proved serviceable in these cases. In the earlier stages of the inflammation a drop of aconite repeated every fifteen minutes until profuse perspiration has been produced often relieves the turgescence in the nose and favors drainage. Calomel followed
by the salines for evacuation of the bowels should be given in all cases. The coal tar analgesics such as phenacetin, antipyrin, etc., had frequently been prescribed by the family physician for the pain, but seldom afforded much relief.

Opium and morphin, it seems to me, are contra-indicated in these cases just as much as in acute mastoiditis, for in alleviating the pain they mask the fact that the secretion may still be under considerable tension with insufficient drainage, and lure the patient and physician into thinking the condition is improving, whereas it may be getting so decidedly worse as to be of considerable danger to the life of the patient.

External Local Treatment. External applications of moist heat, by cloths wrung out in very hot water, not infrequently contract the blood vessels of the mucous membrane in the frontal sinus and its duct so as not only to diminish secretion, but to increase the caliber of the canal and afford better drainage for the secretion, which has accumulated in the sinus. This form of heat has almost always proved agreeable, giving great relief. Occasionally cold applications in the shape of ice cloths or an ice bag to this region will produce the same results on the blood vessels as that usually produced by heat. Cold, however, is not usually so well borne as heat.

Internal Local Treatment. The first consideration on the part of the physician should be the establishment of adequate drainage from the sinus. In a large percentage of cases the obstruction lies in the lower portion of the naso-frontal duct where it opens into the middle meatus, from the swelling of the nasal mucosa in this region. In the milder cases solutions of adrenalin 1-10,000 sprayed into the nose every two hours not only contract the mucous membrane here, but also that over the middle turbinate, to such an extent as to afford satisfactory drainage. In some cases adrenalin does not produce the effect desired, and one may then have recourse to spraying the middle meatus, beneath the inferior portion of the middle turbinate, with a 2 per cent. solution of cocain. In recommending this, however, I fully realize the danger of the patient contracting the habit if he were allowed to use it himself. A trained nurse or some member of the family alone should be entrusted with the cocain spray, with instructions to use it only so frequently as may be necessary. When the nasal mucous membrane has been contracted by the adrenalin or adrenalin and cocain the nose should be syringed with a solution
of sodium chlorid and sodium bicarbonate, a teaspoonful of each to the pint of sterile water at a temperature of about 115 degrees Fahrenheit. Most patients stand this temperature very well. The first syringe full will be considered pretty warm, but the subsequent ones will not be complained of, and the contracting effect on the blood vessels of the hot alkaline, saline solution is most beneficial. We have often found that spraying the nose with an oil spray—Menthol grs. xv, Camphor grs. x, Oil pini pumilionis m. vii, Benzoinol q. s. ad oz. ii, keeps the nasal mucous membrane contracted and induces a serous flow from the mucosa which greatly helps in diminishing the obstruction around the lower portion of the naso-frontal duct. Steam inhalations where the nose is very greatly obstructed will do the same as irrigation, but of the two I prefer the irrigation, as it removes the secretion at the same time that the local effect of the heat is obtained. Should the above procedures not suffice in establishing good drainage from the frontal sinus as evidenced by the continuation of the pain after twenty-four hours, or should any of the symptoms enumerated under VI, VII, VIII be present at the first visit of the patient, no time should be lost in removing the anterior third of the middle turbinate so as to uncover the region of the lateral wall of the nose into which the naso-frontal duct opens. One should never forget that the naso-frontal duct does not open constantly at any one place in the nose; it is sometimes situated well forward, at others as far back as the middle of the middle turbinate. The amount of tissue that will have to be taken away will therefore greatly depend upon the position of the naso-frontal duct. The mere taking away of a small portion of the anterior end of the middle turbinate, unless it happens to expose the naso-frontal duct, is of little value. The snare alone does not remove enough of the middle turbinate to be of much value; a pair of forceps—Myles' nasal cutting forceps are the ones we prefer—should be inserted high up, one blade each side of the middle turbinate so as to excise the anterior third of the attachment of the middle turbinate to the outer wall of the nose. The snare then inserted through this cut area will remove the offending portion in a large majority of cases. The bleeding, if the parts are thoroughly cocainized and adrenalized, is seldom very great at the time of operation. By insufflating some powdered suprarenal gland what little hemorrhage there is can be checked in the course of
two or three minutes. If now we irrigate the nose with hot normal saline the powder will be removed, together with the blood clots, so that inspection will enable us to determine whether we have removed enough of the middle turbinate to uncover the naso-frontal duct; if not, Grunwald's punch forceps, Myles' punch forceps, or some of the other types of forceps used for intra-nasal work should be used to remove enough more of the middle turbinate to afford adequate drainage. Should, as occasionally happens, small polypi be found beneath the middle turbinate, they are best removed with the forceps, as it is these, often times, which are the offending bodies in blocking drainage. In cases where polypi are found in the middle meatus, it is our belief that we have to deal in most cases not with an acute frontal sinusitis, but merely an acute exacerbation of a mild frontal sinusitis that has existed some time.

External Operative Treatment. Whenever the intra-nasal treatment of acute frontal sinusitis does not succeed in establishing adequate drainage through the naso-frontal duct, then it becomes necessary to open into the frontal sinus through the anterior or inferior wall. Certain symptoms and signs justify us in performing this operation.

These are:

Marked bulging of the inferior wall of the sinus with evident pointing, as if the contents were about to be evacuated. Oftentimes one sees a lesser degree of bulging which subsides when intra-nasal treatment is vigorously carried out. If, however, symptoms of meningeal irritation exist or meningitis has begun, or if actual displacement of the globe of the eye with diplépia obtains, or if, accompanying the headache there is marked dizziness and vertigo, it seems to me we are justified in urging external operation. I wish, however, to state that these symptoms in acute cases are infrequent. On account of the associated eye symptoms and the disturbance of vision, patients often apply to an oculist rather than to a rhinologist for treatment. Each man will have to be a judge for himself as to when he shall operate in these cases. My experiences with such severe cases have been four:

Miss B. S., age 30. Seen on January 28, 1903. Had had severe grip for five days with considerable discharge from both nasal cavities, more on the right; marked supraorbital pain on the right, none on the left. Two days ago developed
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pain in right ear. Examination showed the right membrana tympani red and bulging; slight tenderness over mastoid antrum; considerable muco-purulent discharge from right middle meatus; septum deviated to right so as to preclude view of right middle turbinate. Great tenderness on percussion over the right frontal area and orbital plate. Under nitrous oxide anesthesia, paracentesis of right membrana tympani; smear made from discharge revealed diplococcus of pneumonia. Temperature 100.4, pulse 80. Until February 2nd patient ran a slightly irregular temperature, varying from 99 to 101, pain over right forehead became more intense, with slight edema of the upper eyelid. On account of deviation of septum impossible to do more than keep the mucous membrane contracted with adrenalin and cocaine; mastoid pain also slightly increased, discharge fairly profuse; ear irrigated every two hours with boric acid. On February 2nd temperature gradually rose to 102, frontal headache increasing to such an extent that the patient begged to have something done to relieve it. Hypo of \( \frac{1}{4} \) grain of morphin gave but little relief. On the afternoon of February 3rd, the temperature was 103.8, pulse 90, respirations 28. At 5 o'clock of the same day, the temperature was 105.6, pulse 110, respiration 24. Pain over the right forehead had increased as also the tenderness over the mastoid. Patient begged to have something done for the relief of pain. It was decided to open the right frontal sinus externally. On exploring the right frontal region, absolutely no trace of a sinus could be found; the diploe was found to be soft and bled profusely. Although we explored towards the nose to the level of the inner canthus of the eye, exposed the posterior table of the frontal, went outward to the middle of the orbit and inferiorly to the roof of the orbit, no right frontal sinus could be found in this region. The left frontal sinus was found to extend in a tongue like projection, one-fourth inch to right of median line, three-eighths of an inch above the glabella. The mucous membrane lining it was perfectly healthy, no secretion in the cavity. A probe could be passed through this cavity down the left naso-frontal duct into the nose. The frontal wound was packed. A separate piece of gauze was placed across the opening made into the left frontal sinus.

Dr. Robert Lewis, Jr., operated on the mastoid, finding but a few cells involved near the tip which were filled with gelatinous infiltration of the mucous membrane and scarcely
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any secretion. Patient’s temperature fluctuated between 105½ and 99 until February 9th, it then ranged between 99 and 100 for two days, when it gradually rose again until February 13th, when it reached 105.2. At this time the patient developed a slight broncho-pneumonia. The temperature ranged in the succeeding days, until February 18th, between 100 and 103 and gradually rose until February 20th, when the temperature reached 104. During all this time the mastoid was healing in the usual way. Cultures taken from this wound were sterile. There was the usual discharge from the frontal wound, cultures from which showed streptococci. There was no discharge from the left nasal cavity to indicate that the left frontal sinus had been infected during or subsequent to the operation. The discharge from the right nasal cavity ceased five days after the operation. The patient was seen several times by Dr. Robt. Lewis, Jr., Dr. Weeks, who examined the eyes with negative results, Dr. W. Gilman Thompson and Dr. Robt. Carlisle. We all felt that there was some other suppuration which had not as yet been discovered. On account of the persistent headache in the left frontal region we suspected an abscess in the frontal lobe of the brain. We decided to wait for more localizing symptoms before operating further. On February 21st the temperature rapidly dropped to 99.6, fluctuated between 98.6 and 100.4 for three days when it became normal and remained so. The mastoid wound healed in six weeks, the frontal in seven weeks. The patient recovered and is well at the present time. In this patient every indication pointed towards frontal sinusitis but we are unable to explain the symptoms preceding operation except on the hypothesis of intense congestion without apparent suppuration in the diploë in the right frontal region. Had we been able to take a skia-graph of this patient’s head prior to operation, she would probably never had been operated upon for frontal sinusitis.

Case II—For the history of the second patient I am indebted to Dr. Robert Lewis, Jr., with whom I saw the patient in consultation. S. W., age 35. First seen on June 2nd, 1903, by Dr. Lewis. Had profuse discharge from the left side of the nose for the previous three weeks, pain and swelling of left cheek and both lids of the left eye. Gave a history of syphilis. June 3rd, Dr. Lewis opened the maxillary antrum through the canine fossa. The cavity was filled with granulation tissue and pus; necrosis of the entire floor of the orbit and wall of
the left nasal fossa. All the bone of the floor of the orbit above the antrum was removed; temperature 102.4-5, pulse 128. Temperature fluctuated on June 4th, 5th and 6th between 101-8 and 99.6, pulse about 100. One June 7th, temperature rapidly rose from 100 to 105.2-5. On June 8th, exophthalmos, very intense pain in left eye; upward and inward movement of the eyeball interfered with, diplopia; temperature 103, pulse 116. On June 9th, temperature again rose to 105, pulse 120. On this date I saw the patient with Dr. Lewis and advised opening the frontal sinus and ethmoidal cells. This was done. The whole lower portion of the frontal sinus was necrosed exposing the periosteum of the orbit; the ethmoidal cells were also badly necrosed, thoroughly opened and curetted. At the time of the operation, 10 p.m., the patient was slightly delirious. On the morning of the day after the operation, June 10th, the temperature dropped to 100 and rapidly rose after a chill to 106 at noon. At 6 p.m. it dropped again and rose with a second chill at 8:30 to 105.8, pulse 144. Meningitis more pronounced, rigidity of the neck. Patient died on the evening of June 11th from basilar meningitis and general sepsis, the point of infection for the brain being probably from the orbit. The cause of the extensive unusual amount of necrosis was probably in great part syphilitic. It was a desperate case for operation and yet that seemed to offer the only possible chance for recovery.

Case III.—Master W., age 17. Healthy specimen of a boy with no previous history of any nasal discharge. While at dinner at 7 p.m. on December 12th, 1903, complained of intense pain back of the left eye. Was unable to finish dinner; lay down and physician summoned who prescribed analgesics without relief. On the 13th pain increased, slight discharge from left nasal cavity, none from right; adrenalin spray prescribed by family physician; morphin administered, pain no better. On December 14th, patient seen by Dr. A. A. Smith, who asked me to see patient in consultation with him. Saw patient at 12:30 noon that day and found considerable discharge from the left nasal cavity, great tenderness on percussion over the frontal and on pressure over the orbital plate of the left frontal. Edema and ecchymosis of the left upper eyelid. Transillumination—left frontal very dark, right frontal clear, left antrum clear. Cocainized left middle meatus and removed the anterior one-third of the left middle turbinate with
forceps and snare; about 20 drops of pus followed the excision. Pus seen posteriorly between middle turbinate and septum; this was wiped away. Canula passed into the sphenoid and half dram of pus washed out of the left sphenoidal cavity. Headache somewhat relieved for next three or four hours. Six p. m., patient’s eyes examined by Dr. Weeks, who found nothing abnormal in the fundus. Temperature 102, pulse 60. At 10 p. m., headache had returned, temperature 103, pulse 50. December 15th, 7 a. m., the boy was unconscious, pulse 40, neck rigid; died at 11:20 a. m. This case illustrates a most intense type of infection of the meninges, probably occurring early in the course of the sinusitis. As the frontal, ethmoid and sphenoid were all involved, it was impossible to determine which of these was the more responsible for the infected meninges. Unfortunately no culture was taken from the pus to determine the variety of bacteria. Had not Dr. Weeks been so positive about the fundus being normal I should have opened the frontal sinus externally on the evening of the 14th. Had I operated and the end come as rapidly as it did, I would have felt that some fault in technique might have caused the early death of the patient.

**Case IV.**—F. A. McG., age 24. First seen on March 26th, 1904. The week previous contracted a severe cold in the head with considerable discharge from the left nasal cavity, none in the right. Four days ago had swelling of the left upper eyelid, great headache, supraorbital and vertical. Examination—large quantities of pus in left middle meatus, none in right. Transillumination of right frontal sinus showed small area of illumination, left did not illuminate at all. Right antrum brilliant, left absolutely dark. Irrigated nose with normal saline, punctured and washed out large quantity of pus from left antrum. Removed anterior one-third of left middle turbinate; considerable pus followed the removal; smears from this were examined and showed staphylococci. March 27th, left nasal discharge profuse, swelling of eyelids considerably less. March 28th, edema of eyelids lessening, pain greatly diminished but with considerable discharge from the nose. Again irrigated antrum and washed out considerable quantity of pus. March 30th, pain over eye slightly increased, discharge from nose less. April 1st, much less discharge from nose, only slight pain in the morning, swelling and ecchymosis of eyelid practically disappeared. Trans-
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illumination—left frontal sinus same as last time, antrum slightly clearer. April 4th, discharge only slight; examined microscopically showed staphylococci and pneumococci. Left frontal dark, left antrum same as last examination. April 5th, left eyelid very edematous, could scarcely see out of eye; marked bulging of orbital plate, slight diplopia, considerable discharge from nose, great pain over eye. Operation at 4:15 p. m. Usual incision through whole length of eyebrow. Mucous membrane almost black in appearance. On passing probe into cavity, thick muco-pus exuded under pressure, considerably more than half ounce escaping. Opening was enlarged and cavity found to extend to the left to the external angular process. An incomplete septum in the median line was found. The skin incision extended across the median line to the inner one-third of the right eyebrow. Bone over the right side of the sinus removed. A slight depression found in the region of the normal position of the right naso-frontal duct but no communication with the right naris. A very large orbital offshoot extended over the left orbit practically the entire depth. Mucous membrane entirely removed and cavity packed with gauze. Patient made slow but uninterrupted recovery, the antrum being washed out but once after this, on April 18th. The frontal sinus did not completely heal until February 22nd, 1905. There has been no discharge from the nose since May 5th, 1904. The long healing in this case was undoubtedly due to the enormous size of the sinus.

CHRONIC SUPPURATIVE FRONTAL SINUSITIS.

We have never observed a case of chronic suppurative frontal sinusitis that was not accompanied by a similar condition in some of the adjacent accessory sinuses. There has always been an associated ethmoiditis. In a large percentage of cases the antrum has contained pus, sometimes without much pathologic change in the mucous membrane, at which time it is probably merely a reservoir for the secretion pouring down from above; at other times the mucous membrane of the antrum has been greatly thickened and polypoid owing to chronic inflammation. The sphenoid is also frequently involved, but not nearly so often as the antrum. As a result of the involvement of the adjacent sinuses, the symptoms and physical signs present a complex picture.
DIAGNOSIS.

The diagnosis of chronic frontal sinusitis, like that of acute, is based upon the symptoms given by the patient and the examination of the physician. The former rarely points so directly to the involvement of the sinus as in acute cases, consequently the examination plays a far more important role.

SYMPTOMS.

Discharge.—Discharge in chronic frontal sinusitis, or “catarrh,” as the patients usually term it, varies considerably in amount with the size of the sinus but it is far more dependent upon the number of the accessory sinuses which are simultaneously involved. If the frontal and ethmoids alone are involved, the discharge is not usually very profuse; if the antrum is also involved, the amount is greater, the bulk of which, of course, comes from the antrum. In character it is almost invariably a pure purulent discharge, which if examined microscopically, will be found to consist of pus cells and their broken down detritus. If putrefactive organisms have gained access to the cavity, the discharge has an odor of sulphureted hydrogen. This, however, is not so common with the frontal sinus as it is in the associated disease of the antrum. From the discharge alone as described by the patient, it is impossible to make a diagnosis of frontal sinusitis.

2. Frequent taking cold.—A very large percentage of these cases have moderate acute exacerbations several times a year, and they call such attacks “colds in the head.” The pharyngolaryngitis accompanying ordinary rhinitis is often absent.

3. Fullness in the frontal region. Pain.—Most patients complain of a feeling of fullness in the region of the frontal sinus which is aggravated by intense mental application. During the time when they have acute exacerbations, their taking cold periods, this fullness is more marked and in many amounts to a dull pain. It is seldom the neuralgic pain that occurs in acute sinusitis.

4. Dizziness and Vertigo.—These two symptoms are occasionally noticed and I am at a loss to know whether the symptom is due to the frontal sinus disease alone or more frequently to the ethmoid and sphenoidal sinusitis which so frequently is present.

5. Kakosmia and Anosmia.—Kakosmia, or the subjective sense of bad odor in the nose, is present in a moderate number
of cases. It has been present when I have been unable to detect any odor in the secretion wiped away with an applicator. Anosmia is often present when the nose is obstructed with polypi or intense hypertrophy of the mucous membrane of the middle turbinate.

6. Edema and Redness of the Upper Eyelid and Bulging of the Orbital Wall of the Frontal Sinus.

7. Diplopia.

8. Fistula Formation.—These have all been observed in a few cases and are usually evidence of acute exacerbations of a chronic suppurative process, accompanied by marked obstruction to the outlet of the pus through the naso-frontal duct. They have been more fully described under acute frontal sinusitis.

EXAMINATION.

1. Examination of the nose on the affected side usually reveals the presence of pus in the middle meatus between the middle turbinate and septum. It has frequently occurred in our practice that on the first examination of the patient, no secretion has been visible, owing to the fact that it is quite common for a patient to blow his nose on entering one's office and thus entirely rid himself of the accumulated secretion. In this way we have at first overlooked the disease, when a subsequent visit revealed the secretion in this region, and led us to investigate the accessory sinuses. As in acute cases pus in this region may have come from the frontal sinus, antrum or anterior group of ethmoidal cells. The same means of differentiating are to be taken in chronic cases as already given in the acute ones. Postnasal examination has occasionally discovered pus over the end of the inferior turbinate when none was visible anteriorly; this has been the means of our investigating and discovering sinus disease when the patient's history would not have led one to suspect it.

2. Multiple polypi in the nose should always cause the investigator to make careful search of the accessory sinuses. With but one exception during the past two years, investigation has proved that patients with polypi have had accessory sinus disease, not always, however, of the frontal sinus.

3. Percussion over the frontal sinus is seldom painful except during an acute exacerbation of the chronic sinusitis.

4. Pressure on the orbital surface of a diseased frontal sinus
has in almost all cases been more sensitive than similar pressure on the healthy side. I regard tenderness on pressure over the floor of the frontal sinus as a valuable sign pointing towards a chronic inflammation within the cavity.

5. Transillumination. — Transillumination of a diseased frontal sinus will in many cases show a markedly smaller area and far less perfect illumination than on the healthy side. Frontal sinuses vary considerably in size and a smaller area of illumination is always to be expected when the sinus on one side is smaller than on the other, so that differences in illumination alone are not of too great diagnostic importance. If, however, the illuminated area is more of a cherry red color than the brighter pink that one sees in a sinus filled with air, the value of trans-illumination is enhanced.

6. Probing the Frontal Sinus.—In cases of chronic frontal sinusitis a probe can in a large percentage of cases (in 101 of the 113 sinuses here recorded) be passed up the naso-frontal duct and into the cavity of the sinus. It is more easily accomplished if polypi are associated with frontal sinusitis, as the middle turbinate is almost always pushed well over towards the septum leaving abundant space between the middle turbinate and the septum for the passage of a probe as soon as the larger polypi have been removed.

In cases unassociated with polypi, the middle turbinate usually hangs so close to the outer wall that it is a considerable hindrance if not an absolute impediment to the passage of the probe. We may often overcome this difficulty by taking a Killian's long speculum which is inserted between the middle turbinate and the outer wall, the parts being thoroughly cocaized, and the blades opened. The middle turbinate is thus sprung towards the median line leaving sufficient space for the passage of the probe. As, however, the preliminary step in the intranasal treatment of such cases is often the removal of the anterior portion of the middle turbinate so as to do away with the immediate obstructing medium, we frequently excise the anterior end and a few days later have little difficulty in passing a probe into the sinus. The proper curve for the probe varies slightly with individual cases but the one here shown with slight increase or diminution of curvature will be found to pass fairly readily. The length of the probe when within the frontal sinus, measured from the tip to the point where the probe passes over the entrance of the vestibule of the nose
at its junction with the tip, varies from 8 to 9½ centimeters. Anterior ethmoidal cells may open alongside of the outlet of the naso-frontal duct and extend upwards towards the root of the nose alongside of and parallel with the naso-frontal duct. It is possible for a probe to enter one of these cells and for the examiner to believe that he is in the frontal sinus when in reality he is in one of the ethmoidal cells. If the precaution, however, be taken to notice the distance and direction that the probe has penetrated, and lay it on the face at the same angle as it lay in the nose, there are few times when one will thus be deceived by a fronto-ethmoidal cell. As a usual thing, a small amount of secretion is forced out of the frontal sinus while the probe is being passed. In a normal frontal sinus when a probe has touched the anterior wall, as it usually does, the sensation is very much the same that would be derived if the probe were passed over a smooth wooden surface. The mucous membrane is so thin that the impression of a hard surface is given. On the other hand in chronic frontal sinusitis with a thickened mucous membrane, the tip of the probe enters a pulpy mass, the feeling of which is not unlike that which is derived on thrusting a probe into a piece of velvet.

7. Irrigation.—Once a probe has been inserted into a frontal sinus it is easy to bend a flexible silver canula of small caliber to conform to the curvature of the probe and pass it into the sinus. By bending the head forward, sterile normal saline may be injected by a syringe into the sinus and the returning fluid caught in a clean black pus basin held below the chin. If all secretion has first been removed from the nose by irrigation and the region wiped clean beneath the middle turbinate with pledgets of cotton, it will be found that ordinarily but a few shreds of muco-pus are washed out of a diseased sinus. The reason for this is that the enormously thickened mucous membrane nearly fills the cavity so as to leave but little space for the accumulation of secretion. One, therefore, need not be chagrined at the small amount of secretion that comes away, or delude himself into thinking that the disease is not very extensive and will readily yield to local treatment.

8. Skiagraphy.—Skiagraphy is one of the most valuable diagnostic aids that we have in diseases of the frontal sinus. It enables us to determine the height and breadth of the cavity, the position of the septum between the two, and most
if not all the subsidiary, incomplete septa so frequently existing. It will often show us the recess which extends back over the roof of the orbit to a greater or less distance. In a number of the plates which I have had the cloudy outline of the diseased frontal sinus as compared with the clear distinct outline of the healthy sinus left no doubt as to which of the sinuses was diseased. Unfortunately not all the negatives have been sufficiently clear to make the latter point one that can be invariably relied on.

**INTRANASAL TREATMENT.**

Intra-nasal treatment of chronic frontal sinusitis will be anything but satisfactory unless we bear in mind the probable involvement of the neighboring sinuses. The ethmoids are of the first importance and next the antrum. The sphenoid from its position rarely directly affects the frontal suppurative, but only indirectly through the ethmoids. The antrum should be widely opened in the inferior meatus, the sphenoidal ostium widened and the anterior ethmoidal cells freely opened with the various forceps such as Grunwald’s, Myles’, etc. Polypi, if present, must be removed as thoroughly as possible. If the middle turbinate renders access to the naso-frontal duct difficult or impossible, remove so much of its anterior end as may be necessary with forceps and snare. But little surgical work can usually be done in the middle meatus more frequently than once a week or ten days as the inflammation consequent on each surgical procedure renders the part quite sensitive, the absorption of cocain is less free, the pain too great for the patient to bear, and the hemorrhage obscures the operative field. The treatment necessarily is slow and tedious. The next step is to pass a probe into the frontal sinus to determine the position and course of the naso-frontal duct. Unless the cavity can be entered by a probe, any attempt at enlarging the naso-frontal duct is fraught with so great danger to the patient as to be absolutely condemned. The forceps and curette may in such cases readily be pushed upwards through the ethmoid cell’s and cribiform plate into the cranial cavity and carrying infected material cause a fatal meningitis. A curette, made to follow the course of the probe, is employed to tear away the thickened membrane at the lower part of the naso-frontal duct. The shreds are to be cut away with forceps. If the curette is made to cut forward and inward there is little
danger. Curetting outward may result in penetrating the cavity of the orbit and setting up a cellulitis with all its possible consequences. Curetting posteriorly while safe near the outlet of the duct becomes more dangerous the higher we go from liability to penetration of the cranial cavity. The bleeding is always annoying and sometimes considerable. Pledgets of cotton soaked in adrenalin packed into the region usually control it. If on removal, the oozing recurs so as to obscure the field, desist for the day, as blind curettage through a bleeding field is unsafe. The object to be attained is the dilatation of the naso-frontal duct so as to establish good drainage and an easy passage for a good sized canula, about a No. 3 Eustachian catheter. If attained, some patients may, after the soreness has subsided, be taught to catheterize and irrigate their own sinuses. A 20 per cent solution of argyrol has seemed to aid in diminishing the secretion. Any one not thoroughly familiar with the anatomy of the sinuses as acquired by considerable study and practice on the cadaver would be unwise in undertaking the dilatation or curettage of a naso-frontal duct.

RESULTS OF INTRANASAL TREATMENT.

My statistics of the intranasal treatment of chronic frontal sinusitis are incomplete, owing to the fact that many of the patients have been lost sight of. Seventy-nine cases have been treated in this manner. Eleven, or 14 per cent, are considered as cured. They have been seen for two years, at least, after the cessation of all discharge. Most of these patients have had one or more attacks of rhinitis, from which they have recovered. Following these attacks, there has been no discharge from the frontal sinus. Of the remaining 68 cases, 27, or 35 per cent, have been lost sight of. Some of them still had a slight discharge when last seen. Whether these cases are cured, or have passed into the hands of fellow practitioners, I have been unable to ascertain. Of the remaining 41 cases, 24, or 30 per cent, have returned, with recurrences, one or more times a year. Twenty-two of these cases have polypi, which recur at intervals, varying from six months to two years. They are satisfied with the improvement obtained, as the result of the removal of the polypi, and the diminution of secretion from the frontal and other accessory sinuses. Seventeen of the 41 cases, or 21 per cent, after having been under
treatment for a period varying from six weeks to three years, finally submitted to a radical operation by the "open method." All have been cured.

To recapitulate, 14 per cent were cured by conservative treatment, 51 per cent improved, and in 35 per cent the result is unknown.

EXTERNAL OPERATIVE TREATMENT.

The indications for operating upon the frontal sinus by some of the well-known methods, are:

First.—Chronic suppurative frontal sinusitis, associated with multiple polypi formation in the nose. These cases are always combined with an ethmoiditis. The intranasal removal of the polypi, curettage of the ethmoids, dilatation of the naso-frontal duct, and irrigation of the frontal sinus, ameliorate the symptoms for a few months. In a large percentage of cases, the polypi and symptoms recur, and some form of treatment must again be instituted. In elderly people, or those with marked organic lesions of the heart, lungs or kidneys, a radical operation may be inadvisable. To all other patients, a radical operation is proposed, if they desire to be permanently rid of their disease.

Second.—A radical operation is indicated in severe acute exacerbations of the chronic disease, whenever any of the graver symptoms, as mentioned in VII, VIII, IX or X, of Acute Frontal Sinusitis, develop.

Third.—If intranasal treatment of a frontal sinus does not suffice to prevent the discharge from passing to the antrum, and the odor and taste of the fetid discharge from the latter annoy the patient, then, in order to cure the antrum, the frontal sinus must be operated upon radically.

Fourth.—Very large frontal sinuses, with multiple septa, particularly those with recesses extending back over the roof of the orbit, can be but imperfectly irrigated. Until recently, we have had no means of ascertaining these facts. Skiography, however, as now practised, will give us the exact height and breadth of the frontal sinuses, indicate the number and position of the septa, and, in many cases, inform us of the presence of an orbital recess. The radical operation should be advised for such patients.

Fifth.—Patients with narrow nasal cavities offer greater difficulty in carrying out intranasal treatment, than those with
more patent nares. When the drainage is poor and headaches frequent, these patients gladly submit to a radical operation.

Sixth.—There is a large class of patients, living at some distance from the larger cities, who journey thence to get relief from their suppuration. Considerable sacrifice is entailed in their absenting themselves from home and business. They desire to be cured, and that as quickly as possible. Intranasal treatment is slow, and the results uncertain. A radical operation may take as long as to effect a cure, but when obtained, it is permanent.

Seventh.—The neurasthenic patient, who is prostrated each time intranasal treatment is attempted, and rarely submits to enough being done at any one time to make much progress, is more satisfactorily treated by the radical method. There is seldom any pain after the second dressing, by the latter method.

Eight.—If a fistula is formed, leading into a frontal sinus, a radical operation is the only treatment likely to effect a cure.

My experience with radical operations on the frontal sinus has been limited to two types of operation.

**OGSTON-LUC OPERATION.**

I have performed this operation upwards of twenty-five times. In fully half the cases the patients had a recurrence of the sinusitis, when polypi recurred in the nose, or after a more or less severe attack of acute rhinitis. The deformity, in this type of operation, is practically only a linear scar, which after a few months, is scarcely visible. The objection to the operation, is the great number of recurrences, owing to the fact that the mucous membrane in the frontal sinus is not removed, and the cavity remains lined with a secreting membrane, which participates in all the acute inflamations that occur in the nose. While the naso-frontal duct is at first widely dilated, constrictions occur at or near its lower end, which necessitate either intranasal operations for relief, or a second radical operation. My belief is that the Ogston-Luc operation gives the patient but little better chance for complete recovery than does an intranasal operation.

In seeking for a better operation, my attention was called to Kuhnt's method. This, as originally proposed, consisted in removing the entire anterior wall of the frontal sinus, thorough removal of the mucous membrane from all parts of
the cavity, and the exposure and removal of the mucous membrane from the ethmoidal cells surrounding the naso-frontal duct. He then inserted a drainage tube through the duct into the nasal cavity, and closed the external wound, so that secretion during the process of healing, should find its way through the drainage tube into the nasal cavity. Having in mind the mastoid operation, it occurred to me that it were better to omit nasal drainage and closing of the frontal wound, and try to accomplish that which is so well done in the mastoid, of allowing the granulations to fill the lower portion of the naso-frontal duct, and to keep the upper portion packed with gauze until the cavity is completely obliterated. By so doing, one keeps the healing process entirely under the eye, and when the healing is accomplished we feel confident that the sinus is obliterated, and cannot be infected from the nose with every attack of acute rhinitis.

Before resuming the method, which is best known as the “open method” of operating, mention should be made of Killian’s operation. You are all perfectly familiar, as I am, with the technique. I have performed it, as he describes it, several times upon the cadaver. The testimony from those who have witnessed the operation, varies as to the amount of deformity which is left by this procedure. The results of the “open method” have been so satisfactory, that I have not as yet, attempted the Killian operation upon any of my patients.

THE OPEN METHOD.

The patient is anesthetized beginning with nitrous oxid, followed by ether. If asthma or chronic bronchitis are very marked, chloroform is preferred. The skin over the forehead and rest of the face is sterilized by scrubbing first with green soap, and later washed with bichlorid, followed with alcohol and ether. In performing this, care must be taken to protect the eyes with a pledget of sterile gauze to prevent the various solutions getting into them and setting up a disagreeable conjunctivitis. A wet bichlorid towel is placed around the head so as to include all the hair and yet leave a large area of the forehead uncovered for purposes of manipulation. The best position for the operator is that directly behind the patient; the assistant who holds the retractor should be on the operator’s left when the right frontal sinus is operated upon and on the right when the left cavity is operated upon; the assistant who
sponges, stands on the opposite side of the operator to that of the one holding the retractor. The eyebrow is not shaven.

The incision begins at the junction of the nose and eyebrow, extends outwards, splitting the middle of the eyebrow and terminating in the outer quarter. It is most convenient to make the primary cut extend through the skin, fascia and muscular tissue down to the periosteum. Considerable bleeding is usually encountered at this point, but may be kept well under control if the finger of the disengaged hand of the operator is placed on the supraorbital artery before it enters the notch in the arch of the orbit. The periosteum is next incised, a quarter of an inch above, and parallel to the orbital arch. With an elevator the periosteum is denuded upwards for a space of an inch and down to the edge of the orbital arch. All blood vessels and bleeding points, usually from four to eight in the lower margin of the wound, are picked up with artery clamps; one or two clamps may have to be used on the upper surface of the wound. The vessels are immediately ligated, in order to prevent the artery clamps from pressing upon and injuring the ball of the eye. There should now appear the bare surface of the frontal bone exposed for a distance transversely of at least an inch and a half and vertically for an inch and a quarter. Blunt retractors should be used to keep this much of the wound exposed. With a Killian V-shaped chisel a groove is made in the bone on the anterior wall of the sinus parallel with the arch of the orbit and one-sixteenth of an inch above it. Above this line one may remove the anterior bony wall extensively without great deformity, but if the bone below this is removed and the arch notched or destroyed, considerable deformity always follows. With gouge and mallet the anterior wall of the frontal sinus is grooved parallel to the aforesaid line and just above it beginning at a point near the nasal end, extending it to the middle of the orbital arch. By gradually deepening this groove and exercising care, one can usually expose the mucous membrane lining the frontal sinus without wounding the latter. When the mucosa has been exposed through an area one-fourth of an inch in diameter, the Cozzolini forceps are introduced into the cavity above the mucous membrane and the bony opening enlarged sufficiently to admit a bone forceps, such as Pyle’s, Bacon’s or any of those commonly used in a mastoid operation. With the exercise of a little care, the entire anterior wall of the frontal sinus may thus be
removed without injuring the mucous membrane. Should any doubt exist as to the necessity for doing the radical operation, the first opening need not be made so large as this; the mucous membrane lining the cavity should be incised to determine its thickness and the contents, if any. The normal mucous membrane is about one-twenty-fifth on an inch in thickness. A diseased mucous membrane may be as much as 3/8 of an inch thick. One does not always find secretion in a frontal sinus thus opened because the space in the sinus is very much diminished as a result of the enormously thickened mucous membrane. The manipulative processes of keeping the field clear of blood by sponging and the pressure of the forceps often force whatever small amount of secretion may have been in the cavity through the naso-frontal duct into the nasal cavity. A probe is now used to explore all the periphery of the sinus for incomplete septa and the various pockets which so frequently exist. With a curette the mucous membrane in the body of the cavity is removed as far as the middle of the naso-frontal duct. A small pledget of gauze packed into the duct prevents hemorrhage below from obstructing the field of operation. All ridges, bony septa, and the margins of the sinus should be smoothed off and careful search made for any further inequalities in shape in the sinus. The margins of the bony wound should be smoothed by curettes so as to bevel from above downwards, no rough portions remaining. Attention should next be directed to removing the mucous membrane from the naso-frontal duct; this can only be accomplished by the aid of artificial illumination, and the small lamps designed by the author, with the lens front, have served him better than any other form of illumination. It is the naso-frontal duct and the ethmoidal cells immediately surrounding it that demand the closest attention on the part of the operator; it is comparatively easy to completely remove the mucous membrane from the main portion of the frontal sinus; it is a matter of some difficulty and the exercise of considerable care to thoroughly eradicate every trace of the mucous membrane from the naso-frontal duct; search should be made in this region for an orbital recess running upwards, outwards and backwards over the roof of the orbit; such recesses are apt to be overlooked by the beginner. If undetected the operation will almost certainly fail to give complete relief. Another region to which especial care must be given is the nasal side
Frontal Sinusitis.

of the naso-frontal duct. Very frequently an offshoot will pass up in this region towards the median line which may readily escape attention unless searched for. About half way down the naso-frontal duct elevations are frequently seen and if these be investigated, it will be found that the bone is very thin and when punctured exposes ethmoid cells which are very frequently diseased. These cells should be freely opened and the mucous membrane removed as thoroughly as that of any other portion of the frontal sinus. As a result of the thorough opening of the ethmoidal cells in this region, it is not uncommon to convert a narrow naso-frontal canal not over an eighth of an inch in diameter, into a wide space more than one-half inch in diameter. During this latter stage of the operation some blood necessarily passes from the nose into the naso-pharynx, but it has never been of such quantity as to cause any alarm on the part of the anesthetist or operator. We frequently pass a probe, threaded with gauze, from the frontal sinus through the nose out of the anterior naris and see-saw gauze through, so as to break down more thoroughly any small cells in the immediate neighborhood of the outlet of the naso-frontal duct. The entire cavity is now wiped dry from blood, carefully inspected to see if any spicule of rough bone exists which, if present, is smoothed off. The cavity is next packed with five per cent iodoform gauze one-half inch wide and double selvedge edged. The gauze is packed into the bottom of the naso-frontal duct but not allowed to protrude into the nasal cavity and from there upwards until the space is entirely lightly filled. Two or three sutures are placed in the outer angle of the wound and the gauze left widely separating the inner margins of the wound so that on its removal all parts of the cavity may be readily inspected. The forehead is cleansed of blood and the towel removed from the forehead and an aseptic pad placed over the wound, held in position by a bandage.

After Treatment.

The patient is returned to his bed, and in only a few instances has it been necessary to give morphin or other stimulant for the relief of pain or shock. In from 18 to 24 hours, usually on the morning of the day following the operation, the bandage and blood stained pad are removed. The surface of the wound is gently washed with a solution of bichlorid of mercury 1-5000. A fresh aseptic pad is placed over the
wound and held in place by an adhesive strap. This I have found to afford sufficient protection from the entrance of outside germs and is far more comfortable than the bandage about the forehead. There is always some edema of the upper eyelid, and on the second day the edema is usually increased and the eye may be closed; boric acid solution may be used for bathing the outer surface of the eye. Should the aseptic pad be bloodstained, it is renewed one or more times before the 6th, 7th or 8th day, at which time the packing is removed from the frontal sinus. Some bleeding, mostly from the margins of the wound, occurs at this time; the cavity of the frontal sinus is gently wiped dry with sterile cotton, and iodoform gauze repacked into the cavity, again keeping the margins of the wound separated. Hereafter at intervals, varying from three to five days, according to the amount of secretion, the packing in the frontal sinus is changed. At the end of two weeks granulations have usually sprung up throughout the entire bony surface of the frontal sinus. At the end of three weeks the granulations in the margins of the skin wound are often excessive and are best trimmed off with scissors. About this time we may observe that the granulations have completely filled the naso-frontal duct. The surgeon has then to do with an open cavity lined with granulations and shut off from the nose below; the same as occurs in a mastoid wound following the closure of the opening into the tympanic cavity. Occasionally the granulations are weak and need stimulating with balsam of Peru, nitrate of silver or other similar substance. Packings are usually continued until the cavity has become small in size, when it is my usual custom to discontinue them and expect the opposing granulating surfaces to come together and unite. Occasionally a superficial pocket is formed with the evacuation for a few days of a small amount of secretion. If this happens, I enlarge the opening and curette lightly the interior of the cavity, repack for a short time, until again the granulations appear to be such as to be able to unite and obliterate the cavity. In a few cases we have found that the bone has remained bare in spots for more than three weeks. In these cases we usually find that the use of 5 per cent iodoform wool induces granulations over the bare bone better than the iodoform gauze.

In one patient the dura was accidentally exposed from too vigorous curettage of the posterior wall near the median line.
A pledget of gauze was placed over the opening and the rest of the cavity packed as usual. No untoward symptoms developed, contrary to what I had been led to expect from the experience of some of our German confreres.

In three cases the opposite or healthy sinus was opened, twice on account of a very oblique septum and once as a result of too vigorous use of curette on the septum. In all these cases a separate piece of gauze was placed over the opening, before packing the diseased sinus, and in none of them was the healthy sinus infected. A good skiagraph would have shown the septum and prevented the opening of a healthy sinus in two of the three cases.

PERIOD OF HEALING.

Of the 113 frontal sinuses, six healed in four weeks, 19 in five weeks, 41 in six weeks, 21 in seven weeks, 7 in eight weeks, five in nine weeks, six in ten weeks, two in 11 weeks, and two in twelve weeks. One remained a persistent fistula for nine months, and a second operation was required. In one the fistula persisted for 11 months, but finally healed without any operation. In one the fistula persisted for 14 months, was operated on a second time, and one patient, two and a half years after the operation, still has a fistula.

The average time of healing, therefore, neglecting the four last mentioned, was six and one-half weeks, including them it was 8.7 weeks.

The duration of the treatment is a matter which cannot be accurately foretold from the size of the sinus. Other things being equal, the smaller the sinus, the quicker one would expect it to heal. This has not always been the case. Some of the small sinuses have been nine and ten weeks in healing, while one of the largest sinuses healed in seven weeks. My impression is that in patients suffering from asthma, bronchitis, and multiple polypi formation in the nose, the sinus heals considerably more slowly than is the case in many other patients.

DEFORMITY.

Deformity by the "open method" of operation varies considerably from one that is scarcely noticeable in a person with a small frontal sinus and heavy eyebrow, to one that may be considerable, where the sinus is very large, and especially, if it is deep. In the earlier operations that I performed, the entire
anterior wall was not removed. A small ledge was allowed to project over the sinus. The deformity consequent upon this method is, I believe, greater on account of the puckering at the site of the drainage, than when the entire anterior wall is removed, and the bone of the circumference of the frontal sinus bevelled from above downwards.

We have heretofore been afraid to inject paraffin, in order to overcome the deformity, fearing that the paraffin might cause a necrosis in the newly-formed connective tissue supposed to fill the sinus. As the result of the two secondary operations, we found that there was no connective tissue in the sinus; a deposit of bone had occurred, completely replacing the connective tissue. I shall attempt to correct the deformity by the paraffin injection method on some of my cases. It seems advisable to wait until the skin over the frontal sinus becomes freely movable, as it does in the course of six or eight months, after the healing has occurred.

RESULTS OF THE "OPEN" OPERRATION.

From May 16th, 1901, until January 1st, 1905, I had performed this operation on 104 patients. Ninety-five had a single sinus involved, the right 52 times, the left, 43 times. Nine patients had a double frontal sinusitis. Thus, there were in all, 113 frontal sinuses operated upon. Of the 52 right frontal sinuses, 32 were in males, and 20 in females; of the 43 left frontal sinuses, 27 were in males and 15 in females. Of the nine double operations, two were in males, and seven in females. Of the 104 patients, 101 had their frontal sinuses obliterated, as a result of a single operation. One patient, Mrs. A. B., age 65, double frontal sinusitis, operated upon two and a half years ago, still has a fistula, with very little secretion, a drop a week. Two patients have each been operated upon twice.

One patient, Mrs. J. H. S., double frontal sinusitis, right side healed, left side continued to secrete for nine months, after which time I opened the sinus again, and found an area of polypoid tissue around the upper portion of the naso-frontal duct, where I had probably failed to remove all of the mucous membrane. As the result of the second operation, the patient had a complete recovery.

The third patient, Mr. P. T. B., age 36, right frontal sinus apparently healed, when three weeks later a fistula formed on
the forehead and discharged muco-pus. Light curettage was followed by apparent healing. The breaking down and healing recurred every three or four weeks, until fourteen months after the original operation, the cavity was again explored, and some portion of the mucous membrane found at the upper inner angle of the frontal, and also in the naso-frontal duct. This case is apparently healed now. In all three of these patients, it was possible to pass a probe from the nose, through the naso-frontal duct, into the sinus, to the same distance that it was possible before the operation. The obliteration, therefore, of the naso-frontal duct had not been accomplished in them.

Two patients have died since their frontal sinuses healed. One, Mrs. I. D., age 27, first seen February 9, 1904, had multiple polypi in both nares for five years, severe asthma, chronic bronchitis and emphysema, great frontal headache. Polypi removed intranasally and naso-frontal duct dilated, frontals irrigated, no relief. March 21st, chloroform anesthesia by a professional anesthetist on account of pulmonary lesion. Both frontals operated on radically by open method. Considerable cyanosis during operation, very blue during last half hour. Right frontal sinus, operation lasted 25 minutes; left frontal, 50 minutes. Patient rallied well and left hospital for home 35 miles away 48 hours after operation.

April 30, right sinus healed. May 7, left sinus healed.

May 12, operation on antra, chloroform anesthesia by same anesthetist. Anesthesia began at 2:05 p. m., and completed at 3:45 p. m. Same cyanosis as at first operation. At 3:55 patient was in room and partly conscious. I saw her at 4:10, at which time she was conscious, pulse 130, respirations somewhat labored, pupils normal. Patient left in charge of anesthetist. I had no sooner left than pulse became very feeble. Stimulating enema ordered, but before nurse could give it patient died at 4:15 apparently from effects of chloroform. As the antra alone were operated upon, there could have been no possible cranial lesion produced during the operation.

The other case, Mr. E. C. E., age 39. Frontal headache, very severe at times, with edema and redness of left upper lid, profuse discharge from L. N. Three years standing following grip. Intranasal treatment for six months without much relief. Operation October 31, 1904. Very large L frontal, with orbital recess, ethmoids and antrum. Left hospital November 9th and came to office for treatment. November 28, had attack
of pleurisy with effusion, confining him to his house in Brooklyn. On December 12 patient resumed visits to office. Very little progress in healing. Healing continued slow until February 2, when frontal wound closed—antrum not yet filled up. No nasal discharge. The latter part of February, 1905, patient contracted a lobar pneumonia and died on March 6, 1905. No autopsy.

Seven healed cases have reported at various times, with involvement of some of their accessory sinuses. The frontal sinus has always been carefully investigated, but so far as I could determine it was not involved.


2. Mr. P. J. W., age 34. Right frontal and antrum operation March 14, 1903. Still has fistulous opening beneath cheek. No nasal discharge.

3. Mrs. J. F. B., age 37. Multiple polypi; pansinusitis, five years' standing. Left frontal, antrum and ethmoids operated on January 21, 1904. Right frontal, ethmoids and antrum on March 23, 1904. In the latter operation no trace of frontal sinuses could be found. Left antrum and sphenoid discharge occasionally. R. sphenoid has polypi formation about ostium, these were removed in October, 1904, and again in May, 1905.

4. Mr. P. R., age 57. Syphilitic history. Double frontal sinusitis with pus in both maxillary sinuses. Only frontals operated on. Pus disappeared from R. antrum after frontal operation. In February, 1905, had hard cold and both antra discharged very foul—smelling pus for one month. Cured by irrigation. Left sphenoid, although anterior wall had been removed so that ostium was nearly one-half inch in diameter, also secreted pus. Mucous membrane very thick and red. Now dry.

5. Dr. A. F., age 35. Left frontal antrum and sphenoid. Operation on left frontal and antrum November 1, 1904. Frontal healed. Antrum, small fistula still leading into mouth. Had acute rhinitis in April, 1905. Left sphenoid discharged for two weeks and right antrum also involved and had to be irrigated three times.

6. I. R., age 34. Left frontal ethmoid and antrum, opera-
tion on left frontal and antrum November 19, 1904. Very small fistula still in antrum. Had severe acute rhinitis April 15, developed severe acute right suppurative otitis media, para-centesis and discharge for six weeks.


To Recapitulate.—Of the 104 patients two are dead, one from chloroform narcosis, the other from pneumonia, one case has a fistula two and one-half years after the operation. Two required a second operation before obliteration of the sinus was accomplished. Thus 3 per cent of secondary operations were necessary to healing. Seven cases are still under occasional treatment, not for frontal sinusitis, however. Three of these cases were operated on so recently that there has not been time to correct the disease in the other sinuses.
That the nasal passages can be utilized as a pathway to the attack of the diseased nasal accessory sinuses, depends upon the well known anatomic fact that all of these sinuses communicate with the nasal fossae by one or more openings or ostia, which though variable as they certainly are as regards their size, form, position and number, are constant as regards their presence, and further by the fact that all of the sinuses, with the exception of the frontal, are in relation to the cavity of the nose proper over an area of greater or less extent, which represents the common boundary wall between them.

Any method of treatment which aims to gain access to the sinuses, either through one of its natural openings, enlarging it if necessary, or the formation of an artificial opening, or by a still more extensive surgical destruction of an intermediary wall, may rightly, I think, be denominated the nasal, intranasal, endonasal or transnasal route.

Having been honored by the president of our Society with the agreeable commission of presenting the claims which can be urged in favor of the intranasal route for attacking the diseased nasal accessory sinuses, the author trusts that his advocacy of the cause will not be taken to mean that he practises the nasal route exclusively and considers it all sufficient for every kind of case.

On the contrary, he recognizes clearly enough that it has its objections and limitations, and must often be superseded by the so-called external operation.

The nasal route can, I think, properly be designated the conservative method, inasmuch as it aims to accomplish a cure with the least possible destruction of healthy tissue, and without producing any deformity, and as a rule without having resort to a general anesthetic.
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A mistake, however, would certainly be committed if the conclusion were reached that because conservative it requires less skill or anatomic knowledge inferior to that necessary for performing the more radical operation; for that is not the case. As we are operating in a more confined space than in the external operation where the operative field is generally enlarged, we shall have consequently greater necessity for depending upon the surgeon's tactus eruditus; and for the same reason, a thorough knowledge of the normal anatomy of the parts and possible abnormalities to be met with is absolutely indispensable.

Recently there has been such activity in devising and experimenting upon new methods of attacking these sinuses from without, and so much attention has been centered upon methods of opening up one sinus to gain access to another, and upon those ultra-radical operations which seek the complete obliteration of the cavity at the cost of the wholesale suppression of the sinusal walls, that we are, it may be reasonably suspected, in a fair way to lose sight of the fact that there is such a thing as a nasal route.

Before we advise a patient to submit to an operation under a general anesthetic, with its possible accidents or to one that entails a risk of orbital complications, such as strabismus, or that will leave an ugly facial deformity, should we not consider calmly, carefully and conscientiously what can be accomplished by a more conservative course?

The objections which I have at one time or another seen or heard raised against employing the nasal route in the treatment of the accessory sinuses, may be summarized as follows:

1. That it is not always practicable.
2. That valuable time is lost postponing radical measures.
3. That the nasal methods are generally slow and tedious.
4. That they are uncertain as to results.

To answer these objections seriatim, we will say in regard to the first, that the nasal route is not always practicable—that if there are certain cases in which the treatment is not practicable, there are others where it is, and that the latter will be found to increase, and the former diminish in proportion to our efforts to put this method into effect.

2. The second objection, viz.: that valuable time is lost in postponing radical measures, is the one most commonly urged
against conservative nasal treatment. Supposing the nasal treatment to have failed in making a definite cure, is the time actually lost in employing any method which consists in the frequent removal of purulent secretions and thus succeeds in relieving the patient at least of the most disagreeable symptoms? Moreover, even though the case must come ultimately to a more radical operation in order to effect a perfect cure, the nasal treatment has in all probability accomplished something which contributes toward a successful outcome, such as the removal of polypi and hypertrophies, and the establishment of better nasal drainage.

In the case of intranasal treatment of maxillary sinusitis, if done in the manner which I shall later describe, we will have actually performed one of the stages of the radical Caldwell-Luc operation, which will prove a decided advantage, should this operation become eventually necessary.

3. The third objection, that the nasal operations are slow and tedious, has to be admitted as generally true, though not always. The only question here is whether the relief afforded or the chance of cure outweighs all the disadvantages of the external route.

4. This brings us finally to the vital question of the efficacy of the nasal route, a question that is involved in the fourth and last objection, viz., that the nasal route is uncertain. Being uncertain, it is argued, it were best to proceed at once to measures that can be better depended upon for successful results.

That a great many cases do get well under conservative treatment will be generally admitted. These cases, moreover, are often such that, according to all rules, seemed to demand radical measures.

Many specialists have borne testimony to the fact that cases in which they expected to operate, have surprised them by recovering under simple treatment, undertaken tentatively, or because the patient himself held out against more radical measures. The uncertainty in the results, then, instead of being an objection, is an argument in its favor, because we ought to give the patient the benefit of the doubt, before proceeding at once to a radical operation, which the outcome may prove unnecessary.

Some will say, differentiate your cases. The nasal routes will do very well for your mild, simple, acute cases; but when
it comes to a chronic case, in which extensive changes have been wrought in the lining membrane and bony wall of the cavity, your conservative measures are useless, and you must proceed at once to radical methods. These are good principles certainly; but how to apply them, there is the difficulty.

The chronicity of an existing sinusitis can be judged only from the history of the case, and is therefore unreliable. The patient may mislead you into mistaking for a recent case, what is in reality a recrudescence of a long standing, latent inflammation of the sinus, or, *vice versa*, into taking to be chronic, what is in fact recent, because the patient confuses the present symptoms with the symptoms of ordinary acute rhinitis which he has had in the past.

The state of the interior of the cavity as a guide to a choice of operative method is of course practically unavailable, unless in the case of the maxillary antrum, where some attempt has been made to distinguish between, on the one hand, an acute sinusitis or simple empyema without thickening in the lining membrane, and on the other a true sinusitis, in which the capacity of the cavity has been contracted by hypertrophic and polypoid degeneration in the lining membrane.

We have for this purpose the following three signs:

1. *Mahu's sign.*—Mahu punctures the antrum, injects into it a fluid, then withdraws and measures it. If the capacity proves to be greater than 2 cm. he concludes that we have to deal not with a true sinusitis, but with a simple empyema.

2. *Lubet-Barbon's sign.*—According to Lubet-Barbon, a true sinusitis may be inferred, if after a thorough washing out of the sinus, drops of pus will continue to flow through the canula, allowed to remain a few minutes in place.

3. *Guisez's sign.*—The easiest to apply, and the most reasonable is the sign of Guisez. It depends upon the principle that polypoid thickening in the mucous membrane, no less than the presence of pus, may account for a failure to get illumination in a diseased antrum. If then an obscurity that was present before, disappears after emptying the sinus of pus, he infers that we have to deal only with an empyema, and not a true chronic sinusitis.

If after applying one or more of these tests we can establish with a reasonable certainty, that the case before us is a true sinusitis, and that chronic polypoid changes have already taken place in the interior of the cavity, an immediate radical opera-
ition is indicated. In all other cases, the nasal route should be given a trial, and if it fails no harm at least has been done.

The nasal route recommends itself as the natural one. An outlet is secured for the diseased secretions through a channel, which constitutes the natural outlet for secretions under normal conditions, and for this reason it is far more convenient and agreeable to the patient than any other.

After all, whether we approve of the nasal route or not, the circumstance that our patients will sometimes refuse to undergo a radical operation from one consideration or another, make it imperative for us to practice it, and therefore I beg your indulgence while I as briefly as possible, outline the nasal route for the individual sinuses.

THE MAXILLARY SINUS.

In a large proportion of cases antrum disease is undoubtedly of dental origin, but in such cases attention must be primarily directed to the diseased tooth or teeth and then the alveolar route naturally takes precedence over all others.

We are considering here, however, that other group of cases, not dependent upon the condition of the teeth, but whose inflammation analogous to those of the other sinuses are of nasal origin.

The nasal route to the antrum of Highmore includes:

1. Irrigation through the natural opening (ostium maxillare or ostium accessorium.)
2. Irrigation through an artificial puncture with trocar in either middle or inferior meatus.
3. Large opening in outer wall of nose.

1. Irrigation through the natural opening, although recommended and practiced in the past by such eminent men as Lichtwitz, Garel, Hartman, Stoerk and Weil, has, I think, too many disadvantages and too few advantages to deserve to be considered as a method of treatment. The opening being near the roof, it is not practicable to effect a thorough cleaning of the cavity. Thick, grumous matter which has sunk to the bottom will not be stirred up and the cleansing will be only superficial.

If there be no accessory opening, the pus will have no place to make its exit, except around the sides of the cannula, which obviously may prove quite insufficient.

2. Artificial opening with trocar.—Some authors have practised puncturing through the middle meatus, for the reason that
In this method, the outer wall of the nose is thin and membranous, and the trocar can be made to enter with less force. But besides having the same disadvantage as the natural opening, viz., its high position, an additional objection exists in the danger of puncturing the orbit in this locality. The outer wall of the nose in the region of the middle meatus sometimes is so fused with the inner orbital wall that a needle entering here is quite certain to enter the orbit. The puncture should, therefore, be made in the inferior meatus, thus avoiding these inconveniences.

Mickulicz was the author of the method of treating the antrum by means of a puncture in the inferior meatus. Krause was also a strong advocate of this method and invented a trocar for the purpose.

The point of the needle should be inserted a little behind the middle of the anterior posterior distance of the nose, and well up under the attachment of the inferior turbinate if we desire to select that part of the inferior meatus where the wall is thinnest.

Curtis (Trans. 9th An. Meeting Amer. Laryng. Rhin. and Otol. Soc., Lexington, Ky., 1903) says the puncture should be 1 cm. behind anterior attachment of inferior turbinate. This is too far forward. It should be from two to two and one-half cm. back of this point, in order to avoid the accidents which will be referred to later.

It is generally stated that treating the antrum through a small puncture with a trocar is unsatisfactory, because of the tendency of the opening to soon close. My experience has been otherwise. Before I had constructed the instrument which I will describe later, I treated quite a number of cases of suppurative inflammation of the antrum, using the Myles trocar or canula. To facilitate the introduction of the canula into the opening at subsequent sittings, I improvised a blunt, pointed, obturator to take the place of the sharp, pointed trocar, and I very seldom experienced any difficulty in finding the artificial aperture and utilizing it for the purpose of irrigation.

I recall one case in which this must have been done not less than 150 times.

The case is instructive in that it demonstrates what may sometimes be accomplished by persistence in the conservative course of treatment.

The patient, a young lady, first came under my care in
August, 1902, suffering from a left frontal sinusitis. After several months irrigation, the liquid injected into the frontal sinus returned clear; but finding nevertheless pus in the middle meatus, I suspected antrum disease, and punctured.

After having irrigated the antrum through the artificial opening in the inferior meatus on an average of three times a week, and the pus still continuing to come, I proposed radical operation, but the patient preferred the symptomatic relief to the promised cure and refused. There was nothing to do but continue the irrigation, which was done sometimes twice a week, sometimes oftener, for full twelve months from the time the antrum was originally punctured. At last, to my surprise, the pus ceased to appear in fluid returned from the cavity, and a perfect recovery resulted.

It is now a year since; the patient has contracted some colds in the meantime, but there has been no return of the pus.

We may use either a straight or a curved needle for puncturing the antrum. It is not possible with a straight needle, to get the shank as near a right angle to the wall of the nose as is desirable, and there is consequently greater danger of the point sliding back and failing to enter. If a curved instrument is used, the point ought to be applied a little further back than when the straight is used, on account of the greater danger of entering the opposite wall of the antrum.

If the trocar has entered the sinus, we become aware of it by the following signs:

(a) The operator experiences through the sense of touch a crepitation from the breaking through of the thin bony wall, and a feeling of having suddenly overcome an obstruction and plunged into a cavity.

(b) The patient’s sensation can also be relied upon of the instrument being in the cavity; especially if he has a pain directly over the root of the teeth.

(c) The instrument becomes fixed, the shank being pressed firmly against the anterior edge of the septum.

(d) If pus be present, some drops may flow through the canula.

(e) The conclusive evidence is the appearance of pus when the cavity is irrigated.

Difficulty may be experienced because of unusually thick walls, or the presence of pus or deviations in the septum, or of a low reaching turbinate; but they are such as may be
overcome. A division of the sinus into two cavities may be misleading. Where suspected, a second puncture should be made farther back or forward as the case may be. A fusion of the outer wall of the nose with the orbital plate is an anatomic anomaly which may lead to unpleasant consequences. This as a rule is a serious consideration only when the puncture is in the middle meatus. But exceptionally it may be so marked as to cause an accident, even from a puncture in the inferior meatus. Dr. Beamon Douglas reported a case, evidently of this class, in which the puncture was followed by a swelling in the orbital region, the eyes becoming closed from the edematous condition in the lids.¹

The facial plate may also become fused with the outer wall of the nose, in which case the antrum is very much narrowed in its anterior part, and there is danger of the needle going all the way through and piercing the cheek. Puncturing well back as advised will circumvent this accident.

We should always study the conformation of the face before making these punctures, especially with reference to a bulging outward of the outer wall of the nose, or a flattening in the malar region, and we may gain information that will save us from accidents of this kind.

3. Large opening into the outer wall of the nose.—Although this is practised regularly as a part of the Caldwell-Luc operation it is seldom that it is done as an independent procedure.

Rethi (1896), Bayer, (1899), Kaspariantz (1900), and quite recently Onodi have advised treating maxillary empyema by means of a large opening in the middle meatus, the naso-antral wall being thinner at this part of the nose.

Claoue of Bordeaux in 1902 (Semaine Medicale, October 15, 1902) advised making a large opening in the inferior meatus, instead of the middle. He used originally a drill driven by an electro-motor for the purpose, but later gave this up because of the painfulness of the proceeding, and adopted a hand-drill and special forceps to make the opening. Curtis at the eighth meeting of this society in 1903, spoke favorably of a large opening through the outer wall of the inferior meatus, which he made by means of a burr drill driven by an electric motor. Escat (Toulouse Medicale, April 15, 1904) uses a sort of rectangular trocar to enter the antrum, and enlarges

the opening by means of special hooks. The flaps thus cut in the outer wall are then removed by means of a snare or cutting forceps. Escat has reported cases of 1, 2, 3, and even 5 years' duration cured by large openings through the inferior meatus.

Gavello of Turin (Sulla cura chirurgica delle sinusite mascellare cronici, Gior. d. r. Acad. di Torino, 1904 4s. X 322) in a recent article also advocated the large opening and has devised an instrument for making it.

There is no illustration of this instrument accompanying the article, but it is described as a trocar on the principle of Naegele's craniotome. After puncturing with this, he enlarges the opening by means of common bone forceps.

The operation of making a large opening through the inferior meatus seems certainly to be a very rational one. We thus establish a communication with the nose at the lower part of the cavity, provide good drainage, and permit the diseased sinus to be aerated and irrigated ad libitum; and the secretions being evacuated by way of the nose give far less discomfort to the patient than were the case should the opening be in the alveolar process or canine fossa. Furthermore, as already once stated, if ultimately the Caldwell-Luc operation must be performed, one stage of the operation will already have been accomplished.

It occurred to me that there was a need of some simple method of making this large opening. For this purpose, I have constructed the instrument which I show you. (Fig. 3.)

In the first place, it consists of a trocar and canula, having a curve representing the arc of a circle as in Myles' instrument, but of considerably greater calibre. I have added a blunt obturator, but have discarded the little connecting piece which Myles fits into the canula in irrigating.

The chief feature of the instrument is the small plate on the concave side of the canula, containing a rasp, intended to cut away the edge of the opening and thus enlarge it to the diameter desired.

Before making the large opening into the outer wall, any polyps which may happen to be present should be thoroughly removed, and the inferior turbinate cut away sufficiently to give good access to the naso-antral wall in this locality. With a pair of serrated scissors, the turbinate is cut away close to its attachment to the wall for about one-half or two-thirds
Intranasal Route in Operating on Accessory Sinuses.

Fig. 1. Author's Sphenoid Sinus Probe and Canula.

Fig. 2. Author's Frontal Sinus Probe and Canula.

Fig. 3. Author’s Special Trocar and Canula for Making Large Opening Into Antrum Through Naso-Antral Wall.
of its extent, after which with wire snare this much of the turbinate can be very easily severed and removed. After having thoroughly satisfied ourselves of the presence of pus in the antrum, we can proceed to make the large opening by means of the special trocar described. The point of the trocar is inserted well back about the junction of middle and posterior third of the inferior meatus; and in case a local anesthetic is used, well up under the attachment of the inferior turbinate where the antro-nasal wall will be found thinner. If done under general anesthesia, the opening might as well be made near the floor of the nose, thus obtaining the most desirable point possible for drainage. As soon as the instrument is felt to have entered the cavity, the blunt obturator is substituted for the trocar, and the rasp made to enlarge the opening in a generally forward direction to the extent of a couple of centimeters or more.

THE ETHMOID CELLS.

There seems to me rather more definite indications to guide the operator in the case of the ethmoid than of the other sinuses. Most authors are agreed as to the advisability of attempting a cure by operations through the nose when there is but a mild state of inflammation present, or when the disease is circumscribed and limited to but a few cells. Where orbital symptoms are present, and the patient presents himself with an abscess or fistula in the region of the os planum, the external operation will generally be necessary. In all cases some preliminary intranasal operation at least will generally be necessary, for before attempting immediate external operation, the natural course is first to remove polyps and polypoid hypertrophies, and thoroughly cleanse the nose of purulent secretions and establish good drainage.

If it is decided to push the intra-nasal treatment any farther, the next step is to remove the middle turbinate. When this is done, polyps previously concealed and hardly suspected to be present, will frequently come into view and give us more employment for the wire snare. The intranasal operation must proceed by slow successive stages, because of the bleeding which generally obscures the field and interferes with a good view of the parts.
Many different instruments have been devised for breaking down the ethmoid cells.

Hajek uses a trocar and hook. Grünwald and Myles have devised forceps and Bryan a curette for the purpose. The Luc cutting forceps have seemed to be the ideal instruments. They are very effective in biting off portions of the labyrinth seized by the blades, and the shanks being slender, they obstruct the view as little as possible.

The use of the electric cautery is to be condemned because of the reaction with which it is followed; and punching instruments, trocars, drills and electric trephines ought to be avoided because of the danger of their being unexpectedly thrust either upward through the cribriform plate or outwardly through the lamina papyracea. With whatever instrument one may be working extreme caution is required.

There is considerable variation in the volume of the ethmoid labyrinth, and the endeavor to effect a complete removal of the cells is attended with the danger of penetrating one or the other of the two structures mentioned.

Using monocular vision, an imperfect idea of distance is very easily obtained, and the operator should frequently remove his instrument and make a mental estimate of the distance within the nose reached by the end of the instrument when in place.

I think it is worth while to recall the fact that the cribriform plate is fully one cm. below a line that is on a tangent with the upper border of the superciliary ridges and that one in operating should always keep below a horizontal plane at the level of the internal angular process or inner canthus of the eye.

It is often a question to determine what tissues are so diseased as to require removal, and what may be left. The probe may be of service as a guide to exposed bone or to such as is friable, and easily broken down. Membrane that is deeply colored, puffy, swollen and edematous, should generally be removed. In case of doubt, it is the part of wisdom to be conservative and let the progress of the case dictate as to further intervention.

The advantages of the nasal route when feasible, are that it opens the cells at their most dependent situation, it is attended with a minimum of surgical intervention, and that it avoids disfiguring external scars.
The external operations upon the frontal sinus, especially those which aim at a complete obliteration of the sinus are sometimes attended with such a hideous deformity, that whatever may be our own inclinations with respect to its indications in a given case as compared with conservative intranasal treatment, the patient will frequently decide the matter by refusing to consent to its performance, thus compelling us to adopt the only alternative.

When we consider that at any rate the radical cure of frontal sinusitis is far from having attained the position of an accepted finality, we are the more disposed to yield to the patient's own wishes and give the conservative treatment at least a trial.

Hajek in the recent edition of his unexcelled treatise on the accessory sinuses (Pathologie und Therapie der entzündlichen Erkrankungen der Nebenhöhlen, Leipzig and Wien, 1903, page 177) shows unusual respect to the endonasal method of treatment and gives expression to such favorable views of its usefulness, that they deserve to be noticed.

He lays special stress upon resection of the anterior end of the middle turbinate and removal of polyps, etc., from the neighborhood of the nasal end of the ductus naso-frontalis, which not only in acute cases he says, or acute attacks in the course of a chronic empyema, but in the chronic cases themselves constitutes a therapeutic expedient of the very highest value, so long as deep-seated muco-periosteal degeneration or destruction in the bony walls of the cavity has not already taken place.

He recognizes that his views are in direct opposition to the prevailing sentiment among contemporary rhinologists, but he argues their rationality and supports them from clinical experience.

Three methods have been used of approaching the frontal sinus by way of the nose:
1. Simple irrigation through the natural opening.
2. Drilling through the anterior-superior wall.
3. Enlarging the naso-frontal canal.

Irrigation of the sinus by way of the infundibulum is a perfectly practical procedure in a large proportion of cases.

Anatomic studies like those recently made by Mosher of
Boston, have been of great value in familiarizing us with the anomalies, as well as the normal relations of the structure in this vicinity. Some authors are inclined to discredit the practicability of probing the sinus through its natural opening. In a few cases the canal being unusually constricted or long and tortuous, it is impossible. In most cases, a resection of the anterior end of the middle turbinate will be required to give free access to the infundibulum; but in quite a number of patients this is rendered unnecessary by reason of the fact that the naso-frontal duct, instead of being continuous with the hiatus semilunaris opens by a wide orifice directly in front of its anterior upper extremity.

In regard to the technique of the procedure, permit me to quote from a previous article (The Laryngoscope, St. Louis, April 19):

"Using the uncinate process as a guide (resection of the anterior end of the middle turbinate having been previously done in some cases) to begin, we apply the beak of the probe well back in the hiatus and draw it upward and forward in the direction of the sinus at the same time that the handle is depressed. If it does not slip easily into the cavity, after tentative modification in the curve, do not use force, but holding the probe always lightly in the hand, reintroduce and feel for the ostium a little in front of the upper extremity of the hiatus."

Error most easily results from supposing that the probe has entered the sinus when it has entered an ethmoidal cell. As a rule, the openings to these cells are placed externally, and the point of the instrument is more certain to enter by being turned slightly toward the median plane.

The beak of the probe should have a curve of about 90 degrees at about three cm. with a slight additional curve a few millimeters from the extremity. The probe originally employed has been slightly modified. It is made a trifle more rigid than formerly, and having already the curve recommended as being right for a majority of cases. It is flexible enough, however, to permit of whatever modification of this curve may be necessary for the individual case. I still hold to the straight shank, instead of one of a sigmoid curve advised by some authors, as it is only with the former a proper idea may be had of the angle of inclination of the shank, an important re-
quirement in an orientation with respect to the entrance into the sinus.

If the sound or canula be in place we will be aware of it by the following signs:

(a) It will have penetrated to a distance between six and seven cm. from the anterior nasal spine. (Six cm, when at the floor of the sinus and seven when fully into the cavity.)

(b) The direction of the shank should be such that it makes an angle of 30 to 35 degrees with the floor of the nose.

(c) The beak of the probe will be pointing directly forward, as shown by the indicators on the handle.

(d) The beak being free in the cavity, is capable of considerable excursion from side to side, as shown by the rotation of the handle upon its axis.

(e) Pus will flow along the shank of the instrument. In case of the canula, insufflation or irrigation will bring pus to light, a previous thorough cleansing of middle meatus being understood.

2. The operation of drilling through the roof of the nose to reach the frontal sinus as proposed by Schaffer, cannot be too strongly condemned. The difficulties of entering by this route and the danger of penetrating the cribriform plate must be apparent to any one who is in the least informed as regards the anatomic relations in this locality. Spiess recommended controlling the operation by means of the skiagraph, a procedure endorsed also by M. Schmidt. Even with this safeguard, the end gained is not worth the risk and trouble.

3. A more rational procedure is that recently described by Ingals, consisting in the enlargement of the naso-frontal duct by drills, especially revised for the purpose.

The region of the middle meatus being previously cocainized, a flexible pilot is introduced into the infundibulum, over which is passed a hollow burr operated by a dental engine. The surrounding tissues are protected by means of a flexible shield. Ingals claims to be able with this instrument to successfully enlarge the canal to a diameter of six mm., after which he introduces a small sharp ring knife and curettes the mucous membrane about the ostium frontale. The canal is packed with gauze, which is allowed to remain in place four or five days. Chlorid of ethyl anesthesia was employed in performing this operation.

It is unnecessary to state that all intra-nasal methods in-
clude a thorough removal of polyps and polypoid hypertrophies, and of spurs or other pathologic conditions which obstruct the naso-frontal canal and interfere with drainage.

**THE SPHENOID SINUS.**

It is only a few years ago that the first efforts were made to gain access to the interior of the sphenoid.

The subject was early taken up in this country and we are particularly indebted to Myles, Bryan, Wright and more recently to Coakley, Henkel, Curtis and Berens for valuable contributions demonstrating the possibility of rational surgical treatment of its diseases.

Various methods have been devised of attacking the sphenoid, so that we have the fronto-ethmoidal, the orbito-ethmoidal, the maxillary, the intra-nasal and the naso-pharyngeal route, and the various operations of Rouge, Oelier, Verneuil and Chalot, Baudenhauer and Garel, Moure, Furet and Jansen.

Without going into detail as to various other methods, we may say that the intra-nasal route commends itself as being the most direct, and most conservative method and as being the route which has been already utilized to diagnose the condition and will probably be utilized in completing the cure and because it avoids deforming cicatrices and the exposure of other healthy sinuses to possible infection.

The intranasal method consists in irrigating the sinus through its normal opening, or by breaking down over a greater or less extent the anterior wall and curetting the interior of the sinus. The natural opening is situated on the anterior wall near the roof and somewhat outward, so that it is seldom visible by anterior rhinoscopy.

It is oval in shape, with its largest diameter vertical and measuring three to five mm. but somewhat narrowed by folds of mucous membrane.

The distance of the antrum from the anterior nasal spine has been variously estimated from five cm. to nine cm., which represent respectively too low and too high estimates to serve as an average.

My observations agree with those of Coakley, who puts the distance at about seven cm.

On the probe and canula which I use for sounding and irrigating the sinus, I have put two small indicators, one at seven, the other at eight and one-half cm. from the point, the
former to mark the distance from the anterior nasal spine to
the situation of the ostium, and the latter to mark the dis-
tance upon the handle when the probe has successfully entered
the sinus. The probe should be slightly curved near the end,
in order to reach the ostium which, as stated, is placed a little
laterally. This curve can be made to serve a purpose, as I
have discovered, in ascertaining whether or not the probé has
successfully entered the cavity.

For if guided by the indicators on the handle, we first turn
the point upward, it comes in contact with the roof, when it
has entered the sinus but a slight distance and cannot be pushed
farther; if now the point be turned downward, it becomes
free, and the probe can be generally entered an additional cm.
or more, until the point comes in contact with the posterior
ewall. (Fig. 1.)

To sound the sphenoidal sinus through its natural opening,
introduce the probe, with the convexity of its curve above,
obliquely upward across the juncture of the middle and
posterior thirds of the middle turbinate, until its point meets
with an obstacle which will be the anterior wall of the sphen-
oidal sinus. Now turn the point laterally and immediately
or with a little groping the probé will glide through the ostium
into the sinus.

In a majority of cases, it is necessary to resect the greater
part of the middle turbinate. In cases of naturally small,
flat turbinate, or where atrophic conditions exist, this ex-
pedient is rendered unnecessary. A deflected septum or large
spur may sometimes also have to be overcome as a preliminary
to a successful introduction of the probe.

One may know that the sinus has been entered by the
following signs:

(a) The end of the probé will be distant from the anterior
nasal spine from seven to eight and one-half cm.—in cases of
extra large sinus, up even to nine and ten cm.

(b) The instrument becomes fixed; that is, excursion in all
transverse directions, is rendered impossible; but it may be
drawn back and forward and rotated to a certain extent upon
its own axis, especially when the point is downward.

(c) The probé can be advanced from one to two cm. more,
when the point is directed downward, then when upward.

(d) Post-rhinoscopic examination will show the probé prop-
erly directed for the ostium, and at least that it is not in the
naso-pharynx.
Intranasal Route in Operating on Accessory Sinuses. 153

(e) Pus may flow along the handle of the probe; or if it be the canula inserted, the flow of pus from irrigation will give positive proof if its being within the sinus.

Extreme caution must be observed in irrigating the sphenoidal sinus, as strong and irritant solutions, or non-irritant solutions if introduced under pressure, are liable to set up alarming cerebral symptoms owing to the extreme attenuation of its upper wall, which may exist.

Boric acid or normal salt or a simple sterile solution may be injected under slight pressure, and having care that the canula does not so tightly fit the ostium as to prevent a reflux of the fluid, the patient inclines the head forward to enable the fluid to appear at the anterior parts.

The natural opening being near the roof, and there being no accessory opening as in the maxillary antrum, this method of treatment does not seem to give much promise of success. Nevertheless we have seen cases of acute sinusitis get well spontaneously, or under mere cleansing and depleting application in the post-nasal region, and it may be that a timely irrigation or so may occasionally be just sufficient to help to the *vis medicatrix naturae* to enable it to accomplish a cure, which alone it might have been unable to do.

As to the more radical measures which look to the breaking down of some of the wall of the cavity, we need lose no time in the consideration of methods which aim to reach it by way of its floor.

The lower wall is too thick, and operations by this route are awkward, cumbersome and uncertain.

The anterior wall has the advantage of thinness and accessibility, and may be considered truly the surgical wall of the sinus. Hajek attacks this wall by introducing his special hook through the ostium sphenoidale, breaking down its edges, which may then be removed with the forceps.

Moritz Schmidt employs a hand saw to take the place of the hook. St. Claire Thomson uses a long forceps which after being introduced through the ostium, are opened and thus enlarge the opening. Bryan, Coakley and others use a gouge or curette. Trocars, hand drills, electric motor drills or galvano-caustic electrodes, are in the writer’s opinion unsafe instruments to use in this locality, because of the danger of unexpectedly penetrating the roof and entering the cranial cavity.
Whatever instrument be used, let the cutting be always downward and inward. Downward in order to keep away from the cranial cavity, and inward as we are thus less liable to have a troublesome hemorrhage from an injury of the sphenopalatine artery, which is located to the outer side of this wall.

Some operators (Henkel, St. Claire Thomson) prefer to have the patient under a general anesthetic, and be guided to the proper locality with one finger introduced into the nasopharynx, which is to be commended as a safe and rational procedure, especially in those cases where the view from the anterior nares is not particularly favorable.

Having made a sufficient opening into the anterior wall, a careful curettage may be necessary to remove granulation masses and fungosities from the interior; but it is best to avoid any curetting the roof which may at times be of the thinness of parchment, and easily penetrated, and to but very gently curette the sides because of the danger to the nerves and vessels which pass through the optic canal and sphenoidal fissure.

The interior of the sinus having been washed or swabbed with some antiseptic solution, may be loosely packed with gauze, which may be changed every day or so as the conditions require.
PAPER:

RESULTS OF OPERATIONS BY WAY OF THE MAXILLARY ROUTE FOR COMBINED DISEASE OF THE MAXILLARY ANTRUM, ETHMOID LABYRINTH AND SPHENOID SINUS.

T. Passmore Berens, M. D.

At the request of your President, it is the privilege and the pleasure of the writer to describe again the operation for the radical cure of multiple sinusitis, via the maxillary route, when affecting the maxillary antrum, the ethmoid labyrinth and the sphenoid sinus. Jansen, Boeninghausen and Mouret have described operations for the radical cure of empyema of the antrum of Highmore, which are more or less similar in their technique. The operation used by the writer applies to the three cavities, the antrum, the ethmoid and the sphenoid, and is practically the result of following the technique of Jansen of Berlin. A brief outline of the operation, as described in detail at the last meeting of this Society (Transactions 1904, p. 89), will suffice.

Insert a post-nasal tampon and hold the tongue forward by a ligature passed through its tip. An opening is then made into the antrum through the canine fossa and enlarged until the antero-lateral wall is nearly completely removed. The bony naso-antral wall is then entirely removed, the mucous membrane on its nasal side being as far as possible preserved. The ethmoid cells and the turbinate process of the ethmoid are then removed. The sphenoid is opened, either through its ostium or through the posterior ethmoid cell; the opening is then enlarged until as much as possible of the anterior wall has been removed, and the cavity of the sphenoid is examined and its diseased contents removed.

The field of operation is illuminated by means of a headlight worn by the operator. Instrumentation is further aided by
the insertion of the small finger deeply into the nostril. This combination of the sense of sight with the sense of touch does much toward removing the feeling of uncertainty with which operations on the deeper structures of the nose are usually approached, and is a strong recommendation for the selection of this rather than the intra-nasal route. Bleeding during the operation is usually controlled by gauze tampons dipped in adrenalin solution, although a resort to artery forceps to catch the sphenopalatine vessels occasionally is necessary.

The writer wishes to emphasize the fact that this operation is designed especially for the relief and cure of those cases of chronic multiple sinusitis involving the antrum and ethmoid, or antrum, ethmoid and sphenoid, and is not meant to be commonly performed for disease limited to the ethmoid or sphenoid, or for mild or ordinary acute conditions. Cases may occur where the maxillary route can be justifiably used for rapidly and safely opening the sphenoid, e. g., a sphenoid causing grave constitutional disturbance might be inaccessible through the nose on account of some nasal deformity of sufficient magnitude to prevent an intranasal operation; in a case of this sort the writer would certainly perforate a healthy antrum to reach the disease.

The following points are to be emphasized: The bony naso-antral wall should be completely removed. The opening into the sphenoid sinus should result in the destruction of practically all of the anterior wall, and at times even of part of its floor. The curettement of the ethmoid cells should result in their complete ablation, and this point should be particularly noted, even though the lamina papyracea is thin or the cribiform plate is near at hand. The presence of these structures teaches us that any operation in their proximity must be so complete as to insure that the region may subsequently be kept surgically clean, and these conditions are secured only by the total ablation of the structure involved.

The surgery of the ethmoid labyrinth is to be compared with that of the mastoid cells. Who, in these days of modern technique, would hesitate to remove the zygomatic cells because, forsooth, the dura might be exposed; who would hesitate to clean out all of the mastoid cells down to the very inner table, because the lateral sinus might be endangered? These questions of the surgery of the ethmoid labyrinth are those of technique, but a technique that must be governed always by
accurate anatomic knowledge and that judgment that comes only by experience.

The writer has performed the operation, as described above, twenty times. Fourteen of the cases were reported to this Society at its last Annual Meeting (loc. cit.). Since then the operation has been performed on six other cases of multiple sinusitis.

Of the cases reported last year two are dead—one from tuberculosis as previously reported, and one from exhaustion consequent to a malignant disease (epithelioma) of the accessory sinuses. Of the remaining twelve cases, seven are entirely well. In these seven cases, pus—the thick, creamy variety from which they had suffered before the operations—did not appear during the attacks of coryza or grippe to which they have been subjected, although the secretions were decidedly mucopurulent in character on both sides during the attacks.

There has been a complete lack of crust formation in these seven cases. The patients have not experienced discomfort and are enthusiastic as to their condition. Of the five remaining cases of those reported last year, one has had an accumulation of pus in the sphenoid sinus. This pus manifested itself in the form of large crusts distributed throughout the nose; removal of these revealed fluid pus exuding from a narrow slit scarcely large enough to admit a probe. This slit was all that remained of the large sphenoid opening made at the time of operation. A second case of almost complete closure of the sphenoid was noted, and was accompanied by a third return of "tic douloureux," from which the patient had been relieved twice before by operation on the sphenoid. The pus in this case also formed large crusts. The "tic" disappeared on the free opening and after-treatment of the sphenoid sinus. In both of these cases, the pus and crusts did not reform after freely opening and curetting the sphenoid. In the two other cases, persistent, troublesome crust-formations were noted, which were finally traced, in each case, to empyema of the frontal sinus. Operation by a combination of the Kuhnt and Luc methods on the frontal sinuses resulted in a complete cessation of crust-formation and the patients now are perfectly well. The fifth case of crust-formation was found to be dependent upon specific disease and responded promptly to treatment. It is but fair to state that in three of these five cases, on account of a slight accumulation of secretion or
small crusts in the nose, an occasional douching must still be resorted to. These three cases, however, had atrophic mucous membranes before the operation. In two other cases and occasional dryness on the septum and a slight crusting on the posterior pharyngeal wall occurs, but is easily prevented by the use of vaseline.

Thus it will be seen that, of the fourteen cases reported last year, the present condition of seven is what may fairly be called normal. Five of the fourteen cases still have to resort occasionally—and by occasionally I mean every two or three or four days—to a nasal douche or the insertion of vaseline, on account of dryness. Three of the cases, however, had distinctly atrophic mucous membranes with crust-formations before the operation and their condition has been vastly improved by the operative interference.

It will be remembered that in last year’s report (loc. cit.) several of the early cases operated upon had to have supplementary curettage of overlooked ethmoid cells to relieve pus and crust-formation. These cases have since done well and are cured.

Of the six cases operated upon since June, 1904, one was a case of right-sided acute pansinusitis of one month’s duration. The infection was probably due to grippe. The patient, a man of 30, had been treated conservatively for a month by two able rhinologists, one of whom advised a radical operation on account of constant pain and the symptoms of pyemia. At the operation (December 23, 1904) the antrum, ethmoid and sphenoid were found filled with pus and granulation tissue. The frontal sinus was entered through the ethmoid cells via the antrum and the nose. In this manner free drainage of the frontal sinus was established. It was hoped that this would suffice for the cure of the frontal disease. It did not, however, and four weeks later, on account of elevation of temperature, persistent pain and constant reinfection of the nose from the pus from the frontal sinus, the latter was opened by a combined Kuhnt and Luc operation. The sinus was found to be full of pus and edematous granulation tissue, although free drainage had been established at the first operation, thus showing that drainage alone will not always suffice to effect a cure, even in acute cases of frontal sinusitis. Healing was interrupted by the partial closure by granulation tissue of the nasofrontal opening, which was readily corrected by curetting under
cocain anesthesia, and the case then made an uninterrupted recovery. There has been neither treatment nor discharge for the past three months.

The five other cases—all of chronic multiple sinusitis—had been under the care of many rhinologists. Two of them had atrophic membranes and three had polypoid degeneration. Lack of time prevents further description. They are now well, although two must resort occasionally to the nasal douche and one must use an oil-spray for the dryness in the pharynx.

Where crusts have been found after operation, in the cases cited, they have been traced in each instance to suppuration in a sinus or cell, either frontal, ethmoid or sphenoid. In these cases the writer has failed to find suppuration in the antrum after operation—excepting in one case where the bone from the inferior turbinate was incompletely removed at the operation; its exfoliation was followed by cessation of pus formation. The writer’s experience teaches that the more complete the removal of the ethmoid cells, the less likelihood is there of postoperative suppuration or crust-formation. He is confident that the results obtained in these cases could not have been accomplished by intranasal work, for the majority of the cases had been treated for years by many different nasal methods. This route affords advantages that cannot be obtained by the intranasal operation. It is safer because it affords much more room for instrumentation; it permits not only of inspection of the field of operation, but also allows of the digital guidance of the instruments, either through the nose or through the wound; and it renders easy the control of the severe hemorrhage that is so apt to occur from the spheno-maxillary vessels; finally, it permits of a thorough exenteration not only of all diseased structure but also of structures that may be a hindrance both to drainage and to after-treatment.

Injury to the dura, brain or other important structures, is an ever-present possibility in all extensive operations on the ethmoid cells and sphenoid sinus; indeed, it is not unlikely that disease itself reaches to and affects these structures in some cases. These dangers of themselves are sufficient warrant for the selection of a route that will assure the greatest accessibility, the cleanest, smoothest wounds, the best drainage and the greatest facility for after-treatment.

The twenty cases operated on show the following results:
Eleven cases have been cured: Seven for two years, two for one year, one for six months, one for four months. Three of these were cases of unilateral pansinusitis.

Five cases with atrophic mucous membranes before operation still have to resort to occasional douching. They are much improved. Two of these cases are specific and the crust-formations are controlled by constitutional treatment; and one has frontal sinus disease, accounting for the persistent crusting and pus formation. Even this case is vastly improved.

Four cases of "tic douloureux" have been cured.

Nine have had grippe and four coryza without harm resulting.

Fifteen have had marked interference with the sense of smell on the affected side.

One has had stricture of the tear duct, cured by probing through the canaliculus.

Two have disappeared from observation, but were in good condition when last heard from.
PAPER:

THE EXTERNAL OPERATION FOR THE RELIEF OF ETHMOIDITIS.

Lewis A. Coffin, M. D.

The ethmoids may be independently diseased, or they may be associated in their disease with any or all of the other accessory sinuses of the same side of the head. Both sides of the head may be simultaneously diseased, but I would hardly think of the two sides as associatedly or dependently diseased. Therefore what is said in the following paper refers to one side of the head.

Just what operation should be done upon the ethmoids will depend not only upon whether the disease is restricted to the ethmoids or is associated with disease of other sinuses, but upon the extent and location of the ethmoid involvement, as well as upon what other sinus or sinuses are involved. The condition of the turbinated bodies also should be taken into account in deciding upon the method of operation. Two general principles should guide us:

First: All diseased parts or cells must be reached and treated.

Second: No healthy part should be sacrificed if it can be saved.

If these principles be sound, then it seems to me that, granting that both the intranasal method of operating on the ethmoids and the method of attack through the antrum have their proper place, the method of cleaning out the ethmoid labyrinth or tract through an external opening through the nasal process of the superior maxillary or through the os planum must be in a vast majority of cases the operation of choice. In those cases where the most anterior cells are diseased or where the ethmoidal cells extend over the orbit, it should be the rule, and in children previous to the descent of the second teeth, it is the operation of necessity.

By this method every cell and the sphenoidal sinus can be easily reached and at every point the field of operation is
directly under the eye of the operator. This can be said of no other operation. As frequently happens, the turbinated bones, both the middle and the inferior, are not diseased. By operating by the external method neither of these structures need be sacrificed. This cannot be said of any other operation. If, as we sometimes see, all the structures of the nose, together with its accessory cavities be extensively diseased, it makes but little difference what the operation is so long as we operate thoroughly and to this end it may be necessary to resort to a combination of all the known methods of operation. In a pan-sinusitis, or in any case of ethmoiditis, where it seems necessary to open the frontal sinus, the operation of the ethmoidal region through an external opening is the logical complement of the frontal operation. If the antrum be simultaneously diseased, it may be operated at the same time that the fronto-ethmoidal operation is done, or it can be left in the hope that the cavities above it, having been cleaned out, it will take care of itself. At the most, a simple Luc-Caldwell operation allowing of curettage, treatment and good subsequent drainage, is all that is required, and it seems to the writer that the person operated upon comes more nearly to having what can be called a nostril than when all the accessory cavities have been turned into one large irregular hole. My preference for the external operation over the intranasal operation is for the following reasons:

First: By the intranasal operation the middle turbinate must be sacrificed.

Second: The intranasal operation is long drawn out and painful.

Third: There are certain parts of the ethmoidal tract that cannot be reached by intranasal methods.

The Operation.—In doing the operation one should make a curvilinear incision from above the inner end of the eyebrow across the side of the nose to end about one-third of an inch below the inner canthus of the eye. The incision is carried through the periosteum which should be freed from the bone on both sides of the wound and the flaps or sides held apart by retractors, and an opening into the anterior ethmoids is now made by chisel or trephine through the nasal process of the superior maxillary bone. The ethmoid cells are easily broken down by either curette or forceps. Personally I prefer the curette. Injury to the tear sac or duct or to the cribri-
form are unfortunate accidents, and one should be watchful that they do not occur. In a recent case operated by me injury was done to the everted tear sac by a sharp retractor. To avoid injury to the cribiform during all the earlier part of the curettement, the back of the curette should be kept toward that bone, and all force should be directed downward and toward the median line. When the cells have been pretty thoroughly broken down I am in the habit of smoothing and cleaning up the cavity with a ring curette.

If the whole intranasal structure be so thoroughly diseased as to demand the removal of the entire contents of the nasal cavity it should be done, and the external wound immediately closed. Primary union and no deformity is the rule.

If on the other hand, the turbinates are preserved, the operated cavity may be packed and obliterated. An insignificant scar will mark the point where wound was kept open for packing. Several cases so treated have given most satisfactory results. In the last case which I did, I closed the external wound and packed the operated ethmoidal cavity through an opening in the region of the bulla ethmoidalis. The entire ethmoidal labyrinth was obliterated, the middle turbinate was preserved, and I think from an intranasal standpoint it was the most satisfactory operation in this region that I have done. This was the case in which the tear sac was injured so that it became necessary to remove it. There is a considerable flowing of tears over the lower lid which keeps the cicatrix over the side of the sac in a more or less reddened condition; otherwise the cosmetic results are perfect. We expect to remove the tear gland and thus prevent the tearing.

In closing, I wish to state that I should not, except in children, operate by this method unless the anterior cells were involved.
PAPER:
FURTHER EXPERIENCE WITH RADICAL OPERATIONS FOR FRONTAL SINUS DISEASE.

Wolff Freudenthal, M. D.

Since my last report on the radical operation for empyema of the frontal sinus was read, just a year ago, I have had occasion to operate on four additional cases, the results of which I have the honor of presenting to you today. This number of frontal sinus affections may appear large as occurring in the practice of one man within a period of twelve months, but when you learn that one of the cases operated upon was an old one in which a relapse had taken place, and that in another I was called in by a general surgeon, the number of new cases becomes reduced to two. I have had some peculiar experiences in these operations, which it seems to me are of importance to anybody engaged in work along these lines. During the last year I have performed Killian's typical operation in two cases and a modified Killian in two.

As to the indications for a radical operation, there are still strong differences of opinion. Extremists are found on either side. Although aware of the fact that some colleagues operate far too often, we are not justified in saying, as some do, that in former years when radical operations were unknown we treated frontal sinus disease without fatal results and that this should be a warning to us now. By analogy we could say: Formerly we did not operate for appendicitis, and yet, to judge from the experience of some physicians, nobody died of that disease. I myself, while house surgeon at the military barracks at Freiburg in Germany, saw a good many cases of perityphlitis—all of which recovered under the use of hot or cold applications. But would it be wise now-a-days to contradict an experienced surgeon, if he should propose appendectomy? Undoubtedly normal appendices have been removed unnecessarily, and such mistakes will happen in operating on the frontal sinus as well. The main question for us to
decide is, can we by operation, save a given case which otherwise would be doomed? The answer to this is "yes," simply because we are now able to make a diagnosis of frontal sinus affections more readily than we could ten years ago. I am convinced that many a patient was left to die with the diagnosis of cerebral abscess or the like, which now-a-days could be saved by operation.

But there is another point which is of importance here: Suppose we have a case of empyema of the frontal sinus, in which drainage into the nose can be established only imperfectly. Have we any knowledge of the time it takes for the pus to corrode the bone and perforate into the dura? There is surely a possibility of meningeal infection in postponing surgical intervention. I must quite agree with Bean and Douglass that in these cases a pachymeningitis may set in at any time and cerebral lesion follow as a result of nasal suppuration, for we cannot "claim that, with the free lymphatic and vascular anastomoses which exist between the nose and the brain, this part would escape involvement from a simple extension of the inflammation." Surely the case reported by Panas should be a warning. His patient died of meningitis, and examination of the pus showed that the sinus suppuration was due to staphylococcus aureus, while that of the meninges was due to streptococcus—a secondary infection. The perforation was in the floor of the orbit through the lesser wing of the sphenoid (See Stucky, Lancet-Clinic, December 17, 1904).

Nor, in this connection, should the fatal results reported by Dreyfuss and others be ignored. Severe "brain" symptoms are, I believe, not unusual in these chronic cases of frontal sinusitis. Let me remind you of case 4 reported by me (Jour. Am. Med. Ass'n., February 11, 1905). That patient often felt like jumping out of the window, a sensation that has not returned since he was operated on eighteen months ago.

Another case, that terminated fatally, is the following: Mr. S. S., fifty years of age, was suffering from nasal polypi and frontal sinusitis. The polypi were removed in New York by me, and in Paris, London, Vienna, etc. A radical operation was not proposed by anybody. One day, while out west, he awoke with much headache which grew worse steadily for six days, when he suddenly committed suicide. From the time his headache became intense, the nasal discharge ceased and there was undoubtedly a retention of pus that was the cause
of the mental aberration. Although unable to bring forward any direct proof of the truth of my statement, I am convinced nevertheless that it is so.

A third case is that of I. P., 25 years of age. Since the age of four years, he had had nasal trouble, evidenced chiefly by profuse discharge, foul odor, pain and headache. This was neglected until his fourteenth year. Then he was treated with cleansing lotions, etc., without any improvement. Two years ago the radical operation was performed by a well known London colleague, but the patient derived no relief from it whatever. He is a conductor on the "L" Road and told me he asked some of his fellows to keep an eye on him, as he is afraid something will happen to him. He has now double frontal sinusitis with imperfect drainage, but dreads another operation.

All these cases give us a warning to be on our guard constantly. On the other hand, I am convinced that there are thousands of people going about with chronic empyema of one or more of the accessory sinuses, where we would not think of resorting to a radical operation. No doubt every one of you has such cases under treatment. Thus, for example, the brother of Mr. C. M. (Case No. 4) has been treated by me on and off for the last four years for nasal polypi. He comes to see me whenever he is unable to breathe any longer through one or both sides of the nose. At such times, as a rule, his headache becomes so severe that he can hardly attend to his business. He has unquestionably a chronic empyema of both frontal sinuses. After a large part of the polypi are removed and his symptoms leave him he stays away, feeling comfortable, as free drainage becomes established. During the summer months he takes his ocean baths and does not know that he has nasal trouble. I have never thought of proposing a radical operation to him, and he may go on in this way for many years to come and perhaps may never require any radical intervention. These radical operations are always dangerous, since a great many serious and even fatal accidents have happened. In this country, as far as I am aware, very few fatalities have been recorded, while abroad, so skillful a man as Luc, reports five out of his first thirty operations. While I am constantly mindful of such facts, I know that there are cases in which there is nothing left for us to do but to perform a radical operation. This was done with excellent results in Case I.
Mrs. A. S., 68 years of age, has complained for the last fifteen months of diplopia. She has also had "for years a very bad catarrh." During the last year she was treated for it by a colleague and the "catarrh improved," although she admits that she has to syringe her nose three or four times a day in order to feel comfortable. Her visual disturbance, however, did not subside. When I saw her, in consultation, she was suffering from extensive proptosis of the left eye, which was pushed forward and towards the temporal region. The anterior and part of the posterior portion of the middle turbinate body had been removed and pus was coming from the infundibular region, the origin of which was found to be in the frontal sinus. This lady absolutely persisted in having an operation performed, as she was afraid of losing her eyesight. Besides, she was very anxious that her eye should regain its former appearance. At the beginning of June, 1904, a Killian operation was performed. The frontal sinus extended only a little above the eyebrow and was filled with granulation tissue and pus. After chiseling away the frontal process all the ethmoidal cells were easily removed, as they presented hardly more than a mass of broken down tissue. The sphenoidal sinus was also cleared out and the external wound closed completely. In spite of her advanced age, this patient made an ideal recovery. Within ten days she was out of the hospital, the discharge from the nose persisting in a mild degree for about six weeks more. Now she feels perfectly well, has no nasal discharge, the proptosis has also disappeared, and there is only a slight scar to be seen on the side of the nose—altogether, as I said, an ideal case.

The narration of the second case I shall omit, as it offered no special features of interest.

In regard to the third case, a man of 31 years of age, whose frontal sinus did not reach above the eyebrow, I would mention only that on scraping away necrotic tissue, I exposed the dura. I do not consider such an occurrence of much importance as long as you do your work aseptically. The man's highest temperature after the operation was 100 °F. He left the hospital on the ninth day after the operation.

Hitz, of Milwaukee, reports a case in which he exposed the dura in two places and the patient got well (Laryngoscope, April, 1905).

Quite in contrast to these cases is Case IV, which I will now
report, and which I believe will interest every one here at this meeting. It has been described in part of my previous paper as Case III, and I will briefly repeat the history here.

Mr. C. M., aged 40, a wholesale merchant, consulted me over two years ago, with quite acute symptoms. He told me he had been unable to breathe well through his nose for the last three or four years. Whether there was pus present during all that time he did not know. Three months ago nasal polypi had been removed in several sittings by a colleague. After the last seance he had "dreadful" headaches. But later it seemed as if something had broken, and an abscess opened, and he then felt easier. About ten days ago this pain returned. It was so severe that he could not sleep at all. For the last two days he felt, on the contrary, like sleeping all the time, although the pain had not left him. He was somewhat dizzy, so that his wife had to lead him into my office, his mind did not seem to be perfectly clear, and he answered questions put to him rather slowly and hesitatingly. Temperature, 101 F. No appetite.

Examination.—On examination I found the parts over the right frontal sinus swollen, and the right eye somewhat closed. Great tenderness to touch at supraorbital margin. Transillumination showed shadow on the right side. In the nose there were several polypi and a mass of pus. Considering the seriousness of the symptoms, I advised an immediate radical operation, but the patient preferred to wait. This gave me an opportunity to remove the polypi. He was growing weaker, felt like vomiting, etc., when, after eight days, his family consented to an operation.

Radical operation after Kuhnt. Eyebrows shaved, horizontal and vertical incision. Periosteum drawn upward and downward; sinus opened above the eyebrow. The cavity, which was filled with pus and granulation, was not very large. The entire anterior wall was affected, and consequently removed, and the rest of the cavity thoroughly scraped out. Drainage into the nose; Myles' tube inserted and sinus packed with gauze. Patient made an uneventful recovery.

So much for the old history. Nine months later he returned to me with mild symptoms of headache, obstruction in the nose, etc. After curetting some of the ethmoidal cells and washing out the frontal sinus he felt well within two days and did not return until six months later. The same symptoms, the same treatment, and the same good result.
On April 12, 1905, I saw him again, his symptoms being much aggravated. The whole right side of the head was painful, especially the right supraorbital region, which was swollen and very tender to the touch. Temperature 100.5; some dizziness. We tried everything to relieve him, but did not succeed this time, and it was evident with the symptoms growing worse quickly, that another radical operation would have to be performed. Apparently Kuhnt's operation had not been thorough enough in this case, and the family hesitated to have him subjected to another more radical one. Still from intranasal methods no relief could be obtained. His headache became very intense, sometimes he felt like vomiting and it was apparent to everyone that his life would be lost unless the sinus was opened from the outside. This was done on April 17, 1905, at 7:30 a. m., and a typical Killian operation was performed. On opening the sinus we found it to be quite large, extending to the external margin of the eye. Undoubtedly at the last operation after Kuhnt when we found the sinus to be small, a pocket which was partitioned off from the rest of the sinus was not seen and been overlooked. This partition had now broken down so that the whole large sinus was exposed to view. This was easily explored in all directions and freed from the large mass of broken down tissue, etc., that filled every crevice. Then the other steps of the operation were performed exactly according to Killian. Before closing the wound we probed the sphenoidal sinus. This was done by myself as well as by my assistant, and the sinus found intact. There was no reason, therefore, to enter it. Furthermore, it must be mentioned that there was no communication between the frontal sinuses, nor was any communication discovered further down on the septum. The operation had lasted more than two hours. The pulse was bad from the beginning and throughout the operation. After the patient was put to bed he had a collapse, which subsided after injections of strychnin, camphor oil and some solution, with whiskey per rectum. In the afternoon, he vomited once about one ounce of a dark fluid, but on the whole passed a comfortable day. During the night he was somewhat restless and slept at intervals. When I saw him the next morning (temperature 101), he told me he could not see with his left eye, i. e., on the side that was not operated upon. I changed the dressing immediately, and not only found the wound healthy, but the patient now said he could see. Consequently
the wound was dressed again as before. Still, when he once more told me the following day that he could not see with his left eye, things began to look more serious. Again the wound was dressed and all accessory sinuses examined most carefully. Nothing was discovered out of the way. Both sphenoidal sinuses were intact. I went over every step of the operation with my assistants, but we found nothing that we would not repeat in another case. Dr. Henry S. Oppenheimer was called in consultation, and expressed the opinion that a fracture must have occurred somewhere near the foramen opticum in consequence of the chiselling of the bones—a contre coup. The Doctor was surprised that such occurrences did not happen more often. Still, there were other possibilities, and I must confess that I had always hoped that this case would turn out to be one of hysteria, as one of the gentlemen firmly believed. I regret to say that the future development proved Dr. Oppenheimer's diagnosis to be correct. Dr. Charles F. May, who had also seen the patient the day after, practically concurred in Dr. Oppenheimer's views. I gave the patient potassium iodid and ordered absolute rest. On the fourth day after the operation when the wound was dressed, a small stitch-hole abscess was seen at the inner angle of the orbit (temperature 100. F.). This gave us no trouble and on the eleventh day the patient was allowed to go home with a small strip of gauze in situ and adhesive plaster over the small wound. He felt so well that he committed some indiscretion at home, in consequence of which the dressing came off completely during the night. A secondary infection set in, which manifested itself on the third day afterwards in a profuse purulent discharge. It required several weeks of treatment before we mastered the situation, fortunately without the sinuses being affected.

The last report received from Dr. Oppenheimer, June 4th, 1905, says that there is complete atrophy of the optic nerve.

We therefore can have no doubt that there was a fracture about the foramen opticum, causing pressure upon the optic nerve.

In the beginning, when nothing abnormal could be detected in the retina, there were other possibilities open for discussion. The first was hysteria, which was soon excluded, as well as acute retrobulbar neuritis. Another and most important point was the possibility that there had been pus in the right sphenoidal sinus,
which had broken through the septum into the other sphenoidal sinus. I thought of that possibility at once, remembering the very interesting case of sudden blindness reported by T. H. Halsted of Syracuse, N. Y. In this case there was an empyema of the right maxillary, ethmoidal and sphenoidal sinuses, which gave occasion to no ocular symptoms until suddenly blindness developed on the opposite side. This patient was cured by treatment directed to the right sphenoidal sinus. In speaking of the anatomy of this region, Halsted says that the thinnest of all is the plate of bone which separates the sphenoidal sinus from the optic foramen, transmitting the optic nerve and the ophthalmic artery. Considering this thinness of the bone, one must be "struck by the infrequency of reported cases of optic neuritis and blindness resulting from sphenoidal suppuration and abscess, and it must be due to the fact that this sinus and its diseases have been greatly overlooked or underestimated as to their ability to occasion eye diseases." (Archives of Oto logic, 1901, p. 222.) Undoubtedly such cases have occurred, but have been overlooked. In our case, however, there was no such accident, and the only possibility left is a fracture near the optic foramen. Cases are on record in which, as the result of a fall upon the nose or the forehead, such a fracture was caused simply by contre coup, and it is surprising that it has not been noticed before in consequence of chiseling and hammering of these parts. If such accidents should be of frequent occurrence, that would be a strong contra-indication to radical operations of any kind on the frontal sinus. In our case the life of the patient would have been endangered by postponing the operation, and even if we had thought of the possibility of such an accident, we were compelled to risk the loss of one eye rather than that of his life. To avoid such contre coup fracture in the future, it may perhaps be wise to place the head of the patient on a soft and somewhat elastic cushion in order to diminish concussion during the operation.
The two cases which I present illustrate the importance of total obliteration of the frontal sinus, as the only sure method of guarding against recurrence of the suppuration from reinfection. The first case was referred by his physician in a western city, to Dr. Charles S. McBurney, and by him sent to me for a radical frontal sinus and antrum operation. The letter giving an interesting history of the case by his own physician reads as follows:

"Dear Doctor:

About five years ago Mr. B. had the grip, at which time he had some swelling and puffiness under the right eye over the right maxillary antrum. There was pain over both antrums. Some time after that both antrums were drilled into after removing the second molar tooth on each side. Pus was found in each antrum. These were douched. Within two months the left one recovered and the discharge stopped; two years later the left antrum was again drilled into and pus found. In the right one the discharge ran along a year and finally stopped. At intervals of from six months to a year the right antrum was again drilled into up to November, 1901, when the present opening was made in the incisive fossa. All this time there was a great deal of pain. The pain was located under the right orbit, over the frontal sinus and at the top of the head. The pain in the top of the head extended to the occipital region. The pain has always been worse in damp weather, and preceding a storm. After a day of unusual mental effort, the pain is increased.

Mr. B. is very susceptible to pain, although he has great powers of resistance. For a number of years, at intervals of perhaps two weeks, he suffered intensely from sick headaches, which were sufficient to put him in bed. For a great many years he has had nightmare; he halloas, and runs about in his
sleep, and, to one who does not know him, it is quite alarming.

Mr. B. came under my care on the 22nd of February, 1902, at which time he had the present opening in the right maxillary antrum, which was excreting from a teaspoonful to two teaspoonfuls of pus in twenty-four hours. The left antrum was also excreting pus in smaller quantity. He was suffering very much from pain under the right orbit, under the left orbit, in the frontal region extending across the brow, and in the top of the head and occipital region. The condition of both antrums had been properly diagnosed. In probing the right antrum, an opening was found at the upper, inner and anterior portion of the antrum, through which a probe passed into what was at first thought to be the anterior ethmoidal cells. Afterwards it was determined that this probe passed into the frontal sinus. An X-Ray examination revealed this fact, as well as the presence of the point of the probe in the frontal sinus when the operation of opening it was made. Trans-illumination never showed the frontal sinuses dark. The character and location of the pain led me to believe that more than the antrum was involved. To confirm this the anterior half of the middle turbinate was removed April 8, 1902. The anterior ethmoidal cells were found to be diseased, and pus came from them after the removal of the middle turbinate. No pus was found in the nose at any time prior to this, to help locate the disease. The anterior ethmoidal cells were curetted and an unsuccessful effort made at this time to wash out the frontal sinus through the nose. September 22, 1902, the frontal sinus was opened at the point indicated by the present wound. The opening made into the bone was about three-eighths of an inch in diameter. The frontal sinus was found to be filled with granulation tissue which was very dark and bled easily. An effort was made to curette the whole frontal sinus on the right side. The opening into the nose from the frontal sinus was made free and large so that there was free access between the sinus and nose. We irrigated the frontal sinus and the antrum at intervals of from 24 to 72 hours, using sterile water, or sterile water containing boric acid, or Borolyptol, or Formaseptol, or equal parts of bi-carbonate of soda, bi-borate of soda, and chlorate of soda. The odor of the discharge at first was quite offensive. Recently the discharge has almost subsided, and there has been very little or no odor. By reason of the continuance of the pain the posterior
half of the middle turbinate was removed from the right nostril about February 1, 1903, and some of the posterior ethmoidal cells were broken down and more of the floor of the anterior ethmoidal cells was cut away. Pus was found in the posterior ethmoidal cells. The sphenoidal cell has been probed a number of times and the ethmoidal cells were cut away. Pus was found in the posterior pharynx at intervals extending over the observation of this case, without at any time finding evidence of involvement of the sphenoidal sinus.

The left antrum was irrigated through a puncture in the nose and has not discharged any for the past six months, although the pain over the left antrum has been as severe at times since then as at any time when it contained pus.

Not more than five or six drops of pus have been washed out of the frontal sinus and right antrum at any recent washing. In spite of this fact the pain has not diminished at all. If there is any difference in the degree of pain, it seems that it has been worse for the past five weeks. Recently the frontal sinus has been irrigated through the nose.

As a boy Mr. B. had a periodic internal strabismus in which the left eye was the offender. He has an esophoria and a compound hypermetropic astigmatism in each eye. Repeated ophthalmoscopic examinations have shown normal fundi.

Recently there has been considerable pain in each ear which has seemed to be in excess of that which would be expected from the local disturbance in the ears themselves.

The question now confronting us is: What is still producing the pain? Is it due to pus still retained in some cell or cells that have not been opened? Is it due to the inflammation that is still present, though not sufficient to cause pus? Or, is it due to the presence of the plugs which evidently produce more or less irritation to the branches of the fifth nerve?

Yours truly, J. L. M."

When the patient came to me he was wearing a gutta percha obturator in his right canine fossa perforation and a similar contrivance through the interior wall of his right frontal sinus, to keep the wounds open for the purpose of douching. The latter plug he had worn for several months. His right antrum was discharging pus as was also his frontal sinus; the left antrum was causing much pain, but the discharge was not appreciable in the middle meatus. Most agonizing and con-
stant pain was a marked characteristic of this case throughout. The right eyelid was indurated and inflamed from the obturator. There seemed every indication for a Killian operation upon the right sinus, but the condition of his eyelid and the inferior wall was such that I did not see my way clear to making a flap which would be satisfactory. I determined, however, to attempt to save the superciliary ridge to prevent deformity and though the bone was very necrosed below the ridge I elected to enter the anterior wall. The patient was anaesthetized by Dr. Denton and I operated as follows. The incision was from the root of the nose on a line above the eyebrow rather higher than usual as you see by the photograph,

having ascertained previously that the sinus was a very large one and extended three-quarters or an inch above the ridge. The sinus walls were found luxuriant in granulation tissue of most unhealthy type, with necrosis of the anterior wall and almost complete destruction of the inferior plate. I cleansed the sinus and curetted the anterior wall in the supraorbital portion, which I preserved as a thin bridge. I then dissected out the old wound in the inferior tissues beneath the ridge and removed the entire inferior wall. The next step was the breaking down of the posterior ethmoid cells which were badly diseased, clearing out the anterior cells as well. Having done this work most thoroughly, I decided to attempt to obliterate the sinus by packing. The condition of the soft tissues in the
orbital region was such that it was impossible to attempt to close the old wound so I left both incisions open and after careful washings with peroxid packed the entire cavity with iodoform gauze. After a week I succeeded in closing the inferior wound and obtained a primary healing. For eight weeks I carefully packed the sinus with iodoform wool which I have previously described, using this after the first dressing of gauze. This I consider the very best dressing for exciting granulations. Little by little the granulations approached and tended to close the nasal orifice; the moment this was accomplished the sinus filled up with great rapidity and the frontal wound was closed after slight paring of its edges at the tenth week. The point I wish to make is this: Obliteration of the sinus is the objective point to be attained in frontal sinus work, and if patience and discretion are used in packing, this object may be accomplished even in very large cavities with extensive ethmoidal complications. I will not detail the operations on the antra and the sphenoid sinus in this case, which were performed after the dread of reinfection was removed by obliteration of the frontal sinus. Suffice it is to say that an individual to whom life had become unendurable, has been relieved of his suffering and able to comfortably carry on the arduous duties of secretary of an important financial institution in the west. I will say that the photograph is taken to show the cicatrix and that the scar on the individual is not as prominent as it appears to be in the picture.

Case II.—I wish to cite a case which like the last, has been through many hands, but continued failures always took place from the fact that the sinus as well as the antrum, became constantly reinfected. A description of the case by a colleague in Philadelphia, may be of interest:

"Mrs. K. has had empyema of the right frontal sinus and of the right antrum of Highmore for one year at least, though there is a history of neuralgia dating back three years.

In December, 1895, shortly after she first consulted me, I removed one-half drachm of thick muco-pus from the right maxillary sinus. While the antrum steadily improved under the frequent irrigation through the ostium maxillare, the frontal inflammation got steadily worse.

Numerous small polypi were removed from about the naso-frontal duct, but at no time was any pus seen there.

Transillumination of antrum positive, of frontal negative.
Frequent attacks of inflammation of the frontal sinus, causing marked edema over the cavity, occurred with extreme pain at the time but lasting only a day or two very severely. These attacks becoming worse and more frequent, the frontal sinus and antrum were opened under ether. The frontal cavity was filled with small polypi or granulations and some thick pus, the antrum contained thick muco-pus. The floor of the frontal sinus was broken through into the nose and a rubber drainage tube passed through and out at the nostril. Both antrum and frontal were packed with iodoform gauze, the former daily for over four weeks.

The drainage tube was removed on tenth day and a horse-hair drain substituted for a couple of days longer.

At the time of operation, I endeavored to pass a filiform bogie through the nasofrontal duct, but it was either markedly stenosed or entirely obliterated.

With a curved delicate probe one can now enter the cavity through the new opening which is beneath the extreme anterior end of the middle turbinates.

When the flow from these cavities was obstructed, before the operation, Mrs. K. had very severe neuralgia of the right side of the neck and in the right ear. There was seldom complaint of pain over the antrum, and over the frontal except during the attacks, which were several times a week at first but later once a month. When less frequent, the pain was severer.

The tooth is not the cause of the difficulty. It has been repeatedly examined by skilled dentists, a mirror even being used inside the cavity to view it."

This letter was written in 1895 and the patient continued the victim of pain and discharge until 1903 when in December of that year she was referred to me by Dr. Kinnicutt. I operated on the frontal sinus by entering and removing the anterior wall above the orbital ridge, except at the nasal portion where I was obliged to remove part of the ridge itself to obtain better access to the posterior cells.

As this case had been previously twice operated upon through the inferior wall, I was obliged to remove a greater portion of this wall during the operation, but preserved the integrity of the soft tissues.

Here as in the previous case I made a very free opening into the nose and packed for some weeks with iodoform wool
until the sinus was obliterated. I then did a slight plastic operation to remove the edges of the cicatrix. The photograph shows the scar to be scarcely visible.

In three weeks I operated on the antrum through the canine fossa, making a very free opening through the inferior meatus for packing. The wearing of obturators through the alveolar puncture which had gone on for years in this case made it necessary to remove much of the floor of the antrum, but I succeeded finally in closing a large buccal orifice and carried out my treatment through the nose until an absolute cure was effected. The patient wrote me a month since that for eighteen months she has had no pain and no discharge from sinus or antrum. The questions of interest which have suggested themselves to me as the result of these and like cases, are these:

1st. Is it ever expedient to attempt to incorporate the anterior sinus wall in a skin flap, after removal of the inferior wall, for the purpose of obliteration?

2nd. Provided thorough asepsis is carried out, the obliteration of the sinus becomes so possible: how often are we ever justified in closing our superficial wound until we are sure that we have secured this end?

3rd. Even with a Killian bone incision, may we not get better results by packing from above and keeping our flesh wound open until we are satisfied with the appearance of the nasal cavity as viewed from above?

4th. In operating on the frontal sinus should not the integrity of the inferior wall be preserved if possible, for two reasons?

1st. The pulley of the superior oblique muscle should not be interfered with, and 2nd, the venous return through the angular and ophthalmic veins into the cavernous sinus should not be unnecessarily exposed to infection.

It has been my observation that cases of fatal termination have been those in which the inferior wall near the nasal junction has been attacked and the infection carried to the cerebral sinuses through the above mentioned channels.

These and similar questions have been discussed from many standpoints, I would simply say that in my hands obliteration of the sinus by packing has more than proved the success I predicted for the method, which I advocated in my paper read before the Society in 1902.
A Case of Inflamed Dentigerous Cyst.

PAPER:

REPORT OF A CASE OF INFLAMED DENTIGEROUS CYST SIMULATING ABSCESS OF THE ANTRUM OF HIGHMORE, CAUSED BY AN ODONTOMA.

WILLIAM H. HASKIN, M. D.

The case to be reported is of interest from several points of view and is rather unusual. The history is of a man, W. H. W., 33 years of age, who, as is shown by his letter, suffered with neuralgia as far back as 1893, and so severely that he had all his teeth extracted on the upper jaw, although only four of the front teeth were decayed. The cure of the neuralgia was apparently effectual, and with a full upper indenture he was comparatively comfortable for years, but there developed another condition which was due entirely to his original disease and was probably the cause of the neuralgia.

I give his letter to me in full:

"The following is an account of conditions relative to present trouble, existing from the time I had my upper teeth extracted in 1893. As far as I remember, I had four (but possibly five) badly decayed teeth in the front of the upper jaw, the others being in good condition. I had suffered for years with intense neuralgia, always on the right side of my face. I could get no relief from medicines and finally consented to the extraction of all my upper teeth.

From that time till July, 1903, I had no trouble and wore a full upper indenture with perfect comfort. Then a small hard lump appeared about the place of the present trouble, which was very painful and interfered with mastication. The dentist relieved the pain by adjusting the indenture, and I had no further trouble until September, 1904, though the swelling became considerably larger during that time.

September 1st an abscess developed at the seat of the swelling, which broke at the end of eight days and refilled three days later, breaking a second time at the end of seven days. I then consulted first a doctor and then a dentist, both of whom said that there was decayed bone present, and on the advice of the dentist I write to ask when I may call at your office.

W. H. W."
September 29th, 1904, he came to my office. Close questioning elicited no symptoms of antrum disease and there was no condition in the nose indicating its involvement. Externally, the right cheek was immensely swollen, with edema of both eyelids. The wall was very hard in the middle but pitted badly around the circumference. Within the mouth the alveolar border presented a normal atrophied appearance, without any fistula or indication of caries. The swelling on the right extended from just above the free alveolar margin below to the malar ridge above, and from the ramus of the inferior maxilla posteriorly to the ala of the nose anteriorly. It presented a smooth rounded surface which seemed to be too hard for a simple inflammatory exudate. Three-quarters of an inch from the free border, at a point opposite the lower bicuspoid, was a fistulous opening which discharged pus. A probe entered a large cavity of irregular outline and at several points detected exposed bone.

On September 30th, at the Manhattan Eye and Ear Hospital, under ether anesthesia, a long incision was made along the alveolus and the periosteum was elevated until the fistulous opening was exposed in the bony wall of the swelling. This wall was very thin and would, I judged, have held a large English walnut very readily. The outer wall was easily removed with rongeur forceps and curettes, although it extended so closely to the malar bone that I felt I was curetting that bone. The inner wall, corresponding to the anterior surface of the inferior maxilla, was covered with granulations, but I could find no opening into the antrum and avoided puncturing it. There was a large amount of granulation tissue in every direction and on both sides of the cyst wall, which was removed with considerable difficulty in places. At the time of the operation I did not detect any unusual condition on the alveolus, though it was carefully scraped to remove any caries. The cavity was then packed tightly with iodoform gauze.

The patient was discharged from the hospital October 4, 1904, and continued treatment at my office.

October 7th, 1904, an abscess developed in the outer wall which threatened to rupture through the cheek, but fortunately did not, as I was able to drain it from within the cavity. There were no unusual symptoms, but on October 18th, in order to cut down exuberant granulations to aid in the re-
moval of a supposed sequestrum at the incision, I used a 50% solution of silver nitrate. On his next visit the probe detected this exposed spot in the alveolus which on examination appeared black, and which on removal proved to be an overlooked root, with a large odontoma involving it.

After this the whole cavity closed rapidly, though several times I packed it with enzmol to remove small areas of exposed bone tissue. I saw him once a week in November, and last on December 12th, 1904, on which date there was no trace of any trouble and he was able to use his upper indenture with perfect comfort.

On examination, the root which was removed presented a large odontoma but no evidence of any caries on its exterior, the upper surface being as though recently broken and the root canal being still patent.

This case presents the interesting phase of the attempt to cure facial neuragia by the extraction of all the upper teeth—although there were not more than four or five decayed ones present—and its apparent success, for there was no return of neuragia for at least ten years.

The question, however, arises, and most pertinently, whether the removal of the above root alone would not have been sufficient of itself, and emphasizes how careless a dentist can become when he will allow such roots to remain at the time of extraction.

The history I obtained from the patient on close question- ing led me to suspect that possibly there had developed a dentigerous cyst in the anterior wall of the superior maxilla. He said that for some months he had noticed a fullness on that side of his face which interfered with the fit of his upper indenture, which he has had cut out on two occasions. I believe that the above was the case, but that some inflammation or injury had caused inflammation to return, and the wall gave way, allowing the escape of its contents. He could not tell me the nature of the discharge, so I could not be certain, but the fact that there was a large cavity surrounded by a very thin osseous wall, that there had been no pain with the swelling until just before the wall ruptured on September 1st, 1904, would tend to the diagnosis of a cyst of some sort. If such was the case, it undoubtedly sprang from the alveolar socket that held the odontoma which I have presented to you.
I could present a number of other cases of interest, which have all been caused by the presence of tooth roots, and I believe that in all cases where we send patients to have teeth extracted we should advise them to bring the teeth back to be certain that no roots have been left, and in that way insure ourselves of no further trouble. It surely would be wiser to pursue this course, even though it should cause some necrosis of the alveolus, for that invariably heals promptly and I have never known serious trouble to result.

Dr. Cobb, in 1900, reported several cases of dentigerous cysts in this location, and was surprised at the rapid absorption of the cyst after the contents had been allowed to escape. In this case, owing to the inflamed condition of the whole tissue, I thought it best to remove as much of the wall as possible; and I believe that this should be the procedure followed in all cases, for my experience has always been that if the cyst wall in any case remains, there is always a strong possibility that it will refill in time.

I have carefully examined the Index Medicus for the past three years, but have been unable to find any reports of cases resembling those Dr. Cobb presented and this which I have just reported.
Acute suppurative inflammation of the frontal sinus generally heals without operation on the sinus, provided obstructions to the escape of the pus from the lower end of the canalis naso frontalis are removed, and I believe that the majority of cases of chronic suppuration of this cavity would soon cease under simple measures if there were free drainage. At all events, free drainage is necessary in every case whether or not curetting of the cavity is required, and the more easily this can be secured, the better. In my experience most patients refuse to have an external operation performed, probably on account of their dread of the resulting scar, and they can be driven to it only by intolerable pain or by external deformity due to the disease.

In nearly all cases, a probe may be passed from the naris into the frontal sinus after the anterior portion of the middle turbinate body and any pathologic obstructions have been removed. Whatever operation is to be performed, all these obstructing conditions should first be eliminated, therefore, very few cases remain in which a simple and safe intranasal operation that will establish free drainage is not eminently desirable.

I desire to present such an operation for your consideration without taking time to refer to any of the other well known operations. In a word my operation consists of passing a steel pilot through the natural canal into the frontal sinus and running in over this a hollow burr by which a canal six mm. in diameter is made, and then inserting into this canal a self retaining gold tube so large that the pus will necessarily drain and that the patient may easily wash out the sinus.
In performing the operation, I first introduce a small silver canula and wash out the frontal sinus with a 50% solution of the commercial solution of peroxide of hydrogen, warm; I immediately follow this with a warm saturated solution of boric acid. I then inject into the sinus slowly, five to ten minims of the following solution which trickles down about the canula and anesthetizes the field of operation: Atropin gr. 1-10th, Strophanthin gr. 1-5th, Suprenalin gr. 1-5th, Oleum Caryophyli M. iii, Acid Carbolic gr. x, Cocain Hydrochlorate gr. xcvi, Aqua. Dist. ad. f. oz. i. I then introduce the steel pilot Fig. I, A, which is no larger than an ordinary probe, and with the patient in the sitting position, administer chlorid of ethyl for about a minute which insures complete anesthesia. The handle is removed from the pilot and the hollow burr Fig. I, B. (which has already had a flexible sheath, Fig. I, C, slipped over it and been attached to the chuck of a dental engine) is slipped over this pilot into the naris and up to the lower end of the nasofrontal canal. Gentle continuous pressure is then made, the electric current is turned on and within a few seconds the frontal sinus has been entered. Before turning on the power, one should note just how much of the proximal end of the burr protrudes from the nostril, otherwise he will not realize when it has passed into the sinus and he may waste a lot of time (as I did in one operation) in the futile effort to make it go farther. One cannot recognize the drilling of the bone by either sound or the feeling of the instrument. As soon as the sinus has been entered the burr is withdrawn and a packer (similar to a uterine packer), the end of which has been bent to the same curve as the pilot, is introduced and through it the frontal sinus is packed and dried by a strip of

Fig. I. Ingals' Pilot Burr; two-thirds size. A, pilot; B, burr; C, shield.
absorbent gauze an inch in width which is left long enough to stop any bleeding. The gauze is then withdrawn and a similar strip saturated with 95% of carbolic acid or with a 10-20% solution of chlorid of zinc is introduced in the same way and allowed to remain a few minutes. The packer is then withdrawn about an inch to insure thorough cauterization of the whole canal, and this strip is then drawn out, through the packer, so as to avoid cauterizing other parts of the nasal cavity. The gold tube (Fig. 2), the upper end of which has been sprung together and covered with a gelatine capsule, is then slipped on an applicator and passed up the canal until stopped by its lower flaring end. A probe is now pressed up against the end of the tube and the applicator is withdrawn. For recent operations I have used the shield C, Fig. I, which has been made a spirai

![Fig. II. Ingals' Spring-gold Frontal-sinus Drainage Tube.](image)

- The upper tube in the cut shows the upper end opened out. The small cut at the right shows the lower end of the tube.
- The small cuts at the left show the diameter of the tube and the gelatine capsule.
- The lower tube shows the tube with the upper end spring into the capsule.

![Fig. III. Syringe for Washing Frontal Sinus; two thirds size.](image)

- The operation is then
complete. I give the patient a small syringe with a bent nozzle, by which the frontal sinus can be washed out or medicated. Little or no attention by the surgeon will be needed afterward. The instruments consist of a flexible steel pilot, Fig. I, A, 14½ cm. long and one to one and one-half mm. in diameter which will project 5 to 10 mm. beyond the hollow burr when the latter has been passed up to the farthest extent. This absolutely prevents perforating the top wall of the sinus. A removable handle for the pilot to facilitate its introduction. A hollow burr, Fig. I, permanently fixed to the end of a hollow steel wire cable, six cm. in length which is permanently fixed to a steel tube (like a trephine) the other end of which terminates in a shank for attachment to the dental engine chuck. At the proximal end of this tubular portion where it terminates in the shank, is a small opening in its side to facilitate cleaning. The cutting burr is six mm. long and six and one-half mm. in diameter and is so made that it will feed rapidly and cut any bone with which it comes in contact. The burr might be made larger without much danger of doing harm, but I believe its present size is within the limits of perfect safety and in the light of experience, I can see no reason for a larger drainage canal than this affords. The whole instrument which I have named, pilot-burr, is 19 cm. in length.

It will be observed that the distal end of the pilot is necessarily kept in position by the canal into which it is inserted so that the whole apparatus can not revolve when the burr is turning, and the proximal end is held by the tubular end of the burr so that the operator has the instrument under control. The thin spiral steel sheath for the cable and tubular portion of the burr, Fig. I, C, prevents any injury to the nasal passages due to rapid turning of the instrument. This is flexible so that it may follow any curve that is given to the pilot. A dental engine, rated one-eighth horsepower furnishes the most convenient power though an apparatus to operate the burr by hand might be made. The packer Fig. IV, is a thin tube the external diameter of which is a trifle less than that of the burr.

It is bent to the same curve as the pilot and is very easily introduced through the enlarged canal into the frontal sinus. From the examination of the frontal sinus in cadavers upon which I did the operation, I found that the opening through the mucous membrane lining the frontal sinus was not clear
cut, and was apparently much smaller than the burr, therefore I had a ring knife made on a flexible steel stem wherewith to curette the borders of the ostium frontale; this worked satisfactorily, but since perfecting the drainage tube, I find it unnecessary. The self-retaining gold tube Fig. II is three and one-half cm. long and six mm. in diameter. It is made of spring gold. The lower end has an oval cup-like flange nine mm. long by six mm. wide. From the upper end the tube is sawed down two cm. in six places, making six sections, nearly a mm. of the end of each of which is bent inward at a right angle so as to make the end blunt. About 12 mm. below this upper end

![Diagram of Frontal Sinus Packer](image)

**Fig. IV.** Frontal Sinus Packer; one-third size.

I bend out each of these sections so as to make the upper end funnel shaped and about nine mm. across at the end, which makes the tube self retaining. The slits down the side make each of these sections a nearly flat spring about two mm. wide and two cm. long and renders it easy to withdraw the tube at any time the surgeon may wish. The slits also prevent pocketing of pus about the tube in the lower part of the sinus. The part of a gelatine capsule used to hold these six spring sections together when introducing the tube is a trifle smaller than the outside of the gold drainage tube. The applicator is a bent copper wire over which I pass the spiral shield thus forming a shoulder to prevent it from slipping too far into the gold tube, and providing a means of pushing the latter off of the applicator. The syringe that I furnish the patient, Fig. III, consists of a small rubber bulb holding two to four drachms fitted with a hard rubber tube three and one-half mm. in diameter and seven to eight cm. long. This was made of
an antitoxin bulb, the vent of which had been closed, and a tube taken from an old atomizer. A Eustachian catheter might be bent for this purpose.

Beamon Douglass in the *Laryngoscope* for May, 1904, p. 346, gave five objections to intra-nasal operations for opening the frontal sinuses.

1st. Absence of the frontal sinus.
2nd. Thinness of the posterior (or upper) wall of the sinus.
3rd. Liability of entering an enlarged ethmoid cell instead of the frontal sinus.
4th. Variation in direction of naso-frontal duct.
5th. Danger of opening into the olfactory fissure and injuring the nasal artery and nerve, and of opening a direct line of communication with the brain, with the possibility of injuring the brain, or of septic meningitis.

The first and fourth of these objections have no bearing on the operation that I propose.

Regarding the second—because of the protrusion of the end of the pilot, it is impossible to perforate the posterior wall of the sinus in this operation, excepting by a lateral grinding action of the burr in an extremely narrow sinus, where the dural surface of this wall would be less than three mm. distant from the center of the naso-frontal duct—a condition that if ever present, would be extremely rare. If such a condition were met with, I do not think the dura could be cut by the burr.

Regarding the third objection. If an ethmoid cell is suppurating, it should be drained, therefore no harm would be done by this operation.

Fifth. As to the danger from the olfactory fissure—the objection urged applies with even greater force to external operations that establish a drainage canal large enough to be permanent. Furthermore, injury of either the artery or nerve would be of no serious moment. The danger of infection must be met in any case and should be minimized in every possible way, but this danger is no greater with this than with other operations.

In conclusion, the advantages presented by this operation in suitable cases as they appear to me are:

1st. It causes no scar, it affords efficient drainage and it enables the patient himself easily to cleanse the sinus.
2nd. It is much safer than other intranasal methods.
3rd. It can be done early before permanent pathologic
changes have taken place and in such cases it may be expected to effect a cure.

4th. The early establishment of free drainage usually prevents serious pathologic changes.

5th. It is no bar to a later external operation if that should become necessary; indeed, it takes the place of a part of that operation as it removes all mucous membrane from the naso-frontal duct, a measure so strongly urged by Coakley, and as it will open any projecting ethmoid cells and establish a free drain, it will render the radical operation much less formidable.

6th. It will cure a large percentage of chronic cases.

I have done the operation several times with good results, two chronic cases, each of about 10 years duration, were cured, and in no case has anything unfavorable occurred; therefore, I can heartily recommend it in practically all cases of suppuration of the frontal sinus in which a probe can be passed from the naris into this cavity. If the disease occurred in a sister, a wife or a daughter few of us would hesitate as to what operation should be first tried."

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DISCUSSION ON SYMPOSIUM; DISEASES OF THE ACCESSORY SINUSES.

Dr. H. P. Mosher, of Boston, in connection with this symposium upon diseases of the accessory sinuses, showed two cases of frontal sinus disease that had been operated upon by the Coakley method. In one the operation had been done two weeks ago; in the other four weeks ago. The cases were shown to illustrate the simple nature of the operation, and the appearance of the wound in the course of healing.

Dr. George L. Richards, of Fall River, Mass., showed three cases of double frontal sinus disease, and one of unilateral frontal disease treated by the obliteration method, with excellent results. The openings into the sinuses had been made under the ridge at the internal angle of the eye, and then enlarged, so that all the sinus area could be reached by the curette. He also exhibited a number of anatomic specimens showing abnormal conditions of the accessory sinuses. Owing to the comparative frequency of these peculiar anatomic conformations, Dr. Richards said it could not be expected that one operation would fit all cases. In some of the specimens shown the conditions were such that complete obliteration of all the cells was practically impossible.

A complete cure in a certain number of cases of sinus disease, the speaker said, was scarcely to be expected. When the disease had lasted for years, how was it possible to get out every cell? The majority of these patients were perfectly satisfied if they could get rid of the pain and most of the discharge, with the restoration of good, normal breathing, and without the recurrence of polypi. If so much could be done for them, they would be perfectly willing to report for treatment occasionally.

Many cases of chronic frontal sinus disease, Dr. Richards said, would get well if free drainage could be secured. The statement made by Dr. Coakley some years ago that the long continuance of the discharge prior to operation had no relation to the question of how quickly a cure could be effected was often well illustrated in nasal disease.
The question of deformity resulting from operation for frontal sinusitis was not to be disregarded. As a rule, American patients, especially women, preferred the operation he had demonstrated rather than the extremely radical one of Killian, or even that of Coakley.

Dr. Joseph Payson Clark, of Boston, said the subject of sinusitis and its treatment was such a large one, and had been so thoroughly covered in the papers presented, that he would limit himself to one or two points. He appreciated, as much as anyone, the success that had attended the work of Dr. Coakley, and the unusually large experience which he had had in frontal sinus surgery, but the fact should not be lost sight of that in a very large proportion of cases there was a resulting deformity from such radical operations, and that many patients refused to submit to them if they could be relieved from pain in any other way, even with a prospect of the possible continuance of a slight nasal discharge.

When fifty per cent or more of frontal sinus cases had been cured when treated by the so-called Ogston-Luc method, he considered it too radical a step to take to abandon that operation entirely. It seemed to him that efforts to improve its technique would be profitable. He urged that each case be most carefully studied, and the most conservative treatment adopted which seemed applicable to the case in question.

Dr. James E. Logan, of Kansas City, said that this question of diseases of the accessory sinuses was a most important one, and could not be too fully discussed. There were a few points that he wished to emphasize, and one was, that conservatism should be practiced in dealing with cases of frontal sinus involvement. In most instances, the disease was not confined to the frontal sinuses, and we should not be too aggressive in dealing with this condition. The speaker said he agreed with Dr. Richards that the possible resulting deformity from a radical operation should not be overlooked. The important element in the cure was the establishment of free drainage, and this was apparently secured by the intranasal method described by Dr. Ingals. In suitable cases and in their selection the X-Rays would prove of valuable assistance, an intranasal operation should always be considered before advising the more radical external method.

Dr. H. W. Loeb, of St. Louis, said that in view of the exhaustive character of the papers that had been presented, it
was very difficult for any one to do more than generalize on the subject under discussion. It was evident, from what had been said, that each man was able to do his particular operation with a great deal of skill, which showed the value of the personal equation in this as well as in other fields of medicine and surgery. For example, one man was able to get better results by employing a method that he had thoroughly mastered than he would obtain with a perhaps superior method that he did not understand so well. This same factor of the personal skill and proficiency of the operator was of importance in connection with the resulting deformity. Some were strongly in favor of conservative measures, and certainly, if we were able to dispense with the radical operation, and to substitute instead the method suggested by Dr. Ingals, it would be well to advocate it.

The papers composing the symposium on this subject had at least emphasized the fact that these operations could be done, and done well, in various ways by different operators.

Dr. Lee M. Hurd, of New York, said he had done conservative work in fifteen cases of frontal sinus disease, and had secured perfect drainage. He had simply entered the frontal sinus through the nose, enlarging the frontal duct in an anterior direction. The bone was sacrificed with forceps or other instrument, making the openings into the sinus as large as possible, and then injecting the sinus, once weekly, with a from five to twenty per cent. nitrate of silver solution. If the patient tolerated this, a saturated solution of silver nitrate was then used. At the same time, he used salt solution in the nose to counteract the effects of the silver solution there. Of the fifteen cases, he secured an absolute cure in six, and improvement in all of the rest, all the symptoms, excepting a diminished purulent discharge, disappearing.

The speaker said he had also operated upon six cases of antral, ethmoidal and sphenoidal disease. The first one, of over a year's standing, was absolutely well without any crust ing whatever; of the remaining five, all were well, but there remained some tendency to crusting. He believed this would disappear in time. One of the cases had frontal sinusitis, and made a prompt recovery in spite of the pus running down over the antral wound.

Dr. Thomas J. Harris, of New York, said the papers making up this symposium deserved the highest commendation; the
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members should not fail to recognize how much time and labor had been spent in their preparation, and personally he wished to express his appreciation of their value.

The speaker said he would confine his remarks chiefly to the subject of frontal sinusitis and its conservative treatment, as suggested by Drs. Clark and Logan. We should consider, first of all, the necessity of radical work in this region. Was it necessary, in the majority of cases, to do either a radical intra or extranasal operation? Leaving out of consideration the urgent cases, to which Dr. Coakley had referred in his paper, was it not true that the majority of our patients would be satisfied with what could be done for them by the usual methods that were employed, namely, the removal of the anterior end of the middle turbinate, and the clearing out of other obstructions? In the large majority of cases, this comparatively simple treatment would prove of immense satisfaction to the patient, and if, after this had been done, there was still a certain amount of muco-purulent discharge now and then, would we be justified in sacrificing the anterior frontal wall? The speaker said he did not think so. It should not be forgotten that the radical operation was not unattended with risk to life. Dr. Logan Turner had collected twenty-four fatal results following operations on the frontal sinus. Another factor to be borne in mind was the resulting deformity.

The most important feature in any method of operation on the frontal sinus was to secure free drainage, and as Dr. Loeb had stated, the personal equation was everything. The speaker said that while it would ill become him to criticise even allude to Dr. Coakley's very extensive work in this field, he still thought there was room for an operation that would give rise to less deformity. He favored Dr. Richards' method, so far as the lack of deformity it entailed was concerned, but it left the question of a complete cure open to doubt, and the same was true of the Ogston-Luc operation. In the cases that he had operated on with Dr. Coffin, the speaker said that recently they had followed the Killian method. He considered the preservation of the ridge as a very essential point in avoiding the deformity that was otherwise so apt to occur.

Dr. H. P. Mosher, of Boston, said that the more he studied the anatomy of the frontal sinuses in the dissecting-room, the more he felt like getting a view into the sinus in the cases which he met clinically. None of the speakers had said anything
about opening the sinus for exploratory purposes. This was very simple, and left no scar. In the future, it ought to become a customary procedure, because the operator at once saw what the condition of the sinus was, and could do little or much for its relief, as the case might require.

The method of reaching the sinus through the nose was the oldest method of all that had been devised for treating the sinus. Men were continually coming back to it, but it was poor anatomy to use this route, and therefore poor surgery. The method described by Dr. Ingals, while it excluded the danger of injuring the posterior wall of the sinus, did not exclude the danger of injury to the posterior internal angle, the dangerous area of the sinus. In that angle the cribiform plate often sent forward a prolongation, and into that region, the bony canal of the foramen caecum, the vein which begins the great superior longitudinal sinus at times extends.

After comparing the scars left by the frontal sinus operation, the speaker thought there was less deformity in the cases that had been shown, where the sinus was entered above the orbital rim.

In connection with the method of opening the sinus at the upper internal angle of the orbit, the speaker said he wished to emphasize the point that whenever the operator used this route, he interfered with the pulley of the superior oblique muscle of the eye. In a large series of cases done in this way, a certain number would have permanent trouble from interference with the muscular balance.

Dr. Coakley said that he did not shave the eyebrow in his cases, because the hairs usually came out coarse, and did not match those of the opposite side. Dr. Mosher thought it was more surgical to shave the eyebrow before operating, and in order to cover the objection raised by Dr. Coakley, both sides might be shaved.

Dr. Lewis A. Coffin, of New York, said he thought Dr. Richards struck the key-note when he said that one operation could not be expected to fit all cases. There were certain cases of frontal sinus disease in which the open method of treatment was undoubtedly indicated; there were others in which it should not be done. The speaker said he was certain that Dr. Coakley was willing and found it necessary at times to get away from any stereotyped method of operation.

In regard to skiagraphy, Dr. Coffin said it was a very beauti-
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ful and instructive method of demonstrating the size of the sinuses and their relation to one another, but he doubted the statement made by one of the speakers that it showed diseased conditions of the sinuses. He did not believe that the X-Rays demonstrated the diseased sinuses in any way, shape or manner. In taking these skiagraphs, the light had to pass through various layers of bony and soft tissues, as well as the brain and the air cavities, and it would be expecting a great deal of the rays to have demonstrated the presence of pus or diseased membrane in the accessory sinuses. The fact should not be lost sight of that skiagraphic pictures of the object were not constant quantities, even by the use of the same tube, and, as far as possible, under the same conditions.

In regard to the various operations for frontal sinus disease, Dr. Coffin said that much depended upon the size and condition of the sinus. In dealing with a very large sinus, with many septa, it would naturally take a long time to obliterate it by the open method; in fact, too long. He regarded the Killian method as practically certain, and one that gave perfect results for the large sinuses.

The degree of scarring after the external operation on the frontal sinus by the open method depended much on where the wound was kept open for packing, because there was sure to be more or less retraction at that point. He advised against splitting the eyebrow, as that would frequently leave a disfiguring scar. The incision, preferably, should be made along either edge of the brow.

Dr. Coffin, in differing with Dr. Coakley, said he had seen cases in which there was undoubted independent disease of the frontal sinus, none of the other sinuses being involved. He regarded Dr. Berens’ operation as certainly an illustration of heroically radical work. In his paper, Dr. Berens had reported several cases as suffering from dry pharyngitis following this radical operation. This was not at all surprising, as the functional integrity of the nose had been entirely destroyed, and nothing was left the patient but a large, irregular hole.

In conclusion, Dr. Coffin said that if the surgeon, in operating on these cases, found it necessary to be radical, he should at all times be conservatively so.

Dr. C. G. Coakley, in closing, said the discussion of the papers composing this symposium had brought out many good points. In the first place, the men who had advocated the so-
called conservative treatment had done so in a very able manner. He regarded Dr. Ingals’ operation as a valuable addition to the conservative or intranasal methods of reaching the frontal sinus. It certainly would seem to give better drainage than any of the other intranasal operations with which he was acquainted. One possible danger of the method was the accidental perforation of the brain, and the setting up of a septic process, as the curettage of the sinus was done blindly. Still, Dr. Coakley said he expected to give the method a trial next Fall, and hoped for as good results as Dr. Ingals had obtained.

The speaker said he was perfectly in accord with the statement made by Dr. Richards that one operation could not be expected to fit all cases. The operation should be varied according to the indications met with; according to what the skiagraph showed, according to the size and shape of the sinus, and its condition. Dr. Loeb struck the key-note when he called attention to the value of the personal equation, which certainly had a great deal to do with it. Dr. Coakley said the reason he had not done the Killian operation was that he was not familiar with it, and the results he had obtained from his own method were so good that he had not been tempted to try any other. If the Killian operation gave better results, with less deformity, the speaker said he would be willing to substitute it for his own in suitable cases. He would gladly concede the superiority of that method when he became convinced of it.

Dr. Coakley said that in his paper he had touched upon the question of an exploratory operation on the frontal sinus, and in certain instances he thought that that was a perfectly justifiable procedure. He could recall cases where he entered the frontal sinus, and finding that a radical operation was uncalled for, he had simply closed the wound, which healed with practically no resulting deformity.

The value of skiagraphy should not be overlooked in dealing with these cases. If Dr. Haskin had resorted to it in the case he reported, the source of the trouble would probably have readily been discovered. The speaker said he had found the X-Rays very valuable in dealing with abscesses caused by aberrant teeth. In dealing with disease of the sinuses, skiagraphy did not always show the presence of disease, but a good negative always showed a marked difference between a normal and diseased sinus.
Diseases of the Accessory Sinuses.

Dr. Coakley said that while the method demonstrated by Dr. Richards caused less deformity than his own if the sinus was small, it was difficult, he thought, by the former method, to gain access to all the recesses of the sinus. In some cases the sinuses were narrow, or we had to deal with multiple septa, and in such instances it would be very difficult, with any curette with which he was acquainted, to get out all the mucous membrane, and unless that was done, the mucous secretion would continue, and obliteration of the sinus would not occur. The only bleeding that occurred in the course of the operation was from the mucous membrane in the sinus, and after that was removed, together with the granulation tissue, the field was absolutely dry.

In connection with his paper, Dr. Coakley showed two patients upon whom he had operated by the method described.

Dr. T. Passmore Berens, of New York, in closing, said that in the discussion of the papers on this subject, Dr. Clark had criticised the radical operation from the standpoint that these cases could frequently be cured by less radical measures. Dr. Berens said that in his own paper he had emphasized the point that he only resorted to the radical operation in cases where milder methods had failed. In his case of pan-sinusitis referred to by Dr. Coffin, the patient had previously been under the care of two eminent rhinologists, who had failed to give him relief. The case was a very severe one, the constitutional symptoms being such that a meningitis was suspected. The local conditions were such that an intranasal operation for the relief of the sphenoidal and ethmoidal disease was out of the question. One of the rhinologists who had previously seen the patient concurred as to the necessity of an operation, and was highly pleased with the result obtained.

Dr. Berens said it was only in those cases of chronic suppurative disease where palliative measures had failed that we were justified in resorting to a radical operation, whether the disease involved the ear or the accessory sinuses of the head. In dealing with these cases of disease of the accessory sinuses, in order to effect a cure, none of the involved cells should be overlooked, and drainage should be made complete.

In reply to Dr. Coffin, Dr. Berens said he thought the nose was still a useful organ, even when "turned into one of those great, big ragged holes." In the operation he had described, the inferior turbinate and the entire mucous membrane of the
septum were always left intact, so that there still remained a large area of healthy, secreting mucous membrane. Any one could readily convince himself of that fact by seeing one of these patients undergoing an attack of coryza, which was good evidence that the operation did not destroy the function of the nose entirely.

Dr. Berens said he would be pleased to see the operation described by Dr. Ingals, but he was strongly opposed to injecting even a weak solution of commercial hydrogen dioxide through a canula into the frontal sinus. In some cases in which that cavity was affected, the disease extended to the dura, and such an injection would be very apt to set up an infection of the meninges.
Strange as it may seem in these days of advanced thought in medicine, there are a few who are firmly adherent to the old notions of tentative medicine.

After all that experience has taught as to the dangers to the function of hearing and of life itself by ear inflammation complicating scarlet fever, yet there are many of our profession who assume an attitude of expectancy and contented helplessness, and a peculiar sense of satisfaction when an ear aches, breaks and runs during the course of this infectious disease.

This is unfortunate for the science of medicine and for the human race and inexcusable in these days of enlightenment.

We might excuse the doctor of past generations who felt that scarlet fever must leave some "corruption" in the system and felt that the organ of hearing could be spared better than the kidneys or other organs, so he welcomed with delight the appearance of pus in the auditory canal, feeling that now the system was safe from harm.

Otitis media is the most frequent complication of scarlet fever, and, everything considered, the most serious. Like the general infection, its severity varies with the epidemic, the climate and the season of the year. It is more common in the winter and spring months and in the colder climates. Statistics show that from three to nine per cent. of the cases of scarlet fever have ear complications; and in about fifty per cent. of these cases, both ears are affected. Bezold of Munich collected six hundred and forty cases of aural disease secondary to scarlet fever covering a period of eleven years in which nine hundred and eighty-four organs of hearing were affected, about one-half of them being bilateral. During the same time, he estimated from other statistical sources showing seventeen thousand and eighty-seven cases, that three and seventy-five hundredth per cent. of all cases had ear complications. In five hundred and
thirty of Bezold's cases, two hundred and sixty-three had a
continued discharge from the ear lasting over eight years;
and a total destruction of the drumhead in twenty-five per
cent of these cases. In another report of one hundred and
eighty-five cases, he shows that in thirty there was an entire
destruction of the drumhead with the loss of one or more of
the ossicles; in fifty-nine the perforation in the drumhead com-
prised two-thirds or more of the membrane; in thirteen there
were small perforations; in forty-four, granulations and polypt;
in fifteen, total loss of hearing on one side; and in six cases
total loss on both sides; in seventy-seven cases, the hearing
distance for whispered voice was less than half a meter.

Of four thousand three hundred and ninety-seven cases
reported by Finlayson, otitis occurred in ten per cent. And
of one thousand and eight cases by Caiger, thirteen per cent.
In Burkhardt-Merian, thirty-three per cent. The greatest
importance is attached to the inflammation of the middle ear,
although the affections of the labyrinth or otitis interna are of
no little moment, when one considers the large number of
cases of total deafness, the large percentage of inmates of deaf
mute institutions where otitis is due to scarlet fever.

Dr. Blau found from statistics of eight authors fourteen
thousand and forty-five cases of otitis interna with fifty-five
cases or three and eight-tenths per cent. due to scarlet fever.
Buckner finds seven per cent.

In a survey of the deaf mute asylums of Europe in 1887,
the smallest percentage was found in Italy, one and five-tenth
per cent., and the largest in Norway, twenty-seven per cent.,
representing the ratio of the cases due to scarlet fever and
showing the relative frequency of the disease in the warm and
cold climates.

Doctor May has collected statistics in New York of five
thousand six hundred and thirteen deaf mutes; five hundred
and seventy-two of whom, or nearly ten per cent., owed their
condition to otitis of scarlet fever. Dr. Holmes of Cincinnati
reports that in the deaf mute institute in Jacksonville, Illinois,
of five hundred cases, seven and two-tenth per cent. were due
to this disease. In the Rhode Island School for the Deaf, of
two hundred and one cases admitted, forty-four or twenty-one
and three-tenth per cent were due to scarlet fever. In the
Clarke School at Northampton, Mass., there were one hundred
and five cases out of six hundred and forty pupils, or sixteen
and four-tenth per cent.
Scarlatinal Otitis.

On the other hand, statistics at large show that of all cases of supplicative otitis media about twelve per cent. are due to scarlet fever; thereby showing that a disease which impairs and often destroys the function of one of the most important organs of special sense, which is the focal point of infection in many cases of septicemia, pyemia, meningitis, brain abscess, and is a constant menace to the patient's life, is a complication of scarlet fever which is often ignored or even welcomed by the physician with content.

For illustration in the study of this disease, I wish to use a season’s experience in the scarlet fever wards of the Rhode Island Hospital. Beginning about the middle of January, 1904, and continuing till the middle of June, I had the privilege of watching some 60 cases. The ears and throats of each case were systematically examined at regular intervals. During these five months seven cases of supplicative otitis media developed, and three cases were in active progress when the patients were admitted, making ten cases in all or about seventeen per cent. Seven cases were bilateral, and three unilateral. Of the seven which developed after admission, four were characterized by pain in the ear and rise of temperature and increased rapidity of the pulse. Three of the seven had no pain whatever; the only condition which attracted attention was a sudden rise in temperature which could not be otherwise accounted for. These cases were discovered by examination of the ear in accordance with a standing order, that in the event of a sudden rise of temperature or increase of fever symptoms in any of the cases, I was to be notified immediately, it being my purpose to forestall the ulcerative spontaneous perforation of the drumhead by a good, free incision, assuring immediate depletion of the parts and adequate drainage. Of the seventeen suppurating ears, two went on to suppuration and necrosis of the mastoid. These were operated and made an uneventful recovery. In one of the cases, a girl of ten years who had a very severe general infection, streptococcus pharyngitis and nephritis, the ear still discharges a little at intervals.

In four other cases, in which paracentesis was done, the drumheads healed perfectly and hearing returned to normal condition in a very few weeks. In one of the very severe cases, which had nephritis, but no severe pharyngitis, the drumheads of both ears and two of the ossicles, malleus and incus of the left ear, were swept out as clean as if eaten out by
acid, in spite of the most careful and energetic treatment. In this case the ears were still discharging when seen ten months later. The other three cases were lost track of after discharge from the hospital.

The bacteriologic study of these cases was intensely interesting. The cases were very carefully followed in the laboratory by Dr. Fulton, Dr. McElroy and Dr. Barrows.

Four cases on which paracentesis was performed showed streptococcus in pure culture in the discharge which was taken from the canal immediately after the incision was made—these were the cases which healed the most rapidly—the ear returning to its normal condition in a few weeks. All of these cases, however, showed a mixed infection within a week after the first culture. An examination showed staphylococci and other organisms with the streptococci in each case. One of these also had a diphtheria-like bacillus in combination with the others. It is interesting to note that this case healed the quickest of any case in the series, and it is also interesting to note that the case—which had so extensive destruction of tissue and ossicles had exactly the same combination of organisms.

The diphtheria-like bacillus which was found in three cases differs from the Klebs-Loeffler bacillus, so this was not considered a diphtheria infection. I might add that while we had a few cases of the double infection, diphtheria with the Klebs-Loeffler bacillus and scarlet fever, yet in the cases under consideration the Klebs-Loeffler bacillus was not found. As yet no specific organism has been isolated as being peculiar to the otitis of scarlet fever; and bacteriology has not yet given us any specific organism for this very common infectious disease. Leutert1, a former assistant at Schwartzze’s clinic, who has done considerable research in this line, is of the opinion that the malignant forms of scarlatinal otitis characterized by rapid destruction of tissue is due to streptococcus, and he likewise thinks that streptococcus is the germ that gives to scarlet fever the picture of a severe disease, while the so-called specific germ of scarlet fever seems to have no relation to the general infection and suppuration. Kurth frequently found a kind of streptococcus laid together in chains forming a lump-like colony which he called streptococcus conglomeratus.

Before bacteriology revealed to us the possibilities of the infection in scarlatinal otitis, it was always considered as

1. Leutert, Arch. f. Ohren. Bd. XLVI and XLVII.
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diphtheritic and nearly all authors up to the present time classify this form of otitis as diphtheritic or scarlatinal-diphtheritic; and the natural inference is that it is necessary to have a diphtheritic infection of the throat in order to have the otitis. In case one there was no diphtheria infection in either throat or ear. My experience leads me to conclude that the otitis of scarlet fever has no relation to diphtheria but is a streptococcus infection.

Clinically there are three forms of scarlatinal otitis, which I prefer to classify as follows:
1. Acute Serous. 2. Acute Suppurative. 3. Acute Necrotic. The severity of the otitis seems to be dependent on the severity of the general infection, on the one hand; and the constitution of the patient on the other. Anatomic conditions and the structure and condition of the vaso-motor system are important factors. In children previously healthy and with good firm skin, normal lymphatic system, and good resistance generally, the disease assumes the milder form, if the general infection is not too severe. In children of the lymphatic diathesis so-called scrofulous tendencies, subject to swelling of the glands of the neck, enlarged tonsils and hyperplasia of the adenoid tissue of the pharynx, we see the severe forms of the disease.

Acute Serous Inflammation.—The mild forms of otitis occurs mostly about the time of the eruption, or within the first ten days, or while the prodromal pharyngitis is active. The symptoms are similar to those of ordinary acute catarrhal otitis media. If the patient is old enough he complains of a feeling of fullness in the ear, pulsating noises, slight deafness and varying degrees of pain, some slight, some severe, and in some there is no complaint of pain at all. In the young children we are only led to think of the ear by an increase of fever symptoms and evidence of discomfort by restlessness and crying; and perhaps by the discovery of a discharge from the ear.

Examination of the ear with the head mirror and speculum under a strong light, reveals, in some cases, a slight redness and swelling of the fleshy portion of the canal according to the period of the scarlet fever, and the condition of the skin of the body. If desquamation has begun, the canal is usually coated with scales of epidermis, and the wax glands seem to have an increased activity at this time and the opening of the canal is usually well coated with wax. The drumhead varies
from a dull flat appearance to that of intense congestion and bulging. After three or four days of the subjective symptoms, a discharge of serum is noticed escaping from the canal, the pain subsides, the fever symptoms diminish, and if the ear receives no secondary infection, it heals after a few days. Unless these cases are under close observation, as in a hospital or by a trained nurse, they are rarely seen until the drumhead has ruptured. Probably most of these simple cases become secondarily infected and continue on into the purulent form. When this is the case the discharge of serum takes on a purulent character and becomes more profuse, the patient becomes restless and more feverish, with a general increase of toxic symptoms, and suffers more or less pain deep in the ear and mastoid bone.

**Acute Suppurative Inflammation.**—This form of otitis usually occurs somewhat later in the course of the scarlet fever than the previous form, about the second week, although it is probably dependent upon the severity of the general infection. The subjective symptoms are much more severe. The sudden increase of feverish symptoms is very pronounced, the temperature often rising to 103° or more. The pain in the ear is lancinating and throbbing in character, radiating from the depths of the ear to different parts of the head and neck. Swelling of the glands of the neck with stiffness of the muscles and torticollis are frequently present in these cases. In some there is evidence of cerebral irritation shown by convulsions and vomiting, so that meningitis may be feared. We must bear in mind, however, that these cerebral symptoms are often among those which usher in the general infection, but when they occur after eruption is complete, or later, they may accompany kidney or ear complication.

**Objective Symptoms:** In cases where the drumhead has not ruptured, the canal is scaly and at its entrance abnormally coated with wax, and is often swollen. The drumhead is edematous, swollen, varying in color from a bright to a dusky red, and bulging in parts, or as a whole to a greater or less degree, sometimes protruding a fourth of an inch or more into the canal. Even after spontaneous perforation has taken place, this enormous protrusion of the membranes of the drum cavity is sometimes seen.

**Acute Necrotic Inflammation.**—This malignant form of otitis is commonly called the diphtheritic form. This type of the
disease is analogous to the throat condition known as scarlatinal diphtheria, although the Klebs-Loeffler bacillus is not found in the discharges, nor are there any of the paretic sequellae so common to diphtheria.

The term diphtheritic, which infests the traditional teaching of disease of the throat and ear, makes it very difficult to estimate the true conditions which have existed in the history of these membranous and exudative forms of disease of these organs; but bacteriology has done much, and we hope soon will do more, toward clarifying this befogged condition. Many cases of the so-called scarlatinal diphtheria, characterized by severe infiltration of the lymphoid tissue of the throat and membranous deposits on the tonsils and posterior and lateral walls of the pharynx and of the mucous membrane surface of the nose, show pure cultures of streptococci or staphylococci, or the mixture of the two, the Klebs-Loeffler bacillus being absent.

This malignant or membranous form of otitis is to be considered the most severe form of ear disease, the infection being intensely virulent, and the destruction of tissue very rapid, often sweeping out the entire drumhead and the ossicles in a few days. If it is uninterrupted by treatment, the necrotic process destroys the inner membranes of the tympanum, those of the round and oval windows, invades the labyrinth, destroying the membranous labyrinth and organ of Corti, thus destroying the organ of hearing and disturbing the equilibration of the body, causing a rolling, staggering or tottering gait for a long time after recovery. Cases have been reported, and I have seen two, where parts of the labyrinth and the cochlea were exfoliated in the necrotic process and removed as a sequestrum at operation.

In other cases the infection travels on through the internal auditory canal, damaging both the auditory and facial nerve, the latter causing facial paralysis, and on into the meninges of the brain causing meningitis and death. Postmortem examinations in these cases have revealed necrosis of the cochlea and deposits of membranous and necrotic tissue in the vestibule and other parts of the labyrinth.

The appearance of this type of otitis as seen through the speculum at the early stage of the inflammation is similar to the violent suppurative form, but the drum membrane soon becomes livid, or has a yellowish white pulpy look, having the appearance of a false membrane which doubtless is present, similar to the false membrane of the pharynx, and contains quantities
of streptococci. The secretion at first is not abundant, in fact very little, but in a few hours a brownish purulent fluid with a very fetid odor of tissue necrosis is present. The hearing soon lessens, the drum membrane dissolves away, and the drum cavity is filled with this membranous exudate with a foul odor. When the labyrinth is affected, its onset is signaled by sounds like the ringing of bells or the clanging of steel, and by dizziness. In some cases the labyrinth becomes involved primarily.

The Cause.—The cause of scarletinal otitis is evidently a streptococcus infection. The method of invasion is still a matter of discussion: formerly it was thought that the avenue of invasion was through the Eustachian tube and some hold this view today. More recent investigations suggest that it is hematogenous, the infection carriers finding their way to the tympanum through the blood current.

It seems to me that in some of the milder forms, infection is carried through the Eustachian tube, and in the severer forms through the blood current or through the lymphatic system of the pharynx and tympanum.

Prognosis.—Prognosis as regards both the continuity of the organ of hearing and of life, is largely dependant on prompt treatment and proper care. The simple forms are favorable, the severe ones not so favorable, especially as regards hearing, for in some a large part of the hearing is lost and the case goes on to necrosis of tympanum, ossicles and mastoid, in spite of the most careful treatment. Cases where adenoids in the nasopharynx and enlarged tonsils are present, also children of scrofulous diathesis are apt to have a severe time of it. And while the outlook, as far as immediate danger to life is concerned, may be good, there is always the loss of the hearing function, or its impairment to be feared, and the establishment of a chronic otorrhea which is a nuisance to the patient and his family and friends, and with all its attending dangers, is a constant menace to life itself.

Treatment.—Treatment is naturally surgical and antiseptic. We are dealing with an infectious process caused by some one or a number of varieties of micro-organisms, and this simple or mixed infection, as the case may be, must be removed as soon as possible, and the part kept as free as possible from it until healing is complete.

Some recommend preventative treatment by irrigating the
nose and throat daily to keep the amount of infection reduced to a minimum. This procedure I think is one attended by great risk; as there is danger of washing infection through the Eustachian tube into the tympanum and thereby setting up the inflammation you are trying to avoid. The patient should be kept in a warm room night and day, avoiding rapid changes in the temperature, draughts and chilling of the body after bathing; this will do much toward preventing congestion of the ear and mucous membranes of the body; for the less the circulation in these parts of the body is disturbed, the less will be the danger of inflammation. When the lymphatics of the neck show signs of swelling, ice should be applied in a throat or ear ice-bag and kept on constantly. Iodid of lead ointment is also useful in reducing the inflamed glands.

If spontaneous rupture of the drumhead takes place and the ear begins to discharge serum, this should be removed by pledgets of sterilized cotton and not by syringing as any disturbance of this condition, as by an unsterile syringe or dishes, might result in a secondary infection. When the discharge has become purulent then it should be syringed every two or three hours in order to keep the canal as free from pus as possible and avoid an infection of the deeper parts and the external glands of the ear and lymphatics surrounding it.

When a case of scarlet fever is first seen by the physician, instructions should be given to the parents or nurse regarding the ear complications, and if the patient complains of pain in the ear, or manifests any discomfort in the ear by putting the hand to it or rubbing it, moving the auricle, or refusing to lie on the affected side, or if a sudden rise of temperature occurs, strict orders should be given that the attending physician be notified at once; and he should immediately examine the ears, and if any of the appearances of the drumhead above described should be present, he should at once incise it freely. If the drum head is to be incised, the canal must first be sterilized by syringing with 1-2,000 bichlorid and carefully dried with sterile cotton, and a sterile instrument used. The canal should then be closed by sterilized cotton, changed as often as it becomes saturated; great care being taken to see that the hands and instruments are clean. If the discharge becomes purulent, the canal should be syringed and any one of the following solutions may be used: Sodium bicarbonate 1 drachm to the pint, lime water, carbolic acid 1-40, saturated solution of boric
acid, or 1-500 permanganate of potassium. After cleansing, the canal should be dried with sterile cotton and a solution of boric acid in 60 per cent. alcohol instilled into the canal. In the severe cases, a one per cent. solution of bichloride of mercury in 60 per cent. of alcohol, or two per cent. nitrate of silver solution may be dropped into the ear, the solution having been previously warmed.

If swelling of the mastoid lymphatics or tenderness over the mastoid region occur, the aural ice bag should be applied, and if relief is not within a few hours, leeches should be applied over the tip and upper part of the mastoid bone. These measures will usually give prompt relief and often stay the progress of the inflammation. If the disease goes on to suppuration of the mastoid, operation will be necessary and should be performed without delay, yet, if the indications for operation are not especially urgent, I prefer to wait until after desquamation is complete, as in my experience if the operation is performed during desquamation, or if within six or seven weeks from the onset of the fever, the repair process is extremely slow; even after a week has elapsed following operation, there will be little or no formation of new tissue in the bone cavity. The discharge from the wound is very profuse and intensely acrid; excoriating the parts wherever it touches, ulcerating the fresh cut surfaces and sloughing out the stitches and destroying the new healthy granulation tissue that may have formed. The large open wound resulting from this destructive process affords an unprotected area for septic infection and with the virulent nature of the discharge, which contains quantities of streptococci and staphylococci, the system is exposed to great danger. One of our cases developed a pronounced septicemia, unquestionably from this cause.

A word regarding the contagious nature of the discharge would not be amiss. A recent experience at the hospital will furnish a good illustration of the care needed in handling a discharging ear immediately after the scarlet fever has had its run. There were three children representing three families who had fulfilled the demand of the Board of Health regarding quarantine and returned to their respective homes, each child with suppurating ears. Within ten days after their discharge from the hospital one other child from each family was admitted with scarlet fever and it is believed, after careful investigation, that these new cases were started by coming in
contact with the discharge from the ears of the children who had just returned home. I believe that the discharge from a scarlatinal otitis serves as a good infection carrier, and cases should be detained in an intermediate station, and from other children at least two weeks after desquamation is complete; during this period the ears to have thorough antiseptic cleansing. As a safeguard to the community I think it is essential to consider the discharging ears in the determination of raising quarantine in scarlet fever cases.

In conclusion, let me emphasize the importance of early recognition of the ear complications of scarlet fever; we should not expect and wait for the ear to "break and run" as is so often done, for this is but little short of criminal negligence, but through prompt treatment by paracentesis of the tympanum, as soon as there is the slightest indication of inflammation in the tympanic membrane or exudate in the tympanic cavity, relieve the distressing symptoms and place the patient in the safest possible condition as regards systemic infection and intracranial complications and do all in our power to preserve the function of one of the most important organs of special sense.

DISCUSSION.

Dr. Edward B. Dench, of New York, said that while it was well known that a certain number of cases of otitis occurred in the course of scarlet fever, accurate statistics on that point were wanting, and for that reason papers of the character of Dr. Sprague's were very valuable. Usually, in seeking information on this subject, we had to depend on text-books which were many years old.
CANDIDATE'S THESIS:

THE INDICATIONS FOR OPERATING IN ACUTE MASTOIDITIS.

PHILIP D. KERRISON, M. D.

In determining the relation of surgery to disease, one should deduce one's facts from the cases which have recovered without operation, as well as from those operated upon. Particularly does this seem to be true with regard to the indications for operating in acute mastoiditis.

Competent surgeons, usually at one theoretically, often differ materially in practice. Whoever, therefore, feels called upon to dissent even in the smallest particular from the popular conception of what should constitute an indication for opening the mastoid, should have the courage to state his views and give his reason therefore. It is the relative surgical value of what are commonly considered the two cardinal physical signs of acute mastoiditis that the writer wishes to discuss.

To review briefly the symptoms of acute mastoiditis, they may be stated somewhat as follows:

The patient during the course of, or convalescence from, an attack of acute purulent otitis media, may suddenly experience deep seated pain in the region of the mastoid process.

The aural discharge, which has perhaps been gradually decreasing in quantity, may follow one of several courses in order to show that recovery has been interrupted; e.g., it may (a) suddenly cease, this abrupt cessation being accompanied by no amelioration of the patient’s condition, and being followed within a few hours or a few days by a still more copious flow of pus; or (b) the discharge may gradually increase in volume until it becomes necessary upon purely physical grounds to assume the involvement of accessory sinuses in order to explain the quantity of pus excreted during the twenty-four hours; or (c) the long continuance of the discharge may of itself be sufficient to warrant the inference of a necrotic focus more
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depth seated than within the small tympanic cavity. With the appearance of mastoid pain, sleep is disturbed, insomnia becoming a more or less prominent symptom; and the temperature, which has run a normal course, or has returned to normal, may become elevated. As corroborating the above symptoms, the two following physical signs have come to be regarded as pathognomonic, viz: (1) Tenderness on pressure over the mastoid; and (2) bulging of that portion of the postero-superior canal wall which immediately adjoins the drum-membrane.

The symptoms to be looked for, then, are mastoid pain, with consequent insomnia; elevation of the temperature; certain quantitative changes in the character of the discharge; mastoid tenderness, and bulging of the postero-superior canal wall.

The above rather meager clinical picture may be said to comprise practically all the symptoms that are characteristic of an uncomplicated case of acute mastoiditis.

Unfortunately many cases of acute mastoiditis run their course with complete absence of one or more of the above symptoms. That extensive necrosis of the mastoid cells may occur with absolutely no elevation of temperature is a fact now fortunately recognized. Mastoid pain may also be absent, or at least not sufficiently marked to be complained of by the patient. When fever is absent, and pain inconsiderable, the subjective and constitutional phenomena are naturally not very characteristic. Fortunately there is one physical sign which is never wholly absent. Sensitiveness to pressure is probably at the onset always present over some point on the mastoid cortex.

In discussing the surgical value of the two physical signs above mentioned, it will be necessary to refer very briefly to certain points in the anatomy of the bone which bear more or less directly upon the pathology of the disease.

Pain on Pressure Over the Mastoid Antrum.—If we were taught to regard the antrum, not as one of the mastoid cells, but simply as the posterior end of the tympanic vault, our conception of its true surgical significance would be more exact. In the fetus at term, the mastoid process as such does not exist, it being represented by a thin cartilaginous plate; yet the antrum is already an easily demonstrable cavity. In the seventh month of fetal life, also, the antrum can be demonstrated to exist, and at this period of its development, its
walls are formed chiefly by the squamous portion of the future bone. While these facts are now fairly generally recognized by students of tympanic anatomy, their surgical significance is still somewhat obscured by statements in some of the older text-books which refer to the antrum as one of the mastoid cells, and describe the *aditus ad antrum* as a narrow passage by which it communicates with the tympanic vault.

The *aditus* is not a narrow passage connecting two bony cavities. It is distinctly a constricted portion of one and the same cavity. Careful examination of a large number of bone sections shows the *aditus* to consist of a comparatively large triangular space, the vertical diameter of which—i.e., measured from the centre of its base above to its inferior angle below—will average not less than 4 to 5 mm. Considered as one osseous space, the *antro-tympanic* cavity may be described as one having a central constriction, and so bent upon itself that while its roof lies throughout in the same horizontal plane, its floor is lower anteriorly and posteriorly than at the center where encroached upon by the lower margin of the *aditus*.

The antrum, then, should not be thought of as a distinct bony cavity; nor is it an accessory sinus in the sense that the frontal, ethmoidal, sphenoidal and maxillary cavities are accessory nasal sinuses. For whereas hypersecretion may occur, and frequently does occur, within the nose without flooding these accessory cavities, it is difficult to conceive of any considerable accumulation of fluid within the tympanic vault which will not flow backward into the antrum.

This rather tedious statement of facts prepares the way for the following propositions, viz: (1) *That acute purulent otitis media is probably always attended by an escape of pus into the antrum*; and (2) *That the presence of pus within the antrum is not necessarily an indication of mastoid inflammation*.

These conclusions seem fairly deducible from the mechanical relations of the various parts of the *antro-tympanic* cavity; and from certain clinical facts now generally recognized. In the living subject the vault is more or less completely separated from the lower portion of the tympanic cavity by the following structures; viz: the neck and processus foliatus of the malleus, the lower angle of the body of the incus; the anterior, posterior and external ligaments of the malleus, and the folds of mucous membrane covering them. With these structures in situ, it would seem more reasonable to assume the mechanical
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separation of the atrium and vault, than to recognize the vault and antrum as two distinct cavities. Pus in the vault, therefore, must under pressure pass in the direction of least resistance to the antrum.

Now experience has shown that in the majority of cases of severe tympanic infection, the suppurative process originates within the vault rather than the atrium, in which case it seems obvious that pus accumulating within the vault must quickly invade the antrum. The fact, therefore, that many cases of severe suppurative otitis media recover without having produced any symptoms of mastoid involvement would seem sufficient evidence that pus within the antrum may be reabsorbed without having produced any of the bone changes characteristic of a true mastoiditis.

To epitomize: Acute purulent otitis media is commonly accompanied by the passage of pus to the antrum; and its presence there on opening the antrum is not necessarily an evidence of mastoid inflammation.

Admitting the above as a working hypothesis, it is not surprising that marked sensitiveness to pressure over the antrum is present in many cases of acute purulent otitis media. With an acute inflammatory process involving the mucous membrane not only of the attic but also of the aditus and antrum, and with the whole antro-tympanic cavity subjected to the pressure of an accumulation of pus for which there is no adequate orifice of escape, absence of pressure tenderness over the antrum would mean a difference between this and all other regions of the body under like conditions. In other words, antrum tenderness may in such cases denote simply the presence of confined pus. Viewed in this way, this important danger signal is as much a logical outcome of the tympanic lesion as is its rapid subsidence a logical result of free incision of Schrapnell's membrane and other rational measures for the relief of an acute purulent otitis media.

Where antrum tenderness persists in spite of such abortive measures, its significance must of necessity be regarded as more grave.

Pressure Tenderness Over the Mastoid Cells Proper.—In the foregoing remarks, the writer refers only to that stage of the disease in which inflammatory process is confined within the limits of the antro-tympanic cavity. When the pus has found its way into the mastoid cells proper, the disease is by no means
so likely to yield to the simpler surgical and therapeutic measures. The lining membrane of the cells in the lower portion of the mastoid process seems to possess but little power of resistance to the action of infective organisms, and their intracellular bone substance is exceedingly prone to undergo necrosis. The significance of mastoid tenderness must, therefore, vary somewhat with its location upon the mastoid cortex, its gravity becoming relatively greater as it extends downward below the level of the floor of the antrum.

_Sagging of the Posterior Canal Wall._—A question which it may be permissible to reopen is the surgical significance of sagging or, better stated, of bulging downward and forward of the postero-superior canal wall. Are we to continue to regard this as one of the cardinal signs of mastoid inflammation? Is the periostitis upon which this bulging depends due to an extension of mastoid inflammation through that portion of the thick anterior wall of the mastoid process which enters into the formation of the posterior canal wall? Or is it rather an extension of inflammation by continuity of structure along the soft parts of the posterior canal wall from the tympanic vault? The writer believes that in the vast majority of cases this bulging of the postero-superior canal wall is due to an extension of inflammation from the vault, and is not an indication of mastoid inflammation, which may or may not be present. This belief is based upon the following anatomical, surgical, and clinical facts:

(1) **Anatomical.**—(a) A section of the temporal bone, more or less horizontal in direction, and passing through the postero-superior canal wall, shows this to consist of a dense, and often thick plate of bone which should act as a natural barrier to the rapid extension of an inflammatory process from the mastoid cells to the membranous lining of the bony canal.

(b) The intimate structural relation of Schrapnell's membrane to the membranous lining of the posterior canal wall provides a natural pathway for the extension of inflammation by continuity of structure.

(2) **Surgical.**—While complete removal of all diseased bone is the first aim of mastoid surgery, this indication never in acute mastoiditis requires the removal of any portion of the bony plate which separates the mastoid cells from the membranous canal. In other words, the posterior bony wall is rarely if ever diseased. Why then, if this bony partition is not
involved in acute mastoiditis, should swelling of the membranous lining of the posterior canal wall be regarded as an evidence of mastoid inflammation.

(3) Clinical.—(a) In cases of *chronic suppurative otitis media* in which extensive destruction of the membrana tympani has occurred, characteristic bulging of the posterior canal wall is never present; yet in such cases the posterior wall of the bony canal as well as the mastoid cells, is often diseased. How is the absence of this physical sign to be explained except by the loss of continuity between the structures of the vault and those of the membranous lining of the meatus?*1

(b) There have been many cases of *acute purulent otitis media* which in spite of marked bulging of the postero-superior canal wall, have recovered completely and permanently without having produced any marked signs of mastoid inflammation. Such cases have been repeatedly observed by others as well as by the writer.

Two facts, then, should be borne in mind, viz: (1) that this “sagging of the posterior-superior canal wall,” whatever the exciting cause, is the result of inflammatory changes in its periosteal lining; i.e. is dependent upon a true periostitis; and (2) that in no structure of the body is swelling due to acute inflammation more likely to be prolonged than in the periostea. This is a recognized surgical fact. If, therefore, a somewhat protracted inflammatory thickening of the postero-superior canal wall be regarded as an evidence per se of an acute mastoiditis, many cases may be operated upon in which mastoid inflammation has either never existed, or having been present, has undergone resolution.

The writer wishes to emphasize the fact that not every case of acute purulent otitis media which develops antrum tenderness and bulging of the posterior canal wall is necessarily one of true mastoiditis; and that between the milder grades of tympanic infection and inflammation of the mastoid cells proper there is an intermediate condition—an empyema of the antro-tympanic cavity, which yields quite happily to free incision of the drum-membrane and appropriate after measures. Antrum tenderness may mean, therefore, either a collection of

*In cases of chronic suppurative otitis media in which the upper half of the drum-membrane remains intact, exacerbations of acute inflammation not infrequently give rise to characteristic bulging of the posterior wall.
pus in the antro-tympanic cavity, or the early stages of a suppurative process within the mastoid cells. Which of these two conditions exists can be determined only by the manner in which the symptoms respond to treatment; i.e., their persistence or rapid disappearance after free incision of the drum-membrane and inflamed posterior wall. It is to be noted, however, that even in those cases which go on to rapid and complete recovery, the "sagging of the posterior canal wall" is one of the last symptoms to disappear.

The indications for operating in acute mastoiditis may be summed up somewhat as follows:

(a) Sudden cessation of the aural discharge, other symptoms persisting; deep seated pain in the mastoid region; marked sensitiveness to pressure upon the mastoid over an area extending well beyond the limits of the antrum; these symptoms in the presence of a sudden and considerable rise in temperature, would justify an immediate operation.

(b) In the absence of fever the above symptoms, unless yielding promptly, i.e., in 24 to 48 hours, to abortive measures, would constitute a sufficient reason for operating upon the mastoid.

(c) Marked tenderness over the antrum, persisting four to five days after free incision of Schrapnell's membrane, would point to necrotic changes within the antrum calling for operative intervention.

(d) Marked variations in the quantity of pus discharged; its maximum flow being apparently too great to be explained by the tympanic lesion; its periods of diminution being co-incident with the development of mastoid pain or tenderness (or both). Such a combination of symptoms constitutes one of the most positive indications for opening the mastoid.

(e) Mastoid tenderness having been present and having disappeared, a discharge from the tympanic vault which resists all rational non-operative measures, may by reason of its persistence justify the hypothesis of a necrotic area in the aditus or antrum. In such cases an operation is often the only means of saving the integrity of the organ, and preventing serious impairment of function.

(f) Finally, evidences of mastoid involvement having been present, the development at any time during convalescence of symptoms of septic absorption, e.g., septic temperature, con-
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It will be seen from the above that the writer recognizes a number of conditions as calling more or less imperatively for operative intervention. He is convinced, however, that a careful observance of the rule implied in the third clause, ("c") will reduce very materially the number of cases requiring operation. That is to say, where tenderness is confined to the antrum and free drainage through the drum-membrane has been established, a delay of 4 to 5 days will in many cases demonstrate clearly the absence of mastoid disease.

Among the "indications for operating" the writer has not included bulging of the postero-superior canal wall, because he believes this to be a physical sign of acute suppurative otitis media. It is of undoubted surgical value in pointing to a type, or perhaps stage, of tympanic infection, which must receive prompt and vigorous treatment in order to prevent an extension of the disease to the mastoid cells. Its persistence, however, after mastoid tenderness and other signs of mastoid involvement have disappeared, is no indication of mastoid disease, and should not be regarded as an indication for operative intervention.

N. B.—The writer has purposely avoided any allusion to the bacterial character of the discharge as influencing prognosis and treatment. Cases of streptococcus infection often yield quite readily to minor surgical measures, whereas others in which only the milder pus germs are found often prove most severe clinically. Until we can explain, therefore, the varying degree of virulence exhibited in different cases by apparently the same germ, it would seem safer that the question of operation should be decided in each case chiefly by reference to the symptoms and physical signs.

In conclusion the writer would like to cite two cases from his own practice:

Case 1. A. D., a girl 8 years of age, was referred to the writer on January 15th, 1904, by Dr. Howard Gillespie Myers.

Previous history: Measles 2 years ago, no aural sequelae. Has been subject during past two years to somewhat frequent attacks of acute tonsillitis. Breathes normally.

Present attack. On January 5th, developed acute tonsillitis. On the following day, complained of pain in left ear, which
persisted more or less constantly until January 10th, when relieved by spontaneous rupture of drum-membrane. 5 days later, symptoms recurring, I was called in.

At this time, child complained of ear-ache. Temperature 101.6 degrees.

Physical Examination. Whole drum-membrane is red, with pronounced bulging of Schrapnell's membrane; the bulging here is continuous with marked swelling of the soft parts covering the postero-superior wall of the bony canal. Small perforation in postero-inferior quadrant of mt. Marked tenderness over mastoid antrum.

Treatment. Under nitrous oxide anesthesia, the drum-membrane was freely incised—the incision being carried through the posterior segment of the tense membrane, through Schrapnell's membrane into the vault, and thence outward through the inflamed posterior wall. Leiter coil applied to mastoid. Irrigation of canal with bichlorid of mercury 1 in 5,000, ordered q. 3h. Leiter coil removed at the end of 24 hours, and not replaced in spite of the fact that antrum tenderness was still present. From this time the tenderness over the antrum became daily less marked and had entirely disappeared on January 19th, the 4th day after the myringotomy. Other symptoms were much more persistent. The discharge showed but little tendency to diminish. On January 23rd the incision in the drum-membrane having partially closed and drainage being obviously insufficient, the original incision was repeated. Shortly after this, in spite of a rather free discharge, it was thought wise to discontinue irrigation, and substitute the use of dry wicks of sterile gauze carried into the canal and against the opening in the drum-membrane, both of which had been previously cleansed and dried. The wicks were changed at first twice, and then once daily. From this time the symptoms showed gradual but satisfactory improvement. The persistent sagging of the postero-superior canal wall, however, was a cause of doubt and anxiety to the writer. Even after the opening in the drum-membrane was closed, and the tense membrane had regained a fairly normal appearance, the swelling of the posterior wall was marked. All other symptoms having disappeared, the writer felt justified in discharging the patient on Feb. 11th, the parents being instructed to report promptly any symptoms of relapse.

Three weeks later, the patient was brought to the office for
Indications for Operating in Acute Mastoiditis.

examination. There had been no recurrence of aural symptoms. The tense membrane was normal in appearance. Function tested by acurometer and whisper, seemed perfect. The postero-superior wall, however, still showed some thickening. The writer has heard indirectly that there has been no return of symptoms referable to the ear.

Case No. 2. Mrs. D., was referred to the writer on Feb. 17th, 1904, by Dr. S. A. Brown.

Previous history negative.

One week ago, as a sequence of acute rhinitis, patient experienced severe pain in right ear, which was relieved in a few hours, by spontaneous rupture of drum-membrane. The patient is referred to me on account of continued discharge and return of pain. Temperature 102 degrees.

Examination of right ear. Small perforation in postero-inferior quadrant of mt. Schrapnell's membrane bulging, there being no line of demarkation between this and the swollen postero-superior canal wall. Marked tenderness on pressure over antrum.

Treatment. Under nitrous oxid anesthesia the posterior segment of the drum-membrane and the inflamed posterior wall were freely incised. The usual measure, i. e., rest in bed; catharsis; irrigation q. 3 h. with bichlorid of mercury, 1 in 5,000 solution, were ordered. Patient advised that mastoid operation might be necessary. She was seen daily. Discharge at first free, diminishing daily. On February 22nd, antrum tenderness was barely appreciable on deep pressure. One week later the incision in the drum-membrane was completely closed. The swelling of the posterior canal wall, however, had not subsided, and was again a cause of anxiety to the writer, who still shared the popular belief as to its grave surgical significance. This anxiety the patient did not share. She was free from pain, and to all intents in her usual health, and but for a slight impairment of hearing, would probably have regarded her cure as complete. The correctness of this view was demonstrated by the complete subsidence of all symptoms, the inflammatory changes in the posterior canal wall being the last to disappear.

These histories might easily be reinforced by others in which the disease ran a similar course. They suffice, however, to illustrate clinical phenomena, which the writer has observed in a very considerable number of cases. They were selected
chiefly because, having occurred considerably over a year ago, sufficient time has elapsed to justify the conclusion that recovery was complete.

DISCUSSION.

Dr. Edward B. Dench, of New York, said the distinction attempted by Dr. Kerrison regarding the aditus ad antrum as connecting the tympanic vault and the mastoid antrum was analogous to whether we called a strait a narrow neck of water connecting two larger bodies, or a constriction of a large body of water. He did not regard the distinction as material.

According to Dr. Kerrison, tenderness over the lower cells was more important, as a diagnostic sign, than tenderness over the antrum. Dr. Dench said that in the past four or five years, in almost every case of acute otitis, especially those complicating grippe, there was tenderness over the lower mastoid cells and none over the antrum until well marked changes in the antrum had taken place. Whenever there was mastoid tenderness, it could always be looked upon as a sign of inflammation. The speaker said he had seen caries of the cells in the posterior wall of the canal occur very early in acute mastoiditis. Its occurrence there depended on the conformation of the cells in the mastoid, as in some cases the posterior wall of the canal was very thick. The posterior wall of the canal was simply the anterior mastoid wall, and it was very frequently affected in acute disease. The speaker said he could recall a number of cases in which the only symptom of mastoiditis was a sinking of the upper, posterior wall of the auditory canal. Clinically, he regarded this as one of the strongest signs that the mastoid was not draining satisfactorily.

Dr. S. MacCuen Smith, of Philadelphia, said that of all the symptoms of mastoid disease, he placed most reliance upon bulging of the posterior wall of the auditory canal. He had never yet seen that sign fail. He did not mean to imply, however, that bulging of the posterior and superior walls was an invariable symptom of mastoid disease, nor would he operate on the strength of that sign alone, although he regarded it as very important. In a case that recently came under his observation, the patient was a child one year old, the daughter of a physician. That child had never had any ear trouble, had never had any discharge, and had never lost any sleep. One morning, the nurse observed a slight swelling back of the ear, over the mastoid. An examination through the external
auditory canal failed to reveal the slightest redness, but there was distinct bulging of the posterior and superior walls, with characteristic redness. The case was operated on the same morning, and to his surprise he found a carious opening through the cortex; the antrum and the mastoid cells were filled with pus.

Dr. J. A. Stucky, of Lexington, Ky., said that while sagging of the posterior superior wall of the canal might be pathognomonic of mastoid involvement, still the reverse was not necessarily true. We might have very extensive involvement of the mastoid cells, with absolutely no abnormal indication of it in the posterior superior wall. The speaker said he had seen several such cases, in which there was a history of ear discharge lasting some weeks, and no bulging of the superior wall at all. The ear in those cases was apparently draining well, but the patients had a septic look and ran a septic temperature, and on deep pressure there were signs of mastoid involvement. In one such case where the patient was operated on, Dr. Stucky said he was amazed at the extensive destruction of bony tissue.

The speaker said that in the section of the country where he came from there was still much room for missionary work among the general practitioners, and even among the otologists. Many of these still waited for this bulging of the posterior superior wall, and he could recall two instances where they waited too long. In both of those cases the patients developed meningitis, and died.

Dr. L. L. Mial, of New York, said that in connection with this subject of mastoid tenderness, as indicative of mastoid inflammation, he wished to mention two cases that came under his observation during the past six months. One was that of a man 23 years old who complained of severe pain in the ear and mastoid. There was excruciating tenderness over the tip of the mastoid, but no bulging or other indications of mastoid trouble. It was finally discovered that he had a badly decayed tooth on the lower jaw of that side, and when this was extracted, all his symptoms disappeared. The second case was that of a child of fourteen years, in which a similar train of symptoms was traced to the same cause.

Dr. Francis R. Packard, of Philadelphia, said that bulging of the wall of the canal was a particularly valuable symptom in cases where there was no discharge. He recalled such a
case in which he was called upon to operate by Dr. A. W. Watson, of Philadelphia. There was no discharge, but on opening the mastoid, it was found to be rotten, and every cell was filed with pus. It was in this class of cases that the bulging was particularly valuable, as it indicated that the pus was penned in and could not get out.

Dr. Edward B. Dench, of New York, said that if the mastoid tenderness persisted for four or five days, he would be inclined to operate. The tenderness very frequently began at the tip of the mastoid, and spread up to the antrum, and it was this last tenderness that was important.

Dr. Philip D. Kerrison, in closing, in reply to Dr. Dench's statement that he had seen necrosis of the bony wall, said he did not see any reason why that should not occur in cases where the process went on to distinct mastoiditis. Personally, he had never seen it. In his paper, he had tried to bring out the point emphasized by Dr. Dench, namely, that bulging of the posterior wall was the very best sign we had that drainage was not perfect. Dr. Kerrison believed that it was an important sign of severe tympanic infection, but did not necessarily point to mastoid inflammation.

In the case reported by Dr. S. MacCuen Smith, the doctor had stated that there was some swelling behind the ear, which everyone agreed was an absolute indication for immediate operation. In Dr. Smith's case, this post-auricular swelling was stated to have been present some days before the sagging of the posterior canal wall was noticed.

Dr. Kerrison said that while much had been written regarding antral tenderness and bulging of the canal as pathognomonic signs indicating operation, he could recall a large number of cases where both those signs were present and disappeared, and the patients made a perfect recovery without operation.
The Larynx in Typhoid Fever.

PAPER:

THE LARYNX IN TYPHOID FEVER.

Chevalier Jackson, M D.

The vital importance of this subject is better stated by, and comes with better grace from a practitioner of internal medicine.

Dr. John W. Boyce wrote to the writer as follows: "The question of great interest is whether it is possible for these affections to cause a fatal termination without such symptoms as shall plainly indicate the nature of the occurrence. "Theoretically, it seems impossible that a man should choke to death without the conspicuous symptoms of asphyxia, particularly cyanosis; but observation has convinced me that it is only too true; that these cases may sink away as peacefully as a baby goes to sleep, and that one may not in the least suspect what is happening. I am convinced that in times past such has been the case, where I attributed the death to collapse. In the first case of this nature that I ever recognized (though it is scarcely possible it was the first case I ever saw), a fairly acute resident physician had seen the patient, and had no idea that his dyspnea was in any way an important matter. The case was taken to the operating room for tracheotomy as a precautionary measure, not with the idea that the operation was needed, but for fear it might come to be during the night in the absence of the physician. While we were making leisurely preparations for a systematic operation, I accidentally noticed that the patient had stopped breathing. Fortunately, the surgeon was standing there with knife in hand, and was able to stab the patient on the instant. There would not have been time to send to another room for an instrument; as it was, artificial respiration was performed for fully 10 minutes after the trachea was opened before the patient could be trusted to do his own breathing. In the last case I saw, the patient was rapidly sinking into apnea, which certainly would soon have
been fatal had we not been watching him especially on this identical point; and we had been put on our guard by a slight change of voice, due not to hoarseness, but to an aphonyia, which I have been accustomed to attribute to relaxation of the vocal cords from extreme weakness, and not to lesion. An interesting feature in this case was, that the blood pressure as determined by the sphygmomanometer, rose when the trachea was opened, instead of falling, as we might expect when asphyxia is relieved. Yet there is no doubt whatever that this patient was in desperate need of air before the operation.”

**Literature.**—Instead of a review of the literature, which space forbids, a bibliography is appended. The statements below differ from those in the literature radically in many points. The writer can only say that the following is a record of clinical observations as carefully made and recorded as as limited time would permit.

The great prevalence of typhoid fever of the severest type in Pittsburgh at all times afforded good opportunities for study. The following observations were made in the wards of the Western Pennsylvania Hospital:

In weighing these observations it must be remembered that they were all made on hospital cases which on admission are characterized by foul oral sepsis; severe toxemia; and an aggravated type of disease due to neglect, labor during the early stages, unregulated diet, unhygienic surroundings, etc.

Three hundred and sixty cases were watched throughout their illness. Three separate types were observed. Subacute laryngitis, without solution of continuity of the mucosa; ulcerative laryngitis; perichondritis with or without chondrial necrosis.

**LARYNGITIS.**

Subacute catarrhal inflammation of the laryngeal mucosa was present in 227 (63 per cent) of the 360 cases. It seemed similar to that occurring as an independent affection, save that the surface was at all times freely bathed with secretion, much of which came from the deeper air passages.

That the larynx should participate in the general catarrhal state of the various surfaces, especially the respiratory surfaces, seems natural. Were it not that a few cases develop more serious and possibly fatal lesions, the subject might not merit the two years’ study here recorded.
ULcerative Laryngitis.

Frequency.—The frequency in private practice is unobtainable but it must be much less frequent than in hospital experience. In hospitals no reliable records of observations, systematically made on a large scale, are to be found in the literature. The frequency might be supposed to vary in different epidemics, different countries and different conditions and environment.

Number examined 360 cases. Ulcerative laryngitis in Ulcerative laryngitis in

68 " (18.9%) 4 " ( 5.9%)

Required tracheotomy Required tracheotomy

8 " (11.8%) 6 " ( 8.8%)

Perichondritis with necrosis Perichondritis with necrosis

in. in. 11 " (16.2%) 2 " ( 3.0%)

Abscess from perforation Abscess from perforation

in. in. 9 " (13.2%)

Ulcerative tracheitis Ulcerative tracheitis

with perforation and emphysema in Ulcerative tracheitis with perforation and emphysema in

1 " ( 1.5%) 1 " ( 1.5%)

Ulcerative tracheitis with abscess thyroid glands

15 " (22.0%) 11 " (16.2%)

Associated with acute purulent otitis media Associated with acute purulent otitis media

6 " ( 8.8%) 4 " ( 5.9%)

Died Died

Bacteriology.—The typhoid fever bacillus, unaided by other organisms, has been proven to be pyogenic by a number of observers, though it probably is not often active as such, without the aid or subsequent activity of pyogenic cocci. It has been found by various observers in abscesses in almost all tissues of the body, and by these observers is regarded as a prime factor. To the writer it seems reasonable to suppose that, excluding one infection (syphilis), the conditions of soil are more active factors than the seed in any infection. In typhoid fever we have the conditions of soil for the rapid development of pus cocci. In the cases examined the bacillus typhosus was found in the saliva and in the mucosa but not in the submucosal abscesses. It is not argued from this that it could not have been the prime factor next to conditions of soil. It is more likely, however, that the ever present pyogenic cocci found a foothold in an abrasion of the mucosa or in an inflammation of the mucosa due to typhoid bacilli lodged from the blood flowing through the mucosal vessels; or a low re-
sistance of cells or juices due to toxemia; or to a necrosis of the mucosa from anemia due to embolism or thrombosis, or to an anemia from any other cause. Or the typhoid bacillus by causing a non-inflammatory tissue necrosis may have prepared the soil for other more active pyogenic bacteria.

The bacillus typhi abdominalis was found in the throat, both on and off the lesions, in secretions and mucosa. It was not found in any greater numbers, however, in cases with throat lesions than in those without. Pus cocci were, however, much more numerous in the cases with throat lesions, after, not before, the ulcerations developed. Of the four cases of abscess two were found pure streptococcic, one pure staphylococcic and one these two mixed.

In one case tracheotomized for stenosis, a subglottic abscess communicating with the necrotic tracheal ring was found. Pus withdrawn from this abscess with a hypodermic syringe before evacuation proved the pus to contain a pure culture of streptococci. Careful search showed no Eberth's bacilli.

Of the 11 cases of ulceration that also had acute suppurative otitis media, it is a striking fact that in every case the same pyogenic organisms were found to preponderate in the laryngeal lesions. Thus two of the abscess cases that also had ear suppurations, streptococci in pure culture were found in both.

In the other nine the laryngeal ulcerations, being superficial, were necessarily mixed infections, but the preponderating organisms corresponding to those of the ear. Sloughs examined microscopically in six cases swarmed with staphylococci, in four other cases with streptococci, neither being in pure culture, but mixed with other cocci. Klebs-Loeffler bacilli were found in one case only in this gray slough, and were not found in one case where there was an exudation in the trachea.

The following pathogenic organisms were found in the sloughs from the laryngeal ulcers:

- Streptococcus.
- Staphylococcus aureus.
- Staphylococcus albus.
- Pneumococcus.
- Bacillus diphtheriae.

_Laryngoscopic Appearances and Clinical Pathology._—Any one who has watched these cases can make a diagnosis of typhoid fever by the laryngeal appearance and the odor of the breath, which is peculiar, rather offensive, but not putrid. It is as distinctive as that of diphtheria.
Laryngoscopy is not difficult to one accustomed to work, as every laryngologist should be, with the patient in the recumbent position. A self-illuminating laryngoscope is convenient. The secretions should be expectorated and the throat cleared by the patient if possible. The tongue must be handled gently, and care taken that its epithelium does not come away with the towel. There are very few cases in which a good view of the larynx cannot be obtained.

Edema and nothing else may be the picture, the ulcers being hidden.

In one case three blebs were noted, one on the posterior surface of the epiglottis, another on the left arytenoid, and one in the posterior commissure. They contained sanguinolent serum and were followed by ulcers which differed in no way from the ulcers originating as sloughs.

In one case a pseudo-membranous exudate lined the larynx and trachea as far as could be seen. This could be wiped away and did not leave a bleeding surface.

Four cases of purpuric spots on the laryngeal mucosa were observed. None of these were followed by ulceration. One of them had submucosal hemorrhage, and all had purpuric spots in the mucosa and skin.

Tracheitis without ulceration was noted in 126 cases, though many of these were exceedingly mild. In two cases the trachea during life was seen to be ulcerated. One of these ulcers perforated producing emphysema. In two cases tracheal ulcers were seen with the bronchoscope after death. In no case was the ulcer on the posterior wall.

Of 68 cases of laryngeal ulceration the sites were as given below, a few cases having as many as four ulcers, and some cases having large ulcerations covering more than one location.

<table>
<thead>
<tr>
<th>Site</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Epiglottis</td>
<td>42</td>
</tr>
<tr>
<td>Ary-epiglottidean folds</td>
<td>22</td>
</tr>
<tr>
<td>Inter-arytenoid space</td>
<td>18</td>
</tr>
<tr>
<td>Arytenoids</td>
<td>10</td>
</tr>
<tr>
<td>Ventricular bands</td>
<td>7</td>
</tr>
<tr>
<td>Ventricle</td>
<td>5</td>
</tr>
<tr>
<td>Ant. Commissure</td>
<td>4</td>
</tr>
<tr>
<td>Infra-glottic region</td>
<td>3</td>
</tr>
<tr>
<td>Trachea</td>
<td>4</td>
</tr>
<tr>
<td>Bifurcation</td>
<td>2</td>
</tr>
<tr>
<td>Bronchi</td>
<td>2</td>
</tr>
<tr>
<td>Vocal bands</td>
<td>1</td>
</tr>
</tbody>
</table>
It is remarkable that the frequency of involvement should be so nearly in direct relation to the distance from the mouth, with the notable exception of the vocal bands, which seemed quite immune. The one case in which they were ulcerated had a specific history and cleared up promptly under specific treatment.

As previously stated the larynx of practically every typhoid fever case was the seat of a catarrhal inflammation, and this did not differ from the acute laryngitis you are all familiar with. In five cases this process seemed to become greatly intensified and the mucosa became diffusely crimson in color, so great was the engorgement. Minute vessels ruptured, apparently from coughing. These hemorrhagic spots later became the site of ulcers in a few cases. In many cases ulceration was not apparently preceded by any diffused increase in the intensity of the laryngitis.

Of the 68 ulcerative cases, 18 had ulcerations of the linear type, six were Y shaped or branched, and five were wedge-shaped. Some of these cases also had ulcers of the usual rounded or oval outline.

In ten instances the development of the ulcers was watched from their incipiency. A swelling appeared over an area of mucosa, usually elongated, sometimes linear, in shape and from two mm. to 15 mm. in length. At first the swollen area was pale, followed in a few hours by redness. At the next stage there appeared a thin grayish slough, as if the mucosa had been lightly brushed with a solution of argentic nitrate. Through this the deeper structure could be seen to be of a dark purplish color. This faded within a day to an even opaque, dirty gray, slough, which separated in a period varying from one to three days, leaving a shallow ulcer, with at first ill defined edges, and a dirty gray bed dotted in a few instances and for a short time with dark red spots. Later the edges became thickened and the bed covered with a dirty gray exudate. In some instances the ulcer became surrounded by an areola of engorged mucosa, but more often the tissues seemed normal close to the edge of the ulcer. The depth of the ulcer seemed to be indicated by the thickening of the edges. Soon after the ulceration reached the perichondrium edema set in. The last two statements are based upon examination from below after tracheotomy. In five of the eight tracheotomized cases the ulcers had thickened edges, and the ulceration had reached
The Larynx in Typhoid Fever.

the perichondrium. The other three tracheotomized cases were abscesses, not ulcers.

In one case an abscess of the thyroid gland was opened at the tracheotomy, and the first and second rings of the trachea were found necrosed. The abscess was walled off from the neck tissues, but was burrowing under the tracheal mucosa which was pushed inward occluding the tracheal lumen almost completely. The patient recovered promptly.

Etiology.—In considering the etiology, first place must be given to the typhoid toxemia. The blood, tissues and juice changes are of the most profound character and this must be borne in mind in considering every other element, as it renders operative otherwise insignificant factors. Slight local trauma, or pathologic change, that in health would be promptly cured by nature, becomes formidable in the absence of resisting power.

It is an accepted fact that a particular type of complications may characterize one epidemic of typhoid fever and a different type another. In Pittsburgh we have typhoid fever with us all the time and not only as an epidemic. Yet the tendency one season to preponderance of one type of complications is very noticeable. This has to be considered in weighing etiologic factors. There must be a cause for the preponderance. When the pervading type of complication is purulent and occurs in one ward or institution, the natural conclusion is that it is infective and that the source is a previous case. This was particularly noticeable in the purulent complications in the Western Pennsylvania Hospital, which nearly ceased after the elimination of flaws in the technic of disinfection of wards, beds, mattresses, pillows, etc., discovered and righted by Dr. Thomas Arbuthnot. There are several weak points in any argument based on this observation. The same tendency to type is noticed in widely scattered cases in different environment. It is well to note the tendency to laryngeal implication in certain diptheria epidemics. Another weak point is that the laryngeal complications of typhoid fever at the institution mentioned did not decrease in the same ratio as the ear complications.

One case in 68 (1.47 per cent) occurred before the 21st day. Thus 98.53 per cent occurred after the 21st day. In eight cases that died before the 21st day, no laryngeal lesions were found in a case that died after the 21st day, ulcerations existed in the larynges of two. These 16 examinations were made on the cad-
These facts point to the existence of an etiologic factor after the third week that does not exist prior to that time.

What are the characteristics of the third week and the following weeks of typhoid fever as compared with the earlier period? Sensitiveness to cold, a rapid, often sudden emaciation, lowest resistance of the tissues and juices, thrombotic phenomena, glandular disturbance, pneumonia and bronchopneumonia, beginning inflammatory and purulent troubles, separation of the sloughs from the enteric lesions. The worst of the high temperature is over, but its damages remain.

The etiologic possibilities may be classed as follows:

PREDISPOSING FACTORS.

1. Dorsal decubitus.
2. Lessened cough reflex.
3. Lessened frequency of deglutition.
4. Lowered resistance and weakened phagocytosis or its equivalent, due to toxemia, etc.
5. Increased virulence of organisms proliferating in the air passages.
6. Intensity of the general infection:
   (a) Pyrexia.
   (b) Toxemia.
7. Poor blood supply to larynx, predisposing to necrosis.
8. Pre-typhoid disease:
   (a) Local.
   (b) General. (Syphilis.)
9. Draughts of air, especially when patient is perspiring.
11. Hydrotherapy:
   (a) Sponging
   (b) Tubbing.
   (c) Wet pack.
   (d) Ice pack.
   (e) Ice bag on head.
12. Drugs.
13. Age.
15. Nationality.
16. Occupation.
EXCITING FACTORS.

17. Infection via:
   (a) Blood. Typhoid fever bacilli, or pus cocci, in infected emboli or floating free.
   (b) Abrasions, from coughing trauma, or screatus.

18. Thrombosis:
   (a) Aseptic clot. (Stasis.)
   (b) Infective emboli (classed above).
   (c) Endophlebitis.


1. That dorsal decubitus can favor thrombosis by hypostasis, the writer does not believe. Any one who will look along a ward will see that the larynx of nearly every patient is higher than any other portion of his body except his face, varying slightly accordingly as pillows may be arranged. But it seems probable that the sagging laryngeal cartilages may, so to speak, pinch the mucosa between themselves and the vertebra in the supine patient.

2. Lessened cough reflex by favoring incubation of organisms and the development of more virulent cultures in the accumulated secretions is a factor.

3. Lessened deglutition may be a factor in a similar way.

4. Lower resistance.

The lessened resistance of the tissues in typhoid fever was demonstrated by Brieger and Ehrlich. Malignant edema followed the injection of a solution of musk in typhoid fever patients, but was harmless in others.

Liebermeister, years ago, wrote: "If one studies closely the manifold complications and sequelae of typhoid fever, in the living and at autopsies, he will receive the impression that in severe cases the resistance is reduced to the minimum in all organs without exception, and that there is an extraordinary tendency to the destruction of the tissue." This expresses the clinical aspect of the predisposing factors. It is a condition probably brought about by the action of the toxines on the tissue cells, and is evidenced by the rapid formation (often in 24 hours) of large abscesses in various parts of the body. That the vulnerability of the respiratory mucosa should be similarly increased is a reasonable conclusion, since it is more than any other tissue, exposed to the pyogenic cocci.

During the time these observations were in progress, careful watch failed to find laryngeal ulceration in any other than
typhoid fever cases, with one notable exception, a case of pulmonary tuberculosis, which was sent in through error and could not be gotten out. Laryngeal ulceration developed in this larynx while in a room just off the typhoid fever ward. The ulcers were not tubercular and could not be distinguished from those occurring in typhoid fever, except that the typhoid fever breath was lacking.

5. The possibility of increased virulence was not investigated, but it is deserving of research.

6. As stated, the chief etiologic factor is the typhoid fever. This renders the mucosa vulnerable and thus permits activity of other factors which otherwise would fail. Unlike the complications of the exanthemata, ulcerative laryngitis complicating typhoid fever bears as to the likelihood of its occurrence, its course, and its termination, a close relation to the severity of the primary disease. Under the head of frequency, it was mentioned that inquiry among physicians in general practice developed the fact that those practitioners in the poorer districts occasionally saw cases of laryngeal complications while many of those practicing among the wealthy class never saw even one case. The reason for severe cases in the poorer districts seems to be the continuance at labor in the earlier stages (some men working with a temperature of 103) and at the same time eating a general diet, often forcing food down in spite of anorexia, in the ignorant hope of keeping up the strength. Many laborers make an untreated walking case out of the early stage conditions that would put the wealthier man in bed with bi-daily visits of the physician, and the constant attention of two trained nurses to enforce dietary and other restrictions and a proper regime. Another reason may be in the filthy habits and unhygienic surroundings of the poor. The importance of the bath tub in prophylaxis is unquestioned.

The writer's records show that out of 68 cases of ulcerative laryngitis 61 (89.7 per cent) occurred in cases in which the temperature exceeded 104.2 every day for a week or more, and in 23 (33.8 per cent) the temperature reached 105 degrees. All other symptoms in a fair proportion of the cases kept pace with the temperature, an indication of the severity of the case. No case of laryngitis occurred in any case in which the temperature did not exceed 103. In considering the temperature it must be remembered that except in a few cases not thought to require it, the patient was sponged every time the temperature
rose above 103. Wet packs, and in some cases, ice packs were used, if sponging failed to bring the temperature down.

Von Ziemssen thought the pyrexia was the most important factor in lowering resistance of tissues and advocated antipyretic treatment as the best mode of preventing laryngeal complications. As to the causative influence of pyrexia, this was disproven by the writer’s records. Of ten cases allowed (for other reasons) to go without sponging, there were two (20 per cent) developed laryngeal ulcers. This is about the same as the record of all cases, 68 out of 360 (18.8 per cent). So that it would seem that it is the toxemia that lowers the resisting power, and that the pyrexia is but an index of the toxemia.

As to the effect of antipyretics other than hydrotherapy, no records were obtainable, as none other is used by the staff at this hospital.

7. The etiologic possibilities of poor blood supply must be considered in the light of pathologic stasis.

8. Local diseases of the upper air passages were faithfully recorded, but seemed to have no bearing except on three points. Of 68 ulcerative laryngeal cases, ten (14.7 per cent) were mouth breathers, and thirteen (19.1 per cent) had chronic laryngitis, and 66 (97 per cent) had a foul oral sepsis, with foully carious teeth, and of the six cases of peri-chondritis three (50 per cent) were hucksters, with a chronic laryngitis when admitted.

Several observations seem to point to syphilis being a factor in the etiology of ulceration. Histories, proverbially unreliable, were of even less than usual aid, because of toxemic stupor, lack of an interpreter, which often rendered it impossible to separate syphilis and gonorrhea.

Giving the record, however, for what it may be worth, specific history was:

Positive, in 8 cases (11.7 per cent).
Negative, in 41 cases (60.3 per cent).
Unobtainable, in 19 cases (27.9 per cent).

Specific treatment was of prompt and decided benefit in nearly all cases. But mercuric, mercurous and potassium iodides are good excretory stimulants, and would render good aid in whipping up the overworked excretory apparatus, and thus help to rid the system of typhoid fever toxines. This weakens the test value of therapeutics. In general, syphilis favors suppurative conditions; so does typhoid fever. The concurrence of the two probably intensifies the tendency.
9, 10, 11 and 12. A chart of the beds showed that one bed located close to a door was occupied by seven successive cases of ulcerative laryngitis. No other one bed had more than two to its credit. This door opened on to a short, draughty corridor, which led to a room filled with scrubbing sinks, sewer connections and water closets. This corridor, on account of defective plumbing (since refitted), was always over-ventilated, which caused a draught to strike the bed in question. The proportionate share of the defective plumbing, the draughts of air on the sweating patient, and the defective sterilization of bedding which existed then, the writer is unable to state, for all have since been corrected, and while acknowledging a weakness for experimental research, he could not, or course, endorse the reinstatement of these horrors, one at a time, to determine the share of each. He prefers to put them all down as etiologic factors of the first importance.

Overcrowding of wards is certainly an etiologic factor.

In regard to the effect of a draught of air he must acknowledge his inability to demonstrate wherein a draught of air on a perspiring skin differs from a cold wet pack. If exposure to draughts of air under certain conditions may cause laryngitis in the well, why may they not so act in the typhoid fever patient?

It is Dr. John W. Boyce's practice to omit sponging in certain cases, no matter what the temperature.

He also does not advise the ice pack. He stimulates and feeds sparingly. Other members of the staff feed and stimulate more freely, the stimulants being chiefly strychnin and whiskey and some of them use ice packs freely. Various drugs such as acetozone and guaiacol were tried extensively by Dr. Lawrence Litchfield. Some patients liked an ice bag on their heads and were allowed to have it constantly, while others objected to it and it was not used. Detail-tables would be too voluminous, but the result of observations of all these differences in treatment and management led to the conclusion that hydrotherapy, including ice pack, and head ice bags (tubbing not being used) drugs, including stimulants, and foods and feeding are absolutely negative as etiologic factors in ulcerative laryngitis, with the single exception of the ice pack, which had some evidence against it.

13. The age of the patients with ulcerated larynges ranged from 16 to 55 years, but 71 per cent of them were between the ages of 20 and 30 years.
14. In the female wards three cases of ulcerative laryngitis media developed in 60 cases of typhoid fever. In the average the typhoid fever cases in the female wards were of a less degree of severity than those in the male wards; probably on account of the earlier taking the bed in the initial stages and other recognized causes. These three were very severe cases. As this simply brings us to the severity of the general infection, it cannot be said that sex is a factor.

15. The bearing of nativity on the etiology is interesting. Of 68 cases of ulcerative laryngitis the following were the nativities:

<table>
<thead>
<tr>
<th>Nativity</th>
<th>Cases</th>
</tr>
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<tbody>
<tr>
<td>Arabia</td>
<td>1</td>
</tr>
<tr>
<td>Austro-Hungary</td>
<td>25</td>
</tr>
<tr>
<td>Ireland</td>
<td>2</td>
</tr>
<tr>
<td>Italy</td>
<td>21</td>
</tr>
<tr>
<td>Poland</td>
<td>4</td>
</tr>
<tr>
<td>Russia, (southern)</td>
<td>7</td>
</tr>
<tr>
<td>Russia, (northern)</td>
<td>2</td>
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<tr>
<td>Slavonia</td>
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<tr>
<td>Syria</td>
<td>1</td>
</tr>
<tr>
<td>United States (negroes)</td>
<td>3</td>
</tr>
<tr>
<td>United States (white)</td>
<td>2</td>
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</tbody>
</table>

The preponderance of the natives of Southern Europe is interesting, though environment and the fact that they now constitute our laboring class must be considered.

16. Occupation.—It is worth noting that three cases of perichondritis occurred in "hucksters" who call their ware loudly from a wagon in the streets. They had severe chronic laryngitis with hyperplasia and dilated mucosal capillaries on admission.

17. Infection.—There is much argument in the literature to show that the laryngeal lesions are true typhoid fever glandular involvements similar to the intestinal lesions. Local infection of the lymphoid tissue of the larynx by the bacillus typhi abdominalis is of course a possibility, but if so, in view of the cases here recorded, it must occur late when immunity is being developed.

Of the 68 cases but one (1.47 per cent) occurred in the first week. It was a diffuse inflammation starting in the lymphoid tissue of the larynx. This case was, probably, a true typhoid fever inflammation of the lymphoid tissue of the larynx, though the local bacteriologic examination was negative. This was,
however, the only case that could be so classed. The other 67 cases all occurred so late in the disease that they could not be considered true typhoid fever lesions in the sense that the lesions of Peyer's patches are. Enteric re-infections occur in this light, though such is not the writer's opinion. The outline, too, of these ulcers, as well as the locations, negative the assumption in the literature that the lesions are specific typhoid fever ulcerations, starting in glandular tissue. Of 68 cases, 42 (61.8 per cent) had ulcerations on or near the free border of the epiglottis where adenoid tissue does not exist.

Local pyogenic invasion assisted by trauma seemed to account for some of the cases observed. Two chief causes of trauma are the "pinching" mentioned under dorsal decubitus, and cough. Coughing induced by bronchial conditions was present in nearly all severe typhoid fever cases. This cough is, of course, an irritant to the larynx favoring abrasion as well as inflammation, though of course it is highly necessary to rid the air passages of infective secretions. A longer sojourn than in the normally active state of the cough reflex probably favors the development of a virulent culture.

Two very clear cases of local pyogenic invasion occurred. In both a stream of pus from an acute suppurative otitis media was draining into the laryngo-pharynx from the Eustachian tube mouth. The ulcers were extrinsic (confined to the epiglottic and posterior cricoid mucosa), and disappeared promptly after circumcision of the membrana tympani with adequate "wick" drainage through the external auditory meatus.

18. The period and the suddenness of the onset, together with the laryngoscopic appearances as already described, especially the linear wedge-shaped and branched outlines, point to a local thrombosis as one of the chief exciting factors.

As to the etiology of this thrombosis, whether it be primarily an aseptic clot or stasis, or from an endophlebitis, or an endarteritis, or an embolus (aseptic or infective) the writer has only two post mortem findings to offer. Two cases with the linear and branched ulcerations had multiple infarcts in lungs and kidneys. These were the only autopsies. Of course the arteries of the larynx are not "terminal arteries," and thus are not subject to infarct exactly as those of the lungs and kidneys are, but arterial occlusion would, by ischemia, favor limited necrosis and bacterial invasion.

An embolic etiology would require an original focus in the
lungs or left heart or in the periphery proximal to the laryngeal arteries. It is to be regretted that the occurrence of endocardial and other possible lesions bearing on embolic etiology were not recorded.

Several arguments against the thrombotic theory might be advanced. The number of cases of ulcerative laryngitis associated with leukophlegmasia was small (6). Yet each of these had ulcerations of the linear type. It might be argued that femoral phlebitis and thrombosis is a common complication in private practice, while laryngeal ulceration is rare. And certainly the writer must acknowledge that he has seen but one case of laryngeal ulceration outside of a hospital. But it must be remembered that he has never had an opportunity of systematically observing the throats of typhoid fever cases in private practice. It may be frequent, yet, as pointed out by Dr. Boyce, unrecognized, even though it actually be the cause of a fatal termination.

19. Oral sepsis is closely related to infection. Its part seems so self-evident as to require no proof.

Glossitis was present in two cases and in one case through extension by continuity, was the cause of perichondritis, chondrial necrosis and abscess with subsequent ulceration.

Symptomatology.—The writer considers it his duty to state as a preliminary that all the classic symptoms of laryngeal trouble may be absent, or so slight as to escape notice, being masked by the general malady. Categorically the local symptoms that may be noted are:

- Pain and tenderness.
- Stridor.
- Dyspnea.
- Dysphagia.
- Odynphagia.
- Dysphonia.
- Odynphonia.
- Hoarseness.
- Croupy cough.
- External swelling over thyroid cartilage.
- Expectoration is masked by bronchial expectoration.

The general symptoms occasionally seen are recrudescence of pyrexia and extreme prostration with symptoms of approaching death by toxemia and exhaustion. The pyrexia, as in all
post-typhoid fever conditions, usually partakes of the type peculiar to the general malady. In a few of the writer's observations the laryngeal complication only reached the stenotic stage so long after the general toxemia that the dyspnea was of the usual active type. But in the feeble state of the profoundly toxemic typhoid fever patient it was not the symptom we see elsewhere. In four of the patients saved from asphyxia by tracheotomy there was none of the symptoms we are accustomed to look for—no sitting erect, gasping, stridor, struggling, violent action of the accessory respiratory muscles, cyanosis, etc. In three others, slight cyanosis was present and some effort was being put forth. While only in a few cases was the patient making a typical fight for air.

Dyspnea, when present may be due to edema, occlusion of the respiratory lumen by a projecting abscess, occlusion of the glottis by a fragment of necrotic or sloughing tissue, collapse of the cartilaginous box from necrosis, fixation of, or abductor paralysis of, the cords.

Hoarsness is the most frequent symptom—aphonia next.

Cough.—The usual cough of typhoid fever was present in 50 (5.9 per cent) of the 68 cases, but in only 36 of the 50 could it be said to be changed in character after the onset of laryngeal lesions. In a few of these it became quite hoarse and croupy.

The onset of symptoms, averaging all cases that had symptoms, was the 31st day. The onset of ulceration in all cases averaged the 22nd day.

Diagnosis.—Diagnosis is easy if the larynx be examined regularly. If reliance be placed on a watch of the symptoms not more than one case in ten will be diagnosticated and, as pointed out by Dr. Boyce, a certain number will die without the diagnosis ever being made, even in some of the instances in which the laryngeal condition is the real cause of death.

As to life, the prognosis is good, if considered apart from the primary general infection. If watched by one skilled in the use of the laryngoscope there is little danger if the suggestions given under treatment be followed. Practically, however, it is not possible to separate the prognosis, and when it is considered that the laryngeal lesion appears in practically always the profoundly toxemic cases, the prognosis as to life must be said to rest altogether on the patient's general condition. As a
matter of statistics no case of the 68 died of either the laryngeal lesions or the tracheotomy done for their relief. Only one tracheotomized case died and that was of toxemia. Of the 68 cases, four cases (5.8 per cent) died; one of relapse with intestinal perforation, two of toxemia, one of pneumonia. The mortality (5.8 per cent) seems low considering that all were severe cases, but it must be remembered that the laryngeal ulceration only appeared after the patient was convalescent and had run the gauntlet of his greatest dangers. How many early fatal typhoid fever cases would have had laryngeal lesions had they lived, of course is beyond human knowledge. In three cases ulceration perforated into the soft tissues of the neck, but in no case was there a cellulitis or violent inflammation of the extralaryngeal tissues.

No case need die from the throat complication. The greatest danger to life is from failing to recognize the existence of a laryngeal lesion. Tracheotomy is wrongly regarded as an operation dangerous to life. It has been credited with too many deaths that were justly attributable to the condition calling for it. Of course, as it is the profoundly poisoned cases that get ulcerative laryngeal lesions, the prognosis as to life must be guarded, but not because of laryngeal dangers.

As to voice.—In 45 out of the 68 cases (66.2 per cent) the ulceration healed without alteration in voice or structure, no visible scar remaining. Permanent deformity, without loss of voice and without stenosis resulted in eight cases. Stenosis requiring surgical relief to enable the abandonment of the tracheal canula resulted in five cases, all of which recovered good useful voices of rough quality and uncertain pitch. Cicatricial stenosis can always be avoided if the suggestions under treatment be followed. If it should occur from neglect of early tracheotomy, it can be cured with good voice by thyrotomy and prolonged intubation. As to paralysis and fixation, they cease to affect the voice ultimately though their stenotic effects cease only by operative measures.

Treatment.—In those cases of ulcerative laryngitis that are primary specific typhoid fever lesions, and also those that are of hematogenous origin whether by embolism, thrombosis or blood-borne pyogenic or specific typhoid fever organisms, prophylaxis is hopeless. But even in these cases the writer does not hesitate to say that if closely watched and judiciously treated, no ulcerative case need go on to chondrial necrosis and
laryngeal stenotic deformity. These occur in the lately discovered cases and in those cases in which a foul state of oral sepsis, an untreated mucosa, and a long postponed tracheotomy favor a great destruction of tissue.

Prophylaxis then must seek to hold in check the mixed infections that run riot.

*The room.*—The air should be kept as free from pus organisms as possible, and all cold draughts of air should be avoided, especially if the patient is perspiring. Mattresses and pillows, the entire room in fact, should be sterilized by thorough fumigation. In hospital wards overcrowding must be guarded against.

*The patient.* Careful and persistent attention to oral antisepsis (asepsis being impossible) is the first consideration. A dentist’s aid should be sought, a daily brushing of the teeth with a soft brush if the gums be tender, followed by swabbing with a one-half of one per cent carbolic acid solution, with borax, sodium bicarbonate, menthol, alcohol and camphor water is the most agreeable and refreshing as well as cleansing agent. The patient should be encouraged to clear his throat frequently. All food and water should be sterile. From a laryngologist’s viewpoint the ice pack should not be used unless deemed necessary to prevent a fatal degree of hyperpyrexia.

The writer does not commend the spraying of the nose except where there is a tendency to accumulation of dried or crusted secretions. Usually the natural posterior drainage of the nose, favored by dorsal decubitus, is sufficient to keep the nose clean.

In all the prophylactic measures, one thing must be clearly borne in mind, namely, anything that excites or annoys the patient is a detriment to his general condition, so that we must be very sure that what we do is of unquestionable value. The regular toilet of the mouth is agreeable to the patient and is certainly a good thing from the otologist’s as well as the attending physician’s viewpoint, and need not annoy the patient.

In the luetic cases specific treatment yielded prompt results. In other cases, considered able to stand it, the same treatment yielded good results, probably by acting as an excretory stimulant, assisting in the elimination of toxines.

Inhalation of benzoin from hot water is useful. The room may be steamed with water kept boiling to which Tr. Benz. Comp. is added.
In acute edematous stenosis adrenalin solution 1-1,000 (or any of the similar preparations) as a spray is useful to gain time and may tide over a danger point, but it may become a danger if it lead to too long a postponement of a tracheotomy. Intubation is useless in edema, worse than useless in abductor paralysis. If used for the latter, glottic closure will terminate the case promptly, should the tube be coughed up.

Of the five cases of cicatricial stenosis, three have been cured by thyrotomy, followed by intubation. They have good, though hoarse voices, the tracheotomy wounds are healed and ample laryngeal lumen has been obtained. The method of treatment was given in a paper by Dr. Ewing W. Day and myself, read before the Middle Section of this Society in 1904. One, the last, is still under treatment, and one was cured by prolonged intubation with large special tubes.

If closely watched and tracheotomized early, chondial necrosis, with its attendant laryngeal deformity, stenosis, alteration of voice, can all be prevented. All lesions disappear as if by magic after an early tracheotomy. Inability to abandon the tracheal canula indicates too long a postponement of tracheotomy.

Direct medication to the interior of the larynx is easily accomplished through the tracheotomy wound, though these cases seem to recover promptly without medication after the trachea is opened.

Abscesses may be incised endolaryngially, if desired, but preparations for tracheotomy should be first made as it may become urgently needed. Personally the writer would advise tracheotomy with subsequent incision of the abscess through the wound.

With regard to tracheotomy, it is practically harmless if Schleich infiltration anesthesia be used, if it be bloodless, if the patient be in the Trendelberg position for the operation, and the day after. If tracheotomy be attempted with a general anesthetic it will usually end up with respiratory cessation and a stabbing operation. Then we have added to the shock of a general anesthetic the loss of blood, lack of time for hemostasis. A few days ago Dr. John W. Boyce locally anesthetized with salt solution a boy of 14 years who had been terrified by being told (prior to admission) that he would die on the operating table. Yet he made no resistance and acknowledged no pain when the writer did the tracheotomy.
Toxemia and also carbonic acid narcosis lessen the need for a general anesthetic in typhoid fever cases, though no case should be allowed to go on to carbonic acid narcosis. After the respiratory centres are profoundly poisoned recovery may be impossible.

The writer here dwells at some length as he feels strongly on this subject. The astonishing records appear in the literature of three different laryngeal typhoid fever cases which were considered too feeble to withstand a tracheotomy, yet they lived more than two days after it was decided that they had not sufficient vitality to withstand the operation. From their histories, they apparently died for want of a tracheotomy.

**Perichondritis and Chondritis.**

Perichondritis and chondritis are so intimately associated that, clinically, they cannot be separated.

The poor blood supply of laryngeal cartilages, lessened by the feeble circulation induced by toxemia, and still further diminished by stasis, is undoubtedly one of the most important factors in causing necrosis.

Of the 17 cases of perichondritis, 4 started as abscesses, and 13 occurred from deepening of superficial ulcerations.

The cartilages involved, in the order of frequency, were arytenoids, the cricoid, the thyroid, and the annular tracheal cartilages. As to the involvement of little cartilages of Santorini and of Wrisberg, it was impossible to determine clinically.

The epiglottis while the site most frequently involved in ulceration, was in no case the seat of chondrial necrosis, probably because of its better blood supply.

The writer wishes he could demonstrate pathologically that there is a purulent diathesis. Every clinician sees and knows a type of patient in which every inflammation runs to pus. Many of these cases of abscess and necrosis seemed to be of this type.

Next to this as a cause of chondrial necrosis, the writer believes that lues is a fundamental element, not so much as an active lesion as a predisposing factor.

**Resume.**

From laryngoscopic observations of 360 typhoid fever cases the writer concludes that:

1. Serious and fatal lesions of the larynx are much more frequent than is realized.
2. Death may occur from laryngeal stenosis without even the existence of a laryngeal lesion being suspected, in the absence of laryngoscopy. If pain and hoarseness be depended upon, a diagnosis will seldom be made. Pain is often masked by toxemia. Cyanosis and dyspnea are rare, apnea is common.

3. Unlike the complications of the exanthemata, ulcerated laryngitis complicating typhoid fever bears as to the likelihood of its occurrence, its course, and its termination, a close relation to the severity of the primary disease.

4. The severity of the laryngeal lesion is in direct proportion to the toxemia, pyrexia not being in itself a factor, but only an index of the toxemia.

5. Thrombosis of laryngeal vessels in the mucosa or deeper is probably the most frequent local initial lesion.

6. Mixed pyogenic infections are the rule. Laryngeal lesions due to the bacillus typhi abdominalis are exceedingly rare.

7. Prognosis as to life is good if considered apart from the general malady. Not only the life but the laryngeal vocal and respiratory functions will be saved if a tracheotomy be done early. Death from laryngeal lesion means a death for want of an early tracheotomy.

8. Prophylaxis consists in good ventilation, without draughts, sterile bedding, oral antisepsis, sterile food and water.

9. Treatment. Potassium iodid, hydrargyrum biniodid, benzoin inhalations and oral antisepsis are the best remedies. Early tracheotomy under local (Schleich solution) anesthesia will cure almost every case.

Thanks are due to Dr. Ewing W. Day for suggestions, to Dr. John W. Boyce, Dr. Lawrence Litchfield, Dr. Thomas S. Arbuthnot and Dr. M. C. Cameron for kind help, and to Dr. Ralph Duffy and Dr. Joseph Barach for the pathologic and bacteriologic work.

In conclusion the writer urges the laryngoscopic watch of the typhoid fever convalescent or rather defervescent.

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Toronto, 1897-8, IV, 299.
S. M. Arab, laborer, 30 years of age, was admitted to the Western Pennsylvania Hospital in the second week of a typhoid fever of severe type. At the end of the fifth week the typhoid fever had apparently run its course and the temperature had touched normal.

The patient suddenly began to complain of severe pain in the left ear and mastoid region and the latter became tender. During the night a copious, bloody, serous discharge flowed from the canal, and stained the pillow. Upon examination I found a ragged irregular aperture in the lower part of the membrana tympani which was of a dark purplish brown color. On the second day of the discharge the temperature began to make wide daily excursions, reaching 104 degrees, but returning each day to normal. The mastoid was still tender, and opening was advised, but the patient died, apparently of typhoid toxemia, on the fifth day after the onset of the ear symptoms, the temperature just before death rising to 107 degrees.

Autopsy by Dr. Ralph Duffy. Intestinal ulcerations were healed. Spleen was enlarged. Lungs showed some hypostasis, also numerous infarcts some days old. Kidneys, left, normal; right, two infarcts. Meninges, sinuses, and brain normal. Dura over the floor of middle fossa normal and not adherent. Through it could be plainly seen a dark area corresponding to the left tympano-mastoid region. On removal of the dura the portion of the temporal bone over the mastoid and tympanic roofs was found to be of a dark bluish purple color. The groove for the sigmoid sinus was of the same bluish purple color—not the stain we sometimes see in pyogenic invasion of the sinus. On removing the tegmen tympani the tympanum and antrum were found full of blood-stained pus. The mucous
membrane of both cavities was swollen and was dark crimson with spots of brown discoloration, with here and there sloughs of necrotic tissue. At the tympanic tubal orifice the mucous membrane seemed normal. In the removal of the temporal bone it came apart in a vertical antero-posterior plane roughly separating the petrous portion from the mastoid. The walls of the mastoid cells were found softened, dark in color, with here and there, in scattered locations, cells filled with blood-stained pus. A number of these pus pockets were scattered along the cells adjacent to the sinus groove, but the sinus and the bone in contact therewith were absolutely normal. The membrana tympani was apparently sloughed away to an irregular ring, the edge of which was rough and ragged. The stylo-mastoid artery was found filled with a partially organized clot extending from the posterior auricular upward as far as it could be traced. The unorganized portions were filled with pus, cultures from which showed strepococcus in pure culture, as did the pus from the canal.

I think that the post mortem findings in this case corroborate the clinical observations of mine published in the Laryngoscope, December, 1904, page 959, and that they go to show that, in some cases at least, acute purulent otitis media complicating typhoid fever is due to embolism or thrombosis of the tympanic and mastoid blood vessels.

DISCUSSION.

Dr. Edgas M. Holmes of Boston said that eleven years ago he had examined the ears and throats of 237 patients, ill with typhoid fever at the Boston City Hospital, and in fourteen of those he found ulcerations of the larynx, including under that term the epiglottis, as well as the deeper structures of the larynx. The comparatively few cases in which laryngeal symptoms were discovered might perhaps have been due to the apathetic mental condition of the patients. In one case the entire arytenoid space was involved, with marked swelling of the epiglottis, and in that instance the voice did not disclose the fact that there was anything wrong with the larynx. The patient, although alive to-day, had been hoarse since his attack of typhoid fever. At the time, there was a question as to whether the lesion was tubercular, but repeated cultures failed to show the tubercle bacilli.
Dr. James F. McCaw of Watertown, N. Y., said that during an epidemic of typhoid fever which occurred in his city about a year ago he was able to report on 579 cases, and among that number, to his knowledge, there was only one case in which the larynx was involved. In that instance there was complete sloughing of the posterior and lateral walls of the pharynx. the tissues melting down almost like wax. Laryngeal edema developed, from which the patient subsequently died. This was one of those purpuric cases, overwhelmed with toxemia.

Dr. McCaw said he fully agreed with Dr. Jackson that these laryngeal complications might exist in typhoid fever and escape attention, from the fact that the larynx of these patients was rarely examined; therefore, only the severer complications were brought to our notice.

The speaker said that of the 579 cases of typhoid fever reported on, 29 were complicated by acute purulent otitis media. Of these, four were of the fulminating type of the disease, as described by Dr. Day. Two of these cases died, and no autopsy was obtained, death apparently being due to intracranial involvement or toxemia. In the other two, the mastoid was operated on. In one, where the operation was done on the third day after the first ear pain, the entire mastoid was involved in a destructive process. Dr. Day's findings in his case certainly threw some light on the rapidity of this infective process in the middle ear. In addition to the thrombotic interference with the nutrition of the parts, the low vitality of the patients was a factor in these cases, these two factors readily accounting for the rapid destruction of tissue in the fulminating type of the disease.

Dr. Chevalier Jackson, in closing, referred to the remarks of Dr. Holmes, and said that one peculiarity that had been noted in connection with various epidemics of typhoid fever was that they presented a great difference in the number and severity of complications of the nose, throat and ear. The same was true of epidemics of influenza and the exanthemata. Ear complications were common in some epidemics, rare in others. When influenza first became epidemic, ear complications were very common, while more recently they were rarely observed. The speaker said he could not explain this, but the fact had been very apparent in the various epidemics they
had had in Pittsburg. More recently, throat complications had been comparatively common in that city in connection with typhoid fever, where that disease, like the poor, was always with them. An unhygienic environment prior to admission increased the severity of the general toxemia, and doubtless had much influence on the occurrence of these various complications, as also had the foul oral sepsis.
PAPER:
REPORT OF SEVEN INTRACRANIAL OPERATIONS WITHIN A YEAR.

GEORGE F. COTT, M. D.

Since the advent of grippe some fifteen years ago, many more pus cases affecting the middle ear and sinuses such as the antrum of Highmore, frontal, ethmoidal, and sphenoidal, have been reported than before that time. The ear cases occurring during an attack of so-called grippe are sometimes very intractable and yet the influenza bacillus is seldom found. This is explained by claiming that after an acute attack of influenza the mucous membrane is left in a more or less susceptible condition to irritating substances and thereby becomes fertile soil for the various cocci.

The cases which I report to-day, seven in number, all requiring intracranial manipulation during 1904, dated far beyond this period, save one, and therefore could not be counted as caused by that virulent poison.

The histories of the several cases were traced back to early childhood, all of which had been treated at different times for indefinite periods.

Whenever symptoms of severe deep-seated pain were present intracranial involvement was looked for, but if no opening in the roof of the tympanum was found and no other symptoms but pain observed the radical operation alone was done and further developments awaited. When the dura or brain were involved this became manifest sooner or later, when further operative procedure was undertaken. To differentiate between neurosis and true symptoms of meningeal affection was sometimes very difficult and would cause the patient prolonged suffering until another operation seemed justified. Over-enthusiasm for operating must be discouraged, while on the other hand extreme conservatism often leads to grave disaster. The following cases are self-explanatory:
Case 1—Pachymeningitis with Extradural Abscess—

Man aged 30, had been confined to bed several weeks and unable to work for six weeks because of severe pain in the ear; no discharge, but gave a history of chronic suppuration in childhood which had stopped years ago. Diagnosis of pachymeningitis and perhaps pus under dura was made and he was sent to Riverside Hospital for operation. After having inhaled a small quantity of chloroform and before the postaural incision was made, patient’s breathing gradually became shallow until it ceased altogether; pulse could not be felt at the wrist nor the heart sounds heard over the chest. The table was quickly tilted head downwards and artificial respiration performed until I was too tired to continue, when the assistant, Dr. Jones, worked over him until he gave up and I resumed work again; finally our efforts were crowned with success and patient made slight efforts to breathe, which became more and more pronounced until breathing was again regular.

The radical operation was then proceeded with. The suppuration in early life did not last long enough to cause sclerosis as we usually find it, for the lower cells were quite brittle, the deeper part of the bone having become particularly softened. After its completion the roof of the tympanum was chiseled away and the upper part of the bony canal. Pus was found under the dura, which membrane was very decidedly thickened.

While cleaning out the cells, the internal wall of the mastoid process was found destroyed, leaving a circular opening about five-eighths of an inch in diameter. The whole cavity was packed with gauze and patient made an uninterrupted recovery. The ear became dry in six weeks.

Case 2—Septic Sinus Thrombosis with Epidural Abscess—

Benedict Scynowski, age 12, U. S., of Polish parents. Father and mother, four brothers and two sisters healthy. Boy was never sick until three weeks before; had severe headache which for the most part was confined to the supraorbital region and was constant. On January 1, ’04, ear began to discharge. Entered Deaconess Hospital on January 20, with a temperature of 104 and pulse 130. He was treated for two weeks before for typhoid fever, when a change of doctors was made. Dr. Bradley L. Door, under whose care he had come, asked me
to see the patient and be prepared to open the mastoid. I was somewhat late and the doctor had incised the periosteal abscess and evacuated a quantity of pus. The patient did not improve much. I was asked to see him again on January 23rd; the temperature was then taken every four hours; if no improvement took place in one or two days another operation would certainly be necessary. January 25th, being satisfied there were intracranial complications, and having explained the seriousness of the boy’s condition to the mother, that he certainly would die without operation but had a chance, although a slim one, with it, she consented. A radical operation was first done; although there was no history of previous ear disease, sufficient evidence was found showing old suppuration such sclerosis, remnants of drum-head and ossicles. During the chiseling, pus was noticed coming through the roof of the tympanum; a large opening was made, when a quantity of pus was found under the dura. The result did not satisfy me, however, for the temperature indicated involvement of a sinus, presumably the lateral or sigmoid. The skull was opened over the lateral sinus, which was found apparently empty. A sharp spoon was introduced toward the torcular herophyli and the sigmoid knee and a small quantity of pus brought away each time, then pieces of the thrombus were removed until blood flowed from both sources. The sinus was then packed with gauze and the wound dressed in the usual way. The boy was in pretty bad shape after the operation; strychnia and salt solution were injected and hot bottles applied. He rallied nicely, had a fairly good night, but died the next day. Post-mortem examination was not permitted. Although the case was treated as typhoid fever because of the peculiar temperature, still the extremes, with discharge from the meatus and the bulging of the ear with pain radiating over the right side of the head should have at once cleared up the case as showing that there was intracranial mischief.

The following urinalysis, single sample, was by Dr. Schwertfeger:

Color .................................. amber.
Reaction .................................. acid.
Odor .................................. urinous.
S. G. .................................. 1010.
Sediment .................................. absent.
Report of Seven Intracranial Operations.

Albumin ........................................... absent.
Sugar .................................................. absent.
Microscopic ...................... epithelium and urates.
Ehrlich's diazo test ....................... negative.

History After Entering the Hospital—
The first night at the hospital the patient rested quietly and slept some, had a good movement, and vomited several times; Epsom salts given, but vomited. On the 21st of January Dr. Dorr evacuated the abscess behind the ear without much pain.

Following is the temperature chart:

Bowels moved twice that day, brown fluid. At night, no sleep, delirious at times. On the 22nd stool was light brown, containing white curds, followed by three more brown fluid movements; at night sleep at intervals. Next night more quiet but was delirious at intervals. Although quiet during the day time, no sleep at night. On the 25th he slept some and rested quite well after 2 a.m. The night after the operation he was given hypodermically strychn., digitalin, nitroglycerine and whisky, also eight ounces of saline solution; he had a pretty good night and slept at intervals, but died at 11:30 a.m.
Case 3—Dura Attached to Roof of External Canal by Fibrous Band—

Mrs. S., age 38, height a little over five feet, weight 230 pounds; case referred by Dr. Jas. E. King. Had discharge from left ear for many years until seven years ago. Uterus curetted two years ago; since then ear discharged again, which she attributes to the anesthetic. Severe pain over side of head, also deep seated. Treatment of no avail. Radical operation March 3rd, 1903; drumhead and ossicles absent. After this ear was more or less dry, but pain continued and at times became unbearable; occasionally wanders around until found and taken home, all due to the tremendous pain, she claims. Patient was markedly neurotic and for that reason a second operation was deferred; she, however, insisted upon having something done, so on August 10, 1904, 17 months after the radical, the old wound was opened again and sufficient bone of the skull removed to lay bare the dura for three-fourths of an inch; at the roof of the canal a very strong fibrous band was found attached to the dura and the bone which could not be torn from its attachment but had to be cut out with scissors; otherwise the appearance seemed healthy. The wound was then closed and the exposed dura packed with idoform gauze. The patient has improved perceptibly but is by no means well. At the present writing the ear is dry but there continues occasional pain as before the operation, but her general condition is very much improved.

Case 4—

Mrs. Dr. B., age 51, case referred by Dr. Geo. E. Fell; chronic middle ear suppuration for many years, with pain in ear and radiating over side of head, causing months of sleepless nights and consequently a marked neurotic condition. The radical operation was undertaken, followed by some amelioration, but gradually the pain again became unbearable. Discharge from the cavity never ceased. Hour glass contraction quite external to site of drum head emitting drops of fetid pus. Several months later, patient seemed as bad as ever, but because of her neurotic condition further interference was postponed until finally, several months after the first operation, the patient was again removed to the Buvalo General Hospital on account of a probable pachymeningitis. The old wound was reopened, some tough tissue and half an inch of
the roof of the external canal removed. The dura was coated with organized lymph and the roof markedly roughened, all of which was curetted and the opening packed with gauze. Patient made an uninterrupted recovery and although some pain still remains, she is very much better and able to perform her duties as the mother of eight children, takes things philosophically and has withal a happy disposition. The scalp is still sore to the touch.

Case 5—Sinus in Temporal Lobe—

Mrs. B., age 44, strong, robust and well built, had discharge from left ear about forty years. Called on me for relief, having had severe pain lately. I found carious bone wherever the probe could reach, no vestige of ossicles or drum head left; treated her some months without entirely stopping the discharge or relieving the fetid odor permanently. Operation was advised but stoutly refused until a year after treatment had begun, then her headaches became so severe that she lost considerable sleep and finally consented to go to the Deaconess Hospital, where a radical operation was done; before closing the postaural wound the bone was probed to seek a cause for the severe headaches; at one point the probe entered the skull over the tympanum; bone was chiseled away sufficiently to explore and then a hole nearly one-eighth of an inch in diameter was discovered in the dura: a probe passed through it which entered the temporal lobe one and one-quarter inches. An incision was made along the sinus large enough to easily admit a sharp spoon, the sinus curetted and then packed with iodoform gauze. After three days the gauze was removed and the opening repacked. At the end of two weeks the wound in the brain was allowed to heal and the external wound closed with stitches. Patient made an uninterrupted recovery. Now, four months after operation, patient is quite well, but has had two or three spells of headache referred to the top of her head which, however, passed off again after some hours.

Case 6—Brain Abscess Seven Months After Radical Operation.

Death—

In May, 1903, Miss May L., age 26, was referred by Dr. C. J. Reynolds. She gave the following history: At the age of 2 years she had inflammation of the right ear. At 8 years both ears suppurated; she then remained well until 12 years
old, when suppuration for two months in right ear occurred, also later in left ear; right ear continued suppurating intermit-tently for a long while, and was treated more or less during that time. When I first saw her she complained a great deal of deep seated pain, radiating over the side of the head. Drum head and ossicles were gone. Patient was fairly well nourished, weighing perhaps 140 pounds, and five feet six inches in height. Family history good; she was the only daughter but had two brothers; father and mother both living. The necessity of operation was explained to the mother and daughter and also the probability of deep seated trouble.

Operation—Patient was sent to Deaconess Hospital and on May 20th, with the assistance of Dr. Reynolds, the radical operation was performed. The second blow of the mallet penetrated the sinus; hemorrhage, however, was readily stopped. After removing the posterior wall of the external canal and the external wall of the attic a sinus was looked for because of the severe pain complained of; this was found paralysis lasting three months, otherwise she made a good recovery and was finally discharged.

After History—Seven months later patient presented herself again, having gained twelve pounds in weight. She was feeling quite well except that there was something bulging in her ear. I found, half an inch from the external orifice, a sac coming down and nearly closing the meatus; this was pressed back but gradually filled again, and upon puncturing, pus escaped. She was again sent to the Deaconess Hospital and the skull opened above the meatus. A large abscess in the temporal lobe was evacuated, its walls curetted, the cavity washed out and lightly packed. Patient made a good recovery, but two months later the cavity filled again. Patient had an epileptic seizure which I think had occurred once before. On February 11, '04, the sac was again evacuated, washed out and packed. She reacted nicely, but after severe pain suddenly became comatose, early the next morning, and died twelve hours later without regaining consciousness. Temperature varied but was never much above 102.

Post-Mortem Examination—This was made sixteen hours after death by Dr. Monroe, the interne who assisted in the last operation. Brain examined only. There was no attempt at healing after first operation nine months previous. Dura
mater adherent where epidural abscess was located and was quite normal in appearance. The brain looked healthy excepting the abscess cavity, which was large enough to admit a finger and over an inch in depth. The immediate cause of coma and death could not be ascertained, but was perhaps due to edema of the ventricles.

Case 7—Sinus Thrombosis—

Girl age 11 years, referred by Dr. McCarty of Geneva, N. Y.; middle ear suppuration since infancy, and while under his care thought it necessary to operate radically to prevent intracranial involvement. I was asked to see the child and decided to act immediately. A typical radical was done and the little girl reacted nicely. Next day temperature and pulse were quite normal, likewise the second day, but the third she showed symptoms of a peculiar character, such as fluctuating temperature, irritability and more or less apathy, while at times she lay very still but would respond when called; occasionally she would move restlessly about the bed.

After consultation with Drs. McCarty and Skinner, both surgeons, of Geneva, it was decided to open the skull at once, which was done: while opening up the old wound a little pinhole leading to the lateral sinus was noticed by the bubbling of gas; this hole was then followed up and enlarged by laying bare the sinus, which was covered with organized lymph. The sinus having been opened, a fatty thrombus was found filling up the vessel from the torcular to the bulb of the jugular vein and was removed with difficulty. The child never came to. Odor of a putrid nature emitted from the recently operated bone. but this looked quite healthy, the odor coming from within the skull. This was a peculiarly sad case, especially for the father, he having buried two entire families, and this was one of two children of the third wife.
PAPER:

THE SERUM TREATMENT OF HAY-FEVER.

HANAU W. LOEB, M. D.

Until Dunbar\(^4\) introduced his serum treatment of hay-fever, the remedies which had been used, had attained so considerable a number that it was obvious that the specific had not been found. Thus Sticker\(^2\) mentions the following:

Quinin, iron, arsenic, salicylic acid, sulphur dioxide and carbonic acid, salt solution, glycerine, boric acid solution, sodium phosphate (1-500), carbolic acid (1-100), bichlorid of mercury (1-5000), hydriodic acid, peroxide of hydrogen, sulphuric acid, ammonium carbonate, chloroform, eucalyptol, chromic acid (1-100), lactic acid (20-100, 50-100), glacial acetic acid, zinc sulphate, zinc chlorid, silver nitrate, camphor, menthol, laudanum, canabis indica, morphin hydrochlorate and sulphate, atropin sulphate, cocain hydrochlorate, bismuth subnitrate, bismuth carbonate, capsicum, ipecac, all ordinary snuffs.

Although the disease had been subject to considerable study, especially during the last 30 or 40 years, very little had been determined in connection with its etiology except that the pollen of certain plants seemed to be instrumental in its production. To this were added a special predisposition on the part of the patient and an abnormal condition of the nose, which were accounted sufficient by teachers and text-book writers. The role of bacteria had been announced by Helmholtz\(^3\), supported by Weil\(^4\), Axillos\(^5\) and others and disputed by Thost\(^4\), Heymann and Matzuschita\(^7\) and others who made extensive experiments. Blackley\(^8\) who was the greatest exponent of the pollen theory enunciated by Elliotson\(^9\), made an extensive study of the relation of pollen to hay-fever and determined
the number of pollen grains per cubic foot under various conditions.

It was Dunbar, however, who was the first to apply modern methods to the study of hay-fever, with tangible results. Differing from others who were content to examine the pollen in the atmosphere, he conceived the plan of subjecting predisposed individuals to the action of pollen grains during the quiescent stages of the disease. His experiments are at present well known. How he determined that the pollen grains would thus excite paroxysms in the predisposed, while the controls were unaffected. How, by classical and logical steps of the investigation the artificial hay-fever was produced by the administration first, of pollen of certain plants, second, of filtered solutions of this pollen in tears, nasal secretions, blood serum, saliva, etc. How the absolute non-toxicity of the pollen or of the solution of its active agents for non-predisposed individuals was established. Finally how a very violent reaction follows a subcutaneous injection of pollen toxin in predisposed individuals, while none occurs in controls.

Dunbar’s further work in developing an antitoxin was an important event in therapeutic research consequent upon his investigations; its value in artificial hay-fever was easily established.

These experiments which have been accepted by various observers have been confirmed and extended, especially in the Hygienic Institute at Hamburg, under Dunbar’s directions. Kammann\(^\text{10}\) determined that the poison was a toxalbumin which was thermostabile, antagonistic to alkalies and not completely destroyed by enzymes like pepsin and trypsin. Liefmann\(^\text{11}\) concludes the report of his observations with the following:

1. The occurrence of hay-fever and the presence of pollen in the air are two simultaneous congruous observations, insofar as the beginning and end fall together.

2. The factors which influence the number of pollen grains in the atmosphere follow the clinical picture, so that the curve showing the pollen count in the air agrees with the general course of the disease.

3. The heretofore unsettled question as to whether the quantity of pollen grains in the atmosphere is sufficient to cause the symptoms of hay-fever may be answered in the affirmative.
Lübbert\textsuperscript{12} publishes a list of plants whose pollen toxicity and nontoxicity for hay-fever has been established.

The pollen of the following plants* has been found nontoxic: Common lilac, common iris, crocus, English plantain, common plantain, scabious, bitter-sweet, deadly night-shade, wild tobacco, black mullein, bindweed, pansy, blue-bell, wooly mullein, cow parsnip, coriander, common carrot, spotted hemlock, elder, common flax, lily, tulip, narcissus, hyacinth, squil, wood rush, dock, sorrel dock, heath, maple, English cherry, mock orange, Japanese quince, English meadow sweet, water avens, rose (7 different varieties), dog rose, bramble, corn poppy, linden, oriental poppy, common poppy, peony, monkshood, European globe flower, buttercup, pasque flower, anemone, purple foxglove, rock cress, wild geranium, meadow geranium, high mallow, wild mallow, sharp leaf mallow, hollyhock, marshmallow, laburnum, St. John's wort, burdock, common dandelion, mountain arnica, wild chamomile, milfoil, common wormwood, sunflower, garden marigold, spurge, Scotch pine, mountain pine, common nettle, alder, American white birch, English oak, willow, European yew, club moss.

The pollen of the following plants has been found toxic: Rye, cultivated oats, barley, oat grass, rice, reed, mountain reed, Haller's reed, orchard grass, blue grass, cotton grass, dog's tail grass, reed canary grass, ray grass, velvet grass, meadow foxtail, turfy hair grass, quick grass, meadow fescus, grand fescus, wheat, soft chess, common European honeysuckle, lily of the valley, Solomon's seal, common evening primrose, mustard, thistle, ox-eye daisy, golden-rod, (3 varieties), corn flower, chrysanthemum, aster, Indian corn (maize), sedge (7 varieties), white orach, great ragweed, bitter weed or hog-weed, ambrosia (ragweed, 2 varieties), burweed, ivy, common spinach.

Having established the value of antitoxic serum in experimental hay-fever, the remedy was exhibited during a portion of 1903 and the whole of last year in cases of hay-fever all over the world. In the main, good results have been reported, far better than from any other remedy previously administered. The results were particularly good when it is consid-

\textsuperscript{*}The botanical classification used by Lübbert is not current in this country. As far as possible the common names were determined from the botanical names which he gives; in other cases the German names have been translated.
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ered that it was used helter-skelter by all sorts of physicians as well as patients without reference to the associated conditions. Doubtless many, among whom I must include myself, used the remedy for cases which were not hay-fever, but which presented symptoms, appearing during the hay-fever season, which simulated those of the disease. What a variety, then, of different conditions conglomerated under the lay term, hay-fever, must have been subjected to the serum treatment? How important, therefore, was it that the therapeutic side of the question should be weighed carefully in the light of accurate clinical observation and test.

Reports confirmatory of the claims made by Dunbar have been made by Glegg, Mayer, MacCoy, Somers, Prausnitz, and Stein.

Somers arrives at the following conclusions after a considerable experience:

1. The serum produces prompt and positive amelioration of the symptoms of fall hay-fever in the majority of cases.
2. In a smaller number this favorable result is soon accompanied with complete disappearance of the affection.
3. Where slight or no action is seen after its use, pollen as an etiologic factor does not predominate.
4. When results are obtained, it favorably influences all the manifestations of hay-fever.
5. When given during the attack, irrespective of its severity, it produces marked palliation rather than absolute cure.
6. Its effect on future attacks remains as yet unknown.
7. Serum in powdered form is slightly soothing to the nasal mucosa, has but little effect on the other symptoms of the affection and in occasional cases it may act as a direct irritant.
8. As a result of larger experience, especially with hay-fever occurring at other times of the year, it may become necessary to modify some of the opinions in regard to this antitoxin.

Sir Felix Semon, who is universally known as one of the most conservative as well as observing of laryngologists, from personal investigation of eight cases, admits that the serum treatment gave relief in some and appeared to have acted beneficially certainly in postponing the occurrence of the attack in others, and that these results might possibly have been more marked if the applications had been made with more frequency. Two of his patients stated that the hay-fever period had been made more tolerable than on previous occasions.
But one paper has appeared which in a marked way contradicts either the findings or the claims of Dunbar. Fink\(^2\) presents objections which are rather polemic than convincing. He argues against Dunbar's theory of pollen toxin by showing that cases of hay-fever occur when but few or no pollen grains are found in the air, when the grasses are not flowering. He is encouraged in his view by the fact that the toxin had acted (as quoted by Sir Felix Semon in one case) where no hay-fever had previously been present. He also lays great stress upon the fact that Möhr\(^2\) succeeded in preventing hay-fever during a railroad journey by means of an apparatus which prevented the pollen from passing into the nose. According to Fink, this disproves the theory because the patient failed to acquire the usual paroxysms through the agency of the conjunctiva. He reports three cases in which the use of the serum was without good result; in one case the artificially produced hay-fever had been relieved by the antitoxin—a living example, he thinks, of the false results of laboratory research when subjected to clinical experience! All of which seems very similar to what was presented in opposition to the diphtheria antitoxin.

Following this, Fink discourses favorably upon the theory that the disease is a manifestation of neurasthenia, admitting that various patients have an idiosyncrasy for certain plants! He believes that the casus morbi of the disease is the antrum of Highmore and that the ocular and other remote symptoms are of a reflex character. Finally he finds in aristol the remedy which when applied to the mucosa of the antrum cures all forms of coryza and hay-fever. Perhaps the same rigid scrutiny manifested in opposing Dunbar's theory and results would be followed by as positive objections to his own conclusions as he found to Dunbar's.

My own experiments began in the summer of 1903 with some toxin sent to me by Prof. Dunbar. Several tests were made to ascertain whether or not there would be any reaction. But one of the cases remained sufficiently long under observation to fulfill all the conditions of the test. This case will be reported more at length. Another that of a young medical student, who had been in bad health, was treated in the following way: For five successive days a simple salt solution was dropped into his nose as well as into my own. On the sixth day the toxin was used resulting in violent reaction in
his case, while there was none in mine. The following day the toxin was again injected with the same result. In this way the element of suggestion was entirely eliminated for the patient did not know but that the toxin was used from the very first day.

Cases will not be reported here in detail particularly as the list subjected to this treatment has now become very large. One thing was manifest early in these studies, viz.: that there were other features to be considered besides the paroxysms—that there were other things that required treatment. It is not to be supposed that an exciting cause affecting the blood vessels so positively would fail to call into action certain other agencies which would continue even after the paroxysms themselves would cease or which would most decidedly influence them. Moreover, it must be admitted that the nasal mucosa of hay-fever patients is subject to the various affections which attack it during the intervals of the paroxysms. On the other hand, there are often found conditions of the nose which occasion no marked symptoms during the quiescent stage, but which makes their presence felt at the period of the attacks. Then again there are circumstances which modify the application of the remedy or prevent its good effect. A large spur or a narrow or irregular nasal orifice may interfere with its application especially when used by careless hands. Besides this, it is just possible that the state of the mucosa or of the secretion may have much to do with the taking up of the agent. Many patients think that they may act with impunity in view of the fact that they have a specific at hand. Finding that it is not equal to the unfavorable circumstances to which the patient submits himself, it is discarded. Again and again has it been observed that the serum proved to be efficient under proper administration when it had been thought to be useless. As with every other therapeutic agent, it must be used with intelligence and with due consideration of the attendant conditions.

The following grouping is clinically made:

1. Typical cases of rose-fever, or German hay-fever.

These cases do better than any other variety, probably because the serum heretofore used has been prepared by immunization with toxin from the pollen of rye and other gramina. In every case there was relief after a few days from the symp-
toms of itching of the eyes, nose and palate, sneezing and nasal obstruction.

In one case, that of Mrs. K., the disease had continued almost uninterruptedly since May, 1902, with the superaddition of asthma which first appeared in October, 1902. As this was the first patient treated (in August, 1903), but little promise of relief was given. After a very few days, however, all the symptoms disappeared with the exception of the nasal obstruction. This was found dependent upon a chronic hypertropic rhinitis in which both inferior turbinates were involved. She still has mild attacks from time to time which come on with an acute coryza. Symptoms of hay-fever appear; under appropriate treatment the symptoms disappear within 24 to 48 hours, with the exception of the obstruction. A portion of the left inferior turbinate has been removed and when these attacks now come on there is only a moderate amount of obstruction on this side. In this case the use of the pollen toxin was followed by a positive reaction.

Another patient, Mrs. L. A., was suffering intensely when she presented herself, August 2, 1904. She stated that since May she had been suffering almost constantly with colds, sneezing, itching of the eyes, etc., and had had no relief from treatment whatever. Within two days after the administration of the serum all the active symptoms disappeared and she insisted on having the nose freed from obstruction. Accordingly the necessary operations were performed, despite the fact that she had been suffering from the paroxysms but a few days before. She has had no recurrence.

H. S. had suffered from rose-fever for many years with sneezing, itching of the nose, eyes and throat during the paroxysms and sneezing at all times during the year. Entire relief from the sneezing and itching speedily followed the administration and the sense of smell returned.

Good results occurred in three other cases of a similar character which presented nothing special.

2. Typical cases of American hay-fever with obstruction manifest only during the paroxysms. These all showed improvement, itching of the eyes, nose and throat and sneezing relieved in every case where the remedy was used under my direction. The patients, with but several exceptions complained that the obstruction persisted in spite of the relief from other symptoms. In several instances where the remedy had
only been used for about two days the patient passed from under observation (visitors at the World's Fair) so that it could not be determined whether or not they were relieved. Two patients who had been suffering for many years were entirely relieved of all symptoms.

3. Cases in which the serum has been used without benefit, but in which relief supervened upon proper administration. Doubtless this class will include a large number of patients, particularly those who used the remedy without medical direction. The average hay-fever patient feels that he is thoroughly competent to attend to his own case. He hears of the good results of the remedy and uses it in a skeptical self-satisfying, though improper way, and, finding it of no avail, discontinues it. Two such cases were relieved by having the serum properly used. One of these, a patient of ten years' standing, who had not found any relief whatsoever previously, took the remedy with him on an Eastern trip so as to be prepared for the paroxysms which were due within a short time. He used it during attacks for two days while on the railroad journey, found that the paroxysms were not influenced and discontinued its use. On his return to the city he was directed to use a very small quantity twice a day and was required to report daily for observation. It was soon found that very small doses given two or three times a day depending upon the severity of the paroxysms and upon exposure to pollen were entirely effective and all of his symptoms disappeared with the exception of the obstruction and some of the nasal discharge which was somewhat irritating.

Another case was that of a physician who had used entirely too large a dose. The dosage being reduced, he was kept under observation and direction for a few days with positive results.

4. Cases in which the condition of the nose interfered with the action of the serum. Under this head are included the various cases in which good results were delayed, but eventually manifested. At times a considerable deformity or ridge or spur prevented the insufflation of the powder. In several other cases, the discharge was profuse, and the powder was probably washed away before it could become effective. In one case the vibrissae appeared so large and numerous that the powder failed to reach the mucosa until the patient was directed to insert the little metal instrument high up into the
nose. In another case, the nose was full of polypi which made it impossible for the patient to draw the powder up into the nose. A close investigation into points of this nature will doubtless overcome the lack of good results in many cases; certainly those who use the remedy without proper medical direction take great chances in this particular.

5. Cases in which the ordinary Pollantin was of no avail, but in which the serum produced by immunization with goldenrod and ragweed toxin was effective. This was most acceptably shown in two cases. In one the relief had been moderate with the ordinary serum and absolute with the goldenrod and rag-weed antitoxin supplied to me very kindly by Prof. Dunbar. The second case had absolutely no relief from the use of the Pollantin. Within a half an hour after the other variety of serum was used the relief was positive. This experiment was made in the presence of Dr. Dunbar. The patient's symptoms continued under entire control during the remaining portion of the hay-fever season. With the introduction of rag-weed and goldenrod antitoxin, we may confidently look for more satisfactory results, generally, in the treatment of the typical American hay-fever.

6. Cases of false hay-fever. Under this head I include three patients who were not benefited by the serum. Subsequent examination showed that they were cases of so-called vaso-motor rhinitis due to a nervous condition and not to pollen. Two of the cases have been relieved by proper therapeutics, and the other had so far resisted treatment.

7. Rose-fever of 1905. During May, 1905, three new cases have been under observation. In one case of 6 years' standing relief appeared within 48 hours. Later, symptoms again developed following a long automobile ride in the country. Since the establishment of the proper dosage, there has been no recurrence, although she now rides in the parks. Another patient essayed to use the remedy after the first day without medical direction. Relief followed for several days. After an undue exposure, she greatly increased the number and size of the dose, so that her nose was in a state of irritation. Relief appeared when proper dosage was established. The third patient has now no symptoms. In these cases the serum of last year was used. None of the cases treated last year have so far found it necessary to seek further treatment.

This list include all the cases treated last year and this
year which I consider remained long enough under attention to warrant a proper trial of the serum. It does not include several patients who remained from 1 to 3 days without experiencing relief. One of these patients wrote me that he found the serum utterly useless. The other two did not communicate with me again. In addition to these there were 5 cases for which the serum was prescribed and the patient not seen again. One of these has written that it was effective and another that it was without result. However, it is fair in considering the value of the remedy from the clinical standpoint to exclude cases of this character. In every case the dried serum alone was used.

As to the relief of individual symptoms the cases showed the following:

Itching of the eyes. Almost invariably relieved during the first two or three days without applications being made to the eyes. This is at variance with the experiences of some other observers.

Itching of the nose disappeared within two or three days.

Itching of the palate. Alleviated, but after a longer use of the serum.

Epiphora. Usually ceased within 24 hours.

Rhinorrhea. In most cases, relieved. In some cases, while other symptoms were removed this remained, but generally somewhat diminished. This appears to be accounted for on the score of vaso-motor paresis due in part to the hay-fever and in part to the local condition of the nose.

Nasal obstruction. In perhaps half of the cases, this was entirely overcome. In other cases it remained, though generally somewhat diminished. The nasal obstruction is so frequently dependent upon hypertrophies, spurs, ridges and deflections and upon vaso-motor paresis that it is not to be expected that any remedy which combats the toxin alone can entirely overcome this symptom.

Sneezing. Relief almost uniformly immediate.

Asthma. In but two cases was this symptom present during the attack. The serum seemed to have no special effect on the asthma directly, but as the other symptoms improved, the asthma likewise was benefited.

From these observations is therefore appears, first, that Dunbar's serum is effective against the distressing symptoms of the disease, in cases even where there is no proper direction
for the administration of the remedy. Second, that the probability of relief is tremendously increased by intelligent observation of the attendant conditions and by proper administration of the antitoxin. Third, that the antitoxin made by using the pollen toxin of rag-weed and goldenrod promises far better results in our American form of hay-fever than that which is at present used. Fourth, that the commoner symptoms of itching of the eyes, nose and palate, epiphora and sneezing are almost invariably relieved within a few days after the serum is properly used. Fifth, that other symptoms, such as rhinorrhea, nasal obstruction and the like which are frequently dependent upon attendant conditions may entirely disappear and in general will be somewhat if not altogether relieved. Sixth, that there are more problems to be solved in connection with the influence of pollen in the production of hay-fever and perhaps other diseases will be admitted and that an important step forward had been made by Dunbar in this work, no one can deny.

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   Bemerkungen über Dr. G. J. Patton's Experience über Heufieber
   Bemerkungen über Dr. G. J. Patton's Experimente über Heufieber
The Serum Treatment of Hay Fever. 269
DISCUSSION.

Dr. Theodore W. Corwin of Newark, N. J., said he had analyzed about twenty-one cases of hay fever in which the serum, either in the fluid or powdered form, had been employed, and in 55 per cent of these it seemed to have some effect. In the remaining cases it was either totally ineffective, or the patients refused to persist in the treatment.

In those cases where the serum treatment had a beneficial effect, the improvement would be noticeable within two or three days; otherwise it was useless to persist in the treatment. In those cases where the remedy was efficient, it was very acceptable to the patients. This was mainly true of the cases seen during July and August, but after the 1st of September several (four) patients suffered from exacerbations of their trouble, and discontinued the use of the serum.

Dr. Clement F. Thiesen of Albany, N. Y., said the society was much indebted to Dr. Loeb for his interesting paper. In considering the serum treatment of hay fever, there were some who were inclined to poke fun at it, and regard it in a spirit of levity, but the fact should not be lost sight of that Professor Dunbar was an authority, and that he had pursued his investigations in a most scientific way.

Dr. Thiesen said that his results with the serum treatment had not been as favorable as those reported by Dr. Loeb. Early in the summer of 1903, in response to a request, Dr. Dunbar had sent him several tubes of the serum, which at that time was made from the true grasses, not from goldenrod or ragweed. His results with that preparation were not very good. The class of cases selected, perhaps, were not suitable for that remedy. Last summer, with the preparation that was obtainable in this country, his results were better. During the summer of 1903 he had treated seven cases, and last summer about twelve or fourteen cases with pollantin, and in only a single instance was there a very marked result. That was a case where the hay fever was accompanied by severe asthma, and a single application of the powder relieved the paroxysms of asthma and the eye symptoms, and the relief persisted for days. In one other case the relief was also quite decided. In other cases where the powder exerted a beneficial effect it had to be given in repeated small doses, and the immunity did not last for a longer period than from six to twelve hours.
In cases where asthma complicated the hay fever, it was important to follow the directions laid down by Professor Dunbar and instruct the patient not to undertake a railroad journey, and to sleep in a room with closed windows.

In the interesting experiments recently made by Dr. John N. Mackenzie of the Johns Hopkins Hospital, it was found that in predisposed subjects who had suffered for some time from hay fever, indifferent substances dropped into the eyes produced the same train of symptoms as the pollen toxin, which seemed to indicate that there was an element of suggestion in it.

Dr. Thiesen said that while in his cases the symptoms had been distinctly lessened by the use of the serum, still he did not think the relief was very much greater than he had obtained from some other methods of treatment, excepting in a few cases. In addition to the serum, he had also used other local measures, such as had commonly been resorted to prior to the discovery of the serum. The serum seemed particularly effective in relieving the sneezing and the eye symptoms.

The speaker said he did not see how any local treatment of hay fever could be entirely efficacious. In this disease we were dealing with a neurotic class of subjects, and local treatment alone could not be altogether successful. Perhaps, if we could get a serum for each particular variety of hay fever, or a combination of the different serums, the results might be better.

Dr. James E. Logan of Kansas City, Mo., said the subject under discussion was a very interesting one, and he congratulated Dr. Loeb on the very careful investigation he had made. It was certainly very thorough, and the speaker said he was satisfied that the subject deserved more consideration than was usually given to it.

While the work done by Professor Dunbar in connection with the serum treatment of hay fever had been very scientific, Dr. Logan said he feared it would not bring him very satisfactory results, and the cause of the failure would be found as much in the patient as in anything else. Hay fever patients were the most difficult subjects on earth to treat. They were highly nervous, and very few of them really had any faith that physicians could do them much good. They were governed more or less by psychical influence, and many of them, apparently, did not care to get well. They looked forward to
their little vacation in some immune locality, where they enjoyed the company of their fellow-sufferers, and discussed their discomforts to their hearts' content. They formed themselves into social clubs, as they had done at Marquette, Michigan, and they even contemplated a national organization of hay fever sufferers. All these factors rendered the treatment of hay fever patients more difficult.

Dr. Logan said that in the cases he had treated with Professor Dunbar's serum the results had not been very satisfactory. Out of ten treated in that way in 1903, he knew of only one case in which the method gave relief. The speaker said that a member of his own household had long suffered from hay fever, so that he was in a position to speak feelingly on the subject.

Dr. Herbert E. Smyth of Bridgeport, Conn., thought it impossible for any one serum to suit all cases of hay fever, because of its varied causation. He knew people who could not remain in the vicinity of a horse without getting an attack of the disease, and any benefit derived in such a case must, in his opinion, be due to suggestion.

Dr. Frederick C. Cobb of Boston said that two years ago, while in Hamburg, he met Professor Dunbar and went over the institute with him, and saw the method of preparing the serum. At that time, Dr. Cobb said, he introduced a small quantity of the toxin into his own eye as an experiment. He had never suffered from hay fever, and the toxin produced no effect. In the case of Dr. Dunbar's assistant, however, who was subject to hay fever, the toxin immediately caused the eye to become inflamed, but at once cleared up again upon the introduction of the antitoxin.

Dr. Cobb said that his own experience with the serum had been very similar to that of the previous speakers. It occasionally proved beneficial, but often failed to have any effect; but in those cases in which it did succeed, the success was so brilliant that he could not but believe that there was a great deal in Dr. Dunbar's theory. We should not forget that hay fever was due to a variety of causes; that some cases were due to various pollens, or to the inhalation of dust, to horses, etc., and we should not expect one kind of serum to cure them all. The theory of the serum treatment had not yet been carried as far as it eventually would be. The golden-
rod and ragweed from which Dr. Dunbar's more recent serum was made was collected for him in this country by commercial firms, and the plants probably became more or less stale before they reached the laboratory. In cases where the serum was effective, it certainly appeared to have a marvelous influence.

Before concluding, Dr. Cobb asked Dr. Loeb what he meant by an excessive dose of the serum? Whether he simply meant more than Dr. Dunbar had advised? Also, what were the evidences of an excessive dose, and whether the directions given by Dr. Dunbar in regard to the treatment in foreign countries also applied to this country?

Dr. H. W. Loeb, in closing, said the reports of the serum treatment made by the various speakers were very similar to those obtained by the majority of men who had been working along this line. They had obtained no result in perhaps the larger number of cases, and startlingly good results in a comparatively few instances.

Dr. Loeb said that personally he had become very enthusiastic in regard to this method of treating hay fever. Last summer he spent about three weeks with Dr. Dunbar, and had become imbued with his earnestness and serious study of the subject. He did not hesitate to tell his patients that the serum would help their hay fever, and he believed that the very psychical elements of which Dr. Logan had spoken had to be combatted. There was something else beside the paroxysm; namely, the psychical condition of the patient. This enthusiasm was a necessary part of the treatment, and any man who was opposed to the remedy, or regarded it doubtfully, could not be expected to make very satisfactory clinical observations regarding it.

Some of the speakers had referred to horse hay fever. Dr. Dunbar had pointed out that these horses carried the pollen with them all the time, and in driving it was freely blown back and inhaled by the susceptible individual. Pollen was also found in the dust of the streets, and was continually kept stirred by the horses' feet. Dr. Dunbar had also proven absolutely that in experimental hay fever the roughness of the pollen grains had nothing to do with the production of the paroxysms. They were not due to irritation, but to a toxalbumin, which was found in connection with the starch bodies. In a certain individual, one particular antitoxin might be of no value, be-
cause the disease was produced by the toxin of another albumin.

So far as dosage was concerned, Dr. Loeb said he could not specify it. He began with a very minute dose, and did not increase it if he could get along without doing so. Large doses apparently aggravated the symptoms. It was necessary to determine the dose in each individual case.

Dr. Loeb said he did not observe the directions given by Dr. Dunbar regarding the patent's sleeping apartments. He simply let the patient understand that if he exposed himself to a large amount of pollen toxin, the antitoxin would proportionately fail to relieve the symptoms. The patient was made to understand that he should not expose himself unnecessarily.
Syphilis of the Nose.

Symposium—Syphilitic Manifestations in the Upper Air Passages.

PAPER:
SYPHILIS OF THE NOSE AND UPPER AIR PASSAGES.

JAMES E. LOGAN, M. D.

No subject in medical literature has been more thoroughly studied nor more exhaustively written upon than syphilis, and yet when we compare our knowledge of this with that of many other diseases we find astonishing deficiencies. In diagnosis, symptomatology and treatment we are wonderfully proficient, while in pathology we are seriously lacking. It would require much more time than is allotted this paper to discuss the pathology of general syphilis, though it would afford interesting reading. No greater honor has ever been accorded a man in our noble profession than will be given to him who discovers the true original etiologic factor in this most dreaded malady, and no one will ever render a greater service to mankind.

Primary nasal syphilis is of rare occurrence, and we wonder that more cases are not reported when we consider the uncleanly habits of the class of people in which this disease mostly abounds.

Buckley, from an analysis of 9,058 cases of extra-genital syphilis, found 95 primary lesions in the nose; he personally found one case in 113 reported. In 2,244 cases observed by Bassereau, Clerq, Lefort, Fournier and Ricord, primary nasal lesions were found in two. In 292 cases of extra-genital reported by Fournier and Martineau, not a single one exhibited a primary sore in the nose.

The favorite site for the nasal chancre is upon the cartilaginous septum, which is probably due to the fact that in this locality there is often an abrasion of the mucous membrane. Some have been found on the under surface of the alae, and a few have been observed higher up in the vestibule. The finger nail seems to have been the most frequent means of conveying
the infection—infected instruments have been regarded as the offending agents in some instances.

The initial nasal lesion does not differ essentially in character from that found elsewhere. Diagnosis may at times be difficult. Before the breaking down of the papule, which may require several days, the condition may be readily mistaken for an ordinary furuncle. The principal factors in determining this are the question of time, together with the amount of lymphatic involvement. Forty-eight to sixty hours will usually conclude the formative stage of a furuncle, while the chancre will be slow—sometimes requiring a week or more to develop.

The furuncular process invades the surrounding lymphatics but slightly, while the chancre will extend to glands not only close by, but to those situated some distance from the seat of infection—such as the submaxillary, the sublingual and even to the post-auricular and cervical regions. The furuncle is usually located in and about the hair follicles, while the chancre is most often found upon the septum or upon the membrane lining the vestibule or turbinates.

The chancre may be confounded with the tubercle.

Nasal tuberculosis is very rare indeed and the writer is not aware of a case reported as one of primary invasion.

The symptoms of pulmonary involvement are nearly always present, and if any doubt exists the microscope will easily determine the presence of the tubercle bacillus.

It may be difficult at times to differentiate between a chancre and some form of malignant disease—such as carcinoma or sarcoma.

The symptomatology of malignancy usually points to pain—repeated hemorrhage and slow development without febrile manifestations—whereas the chancre seldom causes pain—rarely bleeds and often exhibits temperature changes. The microscope will again offer a sure solution of the difficulty.

The secondary stage of nasal syphilis is hard to recognize, due to the fact that but few and very indefinite symptoms are manifest during this period of the disease. But few patients fail to suffer from the so-called “Secondary Coryza,” though not many would be willing to venture a diagnosis based upon this fact alone, or indeed upon any nasal symptoms liable to be observed during this time.

Intuition is often treacherous, but many times have we all
seen cases of coryza with reddened alae, watery acrid discharge, and said to ourselves that we had a specific condition—there is that "unseen something" that tells us this—but it would be most unwise to give heed to this impulse without a careful survey of every symptom. Happily our resources are many and we resort to them for further confirmation. It is at this time that syphilides of distinctive characteristics, general lymphatic involvement, mucous patches in the mouth, and the like, are present, serving to strengthen the evidences found in the nose.

It has been noted by some writers that in those cases where secondary nasal symptoms are distinctly evident there often co-exists palmar psoriasis a manifestation of some rarity in the earlier stages. The writer has especially noticed this in one case.

TERTIARY PERIOD.

This is the particularly interesting stage of nasal syphilis. The writer has often ventured the statement before his medical students that the nose will more frequently and more delicately reflect the presence of a specific infection of long standing than any other organ in the body. This is rather easy of explanation when we consider that the nasal bones are most fragile as well as being richly endowed with blood, and it would be very natural that such a process, however slight, might invade these delicate structures. Notwithstanding the fact that this susceptibility exists, we seldom see tertiary manifestations in the nose till late in the history of the disease. Those cases that have undergone spasmodic treatment seem specially liable to nasal complications—such, for instance, that go to the various hot springs throughout the country and pass through the secondary stages with comparative rapidity.

In married women whose husbands have transmitted the infection, and where the attending physician has been over-cautious in keeping secret the real condition for fear of possible scandal, one will notice the remarkable prevalence of nasal involvement. The writer could report many such cases.

The lesions of this stage are extensive and oftentimes very destructive. But few diseases offer symptoms with which these might be confounded—lupus, tubercular necrosis and malignant neoplasms might present some difficulties in diagnosis. Lupus is distinctly a skin disease and as such evidences are
usually present. Tuberculous pulmonary symptoms will rarely fail to clear this obstacle, while malignancy can almost always be excluded by the ever-present symptoms of pain. The microscope will give valuable aid.

PATHOLOGY.

The submucosa, which serves as the periosteum of the bone, is primarily affected, followed by diffuse inflammatory processes developing in the bony framework.

Differing from some authorities upon this point the writer believes that the bony structures are affected before changes in the mucous membrane are noticeable. The breaking down of the membrane is due to the cutting off of the circulation by pressure on the blood channels, rather than to inflammatory infiltration into the connective tissue. The gummatous nodule develops, primarily, in the space between the periosteum or peri-chondrium and the bone or cartilage, and not in the mucous membrane. Pressure due to this focus of inflammatory deposit produces necrosis of the bone or cartilage. A gummatous node undisturbed by pressure, such as we find in the brain, lungs, larynx, etc., grows to large proportions and sooner or later undergoes fatty degeneration. Histologically these tumors consist of small round cells surrounded by giant cells. Some of these cells reveal the presence of the Lustgarten bacillus. The adjacent tissues show inflammatory proliferation and the walls of the blood vessels are hyperplastic. Any part of the bony framework may be attacked by this disease, but the vomer and perpendicular plate of the ethmoid are especially predisposed to incipient necrosis. In the experience of the writer a large majority of cases have exhibited this fact.

The next in point of frequency are the turbinates—the inferior being usually first to give evidence. The membrane covering these bodies presents a blanched expression, such as we find in a vasa-motor coryza, discharging a purulent secretion. The tissues are highly congested with venous blood due to stasis from underlying pressure. This engorgement is more or less permanent—that is to say, it does not disappear until the bony structure gives way and necrosis takes place. If the septal conditions are not checked the floor of the nose will surely become involved and extensive destruction of the hard palate takes place. The nasal bones, together with the nasal processes of the superior maxillary are likewise very
Syphilis of the Nose.

Early affected, a condition which, if allowed to progress, results in the characteristic "saddle nose."

It is hardly necessary to enter into any detailed account of the conditions resulting from this disease. Everything depends upon the time at which we see the case, the general condition of the patient and the willingness of the individual to carry out a vigorous course of treatment.

ACCESSORY SINUSES.

Primary infection of the sinuses adjacent to the nose is hardly likely to occur. We fail to find mention of such condition unless the orbit be considered accessory.

The same may be said of the secondary period excepting the coryzal symptoms manifest also in the nose. Tertiary bones necrosis is very common. The fragile walls and cell partitions are very surely involved if the disease is allowed to progress. The frontal and ethmoidal are the first to be invaded, and later the sphenoidal body.

A very interesting case has lately come under the observation of the writer, which will serve to verify the statement previously made that the nose was a fertile field for reflecting a latent infection, as it exhibits a sphenoidal sinus complication without involvement of the frontal or ethmoidal bodies.

H., age 64 years—surgeon—was infected upon the finger two years ago while operating.

Treatment during secondary period consisted of injections of gray oil and inunctions of mercurial ointment covering a space of eighteen months—symptoms disappeared and patient considered himself free from danger. Six months later he applied to me for treatment of his nose, complaining of soreness and pain located about the septum, and closure of the right nostril causing difficult breathing; examination showed a small ulcer located at the junction of the cartilaginous and bony septum. Treatment was applied locally and the patient urged to take iodide of potash to full effect and continue same indefinitely. Imbued with the true surgeon's spirit, he proceeded to take this drug without regard to size of dose or stomachic endurance.

In due time the nasal symptoms disappeared and very shortly thereafter the stomach refused to serve its purpose. He discontinued his medicine. Ten weeks ago patient suffered what was supposed to be an attack of la grippe—complained of violent post-occipital pains—had little or no tem-
perature—lost flesh rapidly—grew steadily weaker. I was called in to examine him and soon discovered a large necrosing ulcer at the juncture of the basilar process with the sphenoid, extending down the posterior border of the septum and invading the nasal surface of the soft palate.

**HEREDITARY SYPHILIS.**

A very interesting question regarding the "infecting period" of the parent has been discussed at great length by syphilographers, and it is a matter of the greatest importance to the surgeon.

Many times we are asked, When is marriage permissible? Without going into detail upon this phase of the subject, you will pardon the digression of the writer when he says that never should a surgeon encourage such a step until every possible chance of infection has disappeared. Three years under the most favorable conditions is none too soon. At least a year should elapse after every symptom of the disease has vanished.

Most syphilitic children are born into the world with secondary symptoms. The skin manifestations are most prominent and are usually unmistakable—mucous membrane, especially of the mouth and nose, are nearly always affected at birth or soon after. The secondary coryza or "snuffles" is usually present, together with mucous patches of the pharynx and mouth.

Children born of this misfortune often present a characteristic physiognomy. The flattened bridge, the illy-developed alae, the sunken face, all go to make up a diagnosis which is beyond question.

The tertiary conditions in patients of hereditary infection are similar to those found in the acquired type.

Upon the question of treatment, the writer desires to offer a few suggestions.

*First*—Waste no time in preparing a patient's general condition to be followed later by anti-specific medication. Tertiary destruction is too rapid to admit of any delay.

General anemia, a disordered digestive apparatus—in fact, all disturbed functions—will respond under proper attention devoted to the dominant malady. No medication directed to the relief of a patient's general health will avail anything when a specific infection is destroying the physiologic function of every organ in the body.
Second—Iodide of potash is the greatest potential agent in the hands of the physician. A careful study of the physiologic effect of this drug must be made upon each patient. It is seldom that any two individuals can be treated alike.

Third—Never push the drug to its full physiologic effect—that is, to the point of producing a catarrhal condition of the nasal mucous membrane and conjunctiva—nor to a point where the stomach will refuse to act. This can usually be avoided by giving it in gradually increasing doses. The method invariably employed by me is to begin with ten-grain doses to an adult one hour after each meal, increasing one grain to each dose every other day. I employ an aqueous solution in which one drop represents one grain. The time at which the medicine is taken is a most important point. Any sooner than an hour after meals will surely bring the stomach to an early refusal of the drug. The best results are not obtainable by giving the dose an hour or less before meals.

A catarrhal condition of the stomach will likely result from this method.

You will pardon the writer for indulging in this rehash of treatment, but it is surely a fact that failure in these cases is attributable more to the mismanagement of our therapeutic agent than to its inefficiency.
I regret very much that I have nothing new to offer in this symposium. Little advance has been made in methods of diagnosis, and little that is new, tried and true, is offered in the way of shortening the treatment. It is gratifying to know that when recognized, we feel assured beyond a reasonable doubt that our science offers practically a specific for the thorough eradication and elimination of the disease, if the afflicted is willing to be patient and persevering in the treatment. We are firm in our belief that the disease can be accurately diagnosed, though it may take a few days' or weeks' observation in some cases to establish the fact—also, the disease can be without reasonable doubt, cured—failures of which there are so many, being due not to the physician but to carelessness and neglect on the part of the patient.

It is not my purpose to occupy valuable time in attempting a text-book method in this part of the symposium allotted to me—this can be obtained in much better form from the many invaluable text books which are now so easily within reach. I regret, Mr. President, my own inability to add to the fund of knowledge on this subject, and will content myself not with attempts at description and giving minutea of the essential details in the recognition of the disease, but rather to the emphasis of certain points observed in my personal work.

Syphilitic manifestations in the naso-pharynx, ear, and buccal cavities are nearly always of the secondary or tertiary form. I do not recall having met a single instance of primary infection, the chancre—in these localities. Unfortunately, the microscope or laboratory tests and examinations offer us but little aid—the peculiar and important bacillus never having been discovered. In the naso-pharynx, it is the mucous patch or ulceration that produced the discomfort that brings the
patient to us for examination and treatment of what is usually supposed to be a simple sore throat. In many cases consulting us, we can obtain no history of the primary lesion, and I have learned not to rely upon the history given, but by what is seen in the patient.

We have been taught "to look upon every true ulceration of the mucous membrane as either syphilitic or tubercular"—and it is seldom that I have found that teaching misleading—indeed, so seldom that I have been inclined to test the accuracy of my own observations rather than that of the teaching.

I am convinced that tubercular lesions of the naso-pharynx and fauces are so rare that they may be almost regarded as the exception to the rule. However, I make it a rule to use every known method to eliminate the one or the other before giving an opinion or beginning the treatment. In case of the tubercular we have, as a rule, other symptoms of the septic systemic infection, and can bring to our aid the thermometer, stethoscope, and microscope, but in the syphilitic these are of little value to us. The ulcerations in both diseases look so nearly alike that without considering other aids than ocular inspection, I question my ability to decide which is which. I have examined cases side by side, each pronounced in characteristics—one syphilitic and the other tubercular—with very little difference in general appearance, except the tubercular ulceration existed upon an anemic, relaxed membrane, and with evidence of general toxemia. The microscopic examination of septum and the stethoscopic examination of lungs made the distinction in diagnosis.

The distinction mentioned by Kyle and others that "the syphilitic ulceration had a fairly smooth floor and side, and not rough and shaggy and not very deep, as in the tubercular ulcer," I have not been able to define.

My observation confirms that of many others, that the liquifying necrosis is more rapid in syphilis than in tuberculosis, and in the tertiary form of syphilis the area surrounding the lesion is of a reddish or purplish red color. I have met both the secondary and tertiary forms in all ages from four to sixty years. The youngest case of secondary manifestation—the mucous patch—was in a boy thirteen years of age—the youngest manifestation of the tertiary form was in a child five years old.
Deafness and dysphagia are the symptoms most frequently complained of in the cases of secondary and tertiary syphilis of the naso-pharynx that have come under my observation, and as a rule have yielded readily to mercury and sodii iodd, given in daily increased doses, until the system was saturated with the drugs—then continued for several years in tonic doses. The chief point in the treatment being to saturate the system as rapidly as possible, carefully looking after the eliminative action of the alimentary canal, kidneys and skin. The mercury is given by mouth and inunction and the iodd of soda largely diluted with water. The mixed treatment used in every case where the naso-pharynx and fauces is involved because it is more rapid and arrests the destructive process of ulceration quicker and thus lessens the amount of cicatricial tissue and number of adhesions.

It must be borne in mind that the first evidence of the disease met in the naso-pharynx is not always the mucous patch or ulceration, but gummata on the posterior wall and vault of the pharynx are sometimes seen before they break down into the state of ulceration. When these wounds are revealed by posterior rhinoscopy they should, in the absence of a syphilitic history, be looked upon with suspicion and watched carefully for confirmatory evidence of their true nature.

In the cases of syphilis of the ear that I have met the diagnosis has been made more by exclusion of other causes and by inference, and because anti-syphilitic treatment gave best results. Several cases of middle ear and labyrinthine disease in which no syphilitic history could be obtained and in which no external evidence of the disease existed, after all other means failed to make an impression or gave evidence of any improvement, a thorough course of Mercury and Iodd gave most gratifying results.

Syphilitic manifestations in the buccal cavity are seen more frequently in the secondary stage in form of mucous patches on the palate, anterior portion of the fauces, side of the tongue and lips. The primary form of the disease is sometimes met with in chancre of the lip, and I have seen one case, in the practice of a colleague, of typical chancre of tip of the tongue.

The general systemic treatment is the same, it matters not what portion of the naso-pharynx, ear or buccal is involved. The local treatment consists in keeping parts clean and making topical application to the lesion to relieve pain. For the first
part, some preparation containing hydrogen diox. with formalin, 25 per cent of each in water, to be used frequently as a wash; for the second nothing has given the relief and apparently held in check the extension of the ulceration as chromic acid in 10 or 20 per cent solution, carefully applied to every part of the ulceration, with cotton-covered probe. Before applying the acid, the parts should be thoroughly cleaned and dried.
PAPER:

SYMPHILITIC MANIFESTATIONS IN THE LARYNX AND TRACHEA.

FRANCIS R. PACKARD, M. D.

As one would naturally expect, the manifestations of syphilis in the larynx and trachea are almost entirely confined to those of the secondary and tertiary periods of the disease. In fact, Bosworth (Diseases of the Nose and Throat, Vol. II, p. 383) states that he knows of but a single case of chancre of the larynx reported in the entire literature. This was reported by Moure (Lecons sur les Maladies du Larynx, Paris, 1890, p. 229). The sore occurred in a young man, 22 years old. It made its appearance on the free border of the epiglottis, and was followed by the development of secondary symptoms. Secondary syphilitic manifestations in the larynx are not uncommon and may be, broadly speaking, classed as (a) syphilitic laryngitis, and (b) the mucous patch. Syphilitic laryngitis is a very frequent manifestation of secondary syphilis. It may occur as the result of an extension downward of a syphilitic pharyngitis, but it is probably more often entirely independent of any lesion of the neighboring tissues, and is a local manifestation of the general infection. The most prominent symptom is the characteristic raucous tone which the voice assumes. As Lennox Browne (Diseases of the Throat and Nose, p. 382), "When once appreciated the raucous syphilitic voice is so distinctive that the practiced ear will recognize the disease as soon as the patient speaks." The patient, as a rule, complains of no pain or local discomfort. On laryngoscopic examination, the appearance presented is very characteristic. There is a marked erythema, somewhat mottled in appearance, especially affecting the vocal cords. The discoloration is much less vivid than that seen in an ordinary acute congestion of the larynx. It is dark red bordering on purple.

Mucous patches when they occur in the larynx are usually found on the epiglottis or the vocal cords. The chief evidence
of their presence is due to their interference mechanically with phonation. Their appearance when viewed with the laryngoscopic mirror is the same as that of mucous patches elsewhere. They form small discrete, elevated, grayish patches, generally sharply circumscribed with well defined edges.

Midway between the lesions of secondary syphilis, the erythematous laryngitis and mucous patch, and the lesions of tertiary spphilis, the gummi with deep ulceration, we find the so-called "superficial ulcer," or, as Whistler termed it, "re-lapsing ulcerative laryngitis." This is a local ulcerative process which extends more deeply into the tissues than does the mucous patch, but does not show the extensive ulceration which accompanies a gummi. Whistler bestowed the name "re-lapsing ulcerative laryngitis" upon it because of its tendency to frequent outbursts of activity following upon periods of quiescence.

By far the most common manifestation of syphilis in the larynx is that of the tertiary period of the disease, the gummi and the ulcerative lesions and cicatricial contractions which follow in its train. Gummi of the larynx is generally of very late development, many years after the appearance of the initial sore. Its most usual location is the epiglottis, although the vocal cords are very frequently its site. It usually appears with considerable suddenness, giving rise to a good deal of pain and interference with phonation. Examination of the larynx shows the gummi as a smooth, rounded tumor. Laryngeal gummata generally begin to ulcerate and break down within a remarkably short time after they form, consequently the characteristic true gummatous appearance is rarely seen. When a gummi does break down it forms what is most generally known as the deep syphilitic ulcer of the larynx. The frightful results of this ulceration are, unfortunately, probably only too familiar to all laryngologists. The tissues seem to literally melt away. As the ulceration is usually at first not attended by much pain, or alteration of function, it often progresses to a terrible extent before it is recognized. A patient will present himself with the history that for some weeks or months he has had some pain and slight impairment of phonation, accompanied by profuse mucopurulent expectoration, often containing streaks of blood. Examination reveals an ulcerative process possibly involving the entire epiglottis, or even a large part of the vocal cords. Cases have been re-
corded in which extensive edema of the larynx accompanied the ulceration, requiring in some instances the performance of tracheotomy for relief.

Probably the most familiar picture presented to laryngologists in syphilis of the larynx is that made up of the adhesions, contractions and distortions resulting from the cicatrization of deep syphilitic ulcerations. The destruction may involve the entire epiglottis or the vocal cords, or we may find those structures existing but twisted and contorted by strong cicatricial tissue. Or the true or false cords may be adherent to one another in such a way as to leave nothing but the merest chink for the passage of the air. In all the reparative processes of syphilis it is characteristic to find the formation of strong adhesions, such as those which follow on a larger scale after severe burns. These will sometimes twist the laryngeal structures in such a way as to render it impossible to definitely locate the site of the stricture of that organ. There is also such submucous thickening and infiltration of the larynx following syphilitic ulceration that it is frequently necessary in these cases to perform tracheotomy because of the encroachment on the lumen of the larynx.

Syphilis of the trachea must be regarded as very rare. Lewis A. Connor (American Journal of the Medical Science, July, 1903), in a paper on "Syphilis of the Trachea and Bronchi," states that Morell Mackenzie had seen mucous patches in the trachea only five times, and that no case of the initial lesion of syphilis occurring in the trachea has been recorded. Conner in this paper reported one case of syphilitic stenosis of the bronchi and analyzed 128 recorded cases of syphilis of the trachea and bronchi. Although he considers such cases as very rare, he justly remarks that they bear an importance quite out of relation with their great rarity because, "first, that in almost every recorded case they have gravely threatened life, and in most cases have actually caused death; and, second, that, from a study of the cases it seems quite evident that a very large proportion of them are curable if they can but be recognized and treated early." As a rule, cases of tracheal syphilis do not fall into the hands of the laryngologist. From Dr. Conner's analysis it would appear that they are very seldom diagnosed intra vitam, and even so their treatment is generally carried out by the internist unless the dyspnea becomes so urgent as to demand tracheotomy.
The treatment of syphilis of the larynx and trachea is, of course, first and foremost the specific measures appropriate to the treatment of the lesions of secondary and tertiary syphilis, wherever found. It is generally wise, however, to push the mixed treatment hard, mercury and potassium in large doses will sometimes avert a threatening extensive destruction of laryngeal tissue, or melt away a gummi in a marvelous manner. Locally soothing and cleansing sprays and inhalations will add to the comfort of the patient. The mucous patch will often disappear more rapidly if touched occasionally with a strong solution of silver nitrate. For ulcerations, whether superficial or deep, insufflations of iodoform will be found beneficial. Here again applications of strong solutions of nitrate of silver, or of some of the various preparations of silver in egg albumin with which our wholesale drug firms love to flood us, will be found of service. Most authorities agree in stating that the stenosis of the larynx in tertiary syphilis is not due to an infiltration, but to cicatricial contraction, and inflammatory adhesion of the tissue, and accordingly constitutional treatment is of no avail. Bosworth is particularly cautious concerning the use of potassium iodid, which, he believes, when used under these circumstances, frequently excites an iodic laryngitis. For the removal of the structure of the larynx, innumerable instruments and operations have been devised. They all aim at permanently enlarging the opening through the strictured portion of the larynx. There are many forms of dilators, bougies, and cutting dilators, but most of them fail in the great majority of cases to attain the object for which they were devised, the great obstacle to permanent success lying in the obstinacy with which syphilitic strictures recur. As J. Solis Cohen (Diseases of the Throat and Nasal Passages, p. 524) states, "success in cases of this kind would seem to require exposure of the interior of the larynx by external division of the thyroid cartilage, and excision of the whole of the cicatrical tissue." In many instances the only resource is found to consist in the performance of a low tracheotomy, with subsequent permanent retention of the tube. Intubation gives relief in some cases, but if the deformity of the larynx is great it may be very difficult to insert a tube so that it will remain.

One striking, and we might almost say, the only cheerful feature of cases of cicatricial lesions in the larynx is the won-
derful manner in which many of them retain their power of phonation. There is a compensatory action of some kind which counterbalances to a great extent even large losses of tissue.

DISCUSSIONS ON SYPHILITIC MANIFESTATIONS IN UPPER AIR PASSAGES.

Dr. Thomas H. Farrell of Utica, N. Y., said that in the treatment of late syphilitic lesions he differed with Dr. Logan in his method of administering potassium iodid. Instead of beginning with a ten grain dose of an aqueous solution, given after meals and increased one drop daily, Dr. Farrell said he invariably gave it one hour before meals, well diluted with milk, and increasing each dose by one drop. Given in that way, the drug rarely caused gastric irritability, and was usually well tolerated.

Dr. James E. Logan, in closing, said the point he wished to emphasize in his paper was that it was very important to gradually increase the dose of potassium iodid in the treatment of tertiary syphilitic lesions. If, for example, the patient was getting forty or fifty grains of the drug three times daily, and the stomach became irritable, he would not increase the dose until the gastric symptoms had disappeared, when he again would begin to gradually increase it.

In cases of syphilis where secondary and tertiary symptoms were present coincidently, the mixed treatment was indicated. There might be secondary symptoms in the digestive tract, and tertiary symptoms in the upper respiratory tract. The speaker said he had seen cases where there were mucous patches in the mouth and pharynx, and necrosis of the bones of the nose at the same time.

For the tertiary manifestations and gummata and necrotic conditions, when not accompanied by secondary lesions, potassium iodid, in gradually increasing doses, was the treatment par excellence.
PAPER:

REPORT OF A CASE OF ABSCESS IN THE TEMPORO-SPHENOIDAL LOBE OF THE BRAIN, FOLLOWING AN ACUTE OTITIS MEDIA. OPERATION—RECOVERY.

THOMAS H. HALSTEAD, M. D.

The case presented in this report has several valuable features which make it seem worthy of being reported rather fully.

E. F., male, aet. 11 years, complained of pain of short duration in the left ear on February 4th, 1905. Four days later the pain and tinnitus recurred, lasting for more than an hour. The next morning his appetite was poor, there was no earache, but he remained home from school. On February 11th there was slight earache, the tinnitus continued, but the boy was not sufficiently sick to have a physician called until February 13th, when Dr. A. C. Mercer was called to see him. He was dressed and about the house, his only complaint being that of earache, severe at times but usually not so, and a blowing noise in the left ear, slight fever and no headache. I was asked by Dr. Mercer to see him the next day. He was lying on the couch dressed; said his ear ached somewhat, complained of the tinnitus and deafness of the left side. On examination the drum-head was enormously swollen, bluish red, and bulged into the canal; some tenderness in front of the ear, but very slight on pressure over the mastoid. Temperature 100 degrees F. Under cocaine anesthesia I made a free incision through the posterior and superior segments of the drum-head. This was followed by a free flow of blood, and later a muco-purulent discharge. He was greatly relieved by this, and I did not see him again for nine days, though he was seen in the meantime by Dr. Mercer. The discharge was free for four days, when it ceased.

Dr. Mercer had been having Dr. W. H. May make blood examinations of a number of cases of scarlet fever and measles and comparing the result with the blood of his other patients,
and in this way it happened that a blood examination of this patient was made on February 20th. The differential count showed polynuclears 89 per cent, lymphocytes 10 per cent, eosinophiles 1 per cent and an actual leucoeytosis of 18000 w. b. c.

From February 14th to the 23rd the boy made very little complaint except that "he felt sick and weak all over," and although he was ordered to bed was dressed and about the house most of the time. Anorexia was very marked. Although at each visit Dr. Mercer took his pulse and temperature, no record was made and consequently they are not available, but the temperature was usually from 100 degrees F. to 101 degrees F., on one occasion 103 degrees F. The pulse varied from 100 to 120, but about the 20th it became slower and its character was good. During these nine days the most striking symptoms were the anorexia, listlessness, and absence of pain in or about the head or ear. He looked decidedly ill, but was not able to indicate any special seat of trouble, complaining, however, of the slight tinnitus. I saw him on the 23rd. On examination the drum membrane was healed, no perforation and no discharge, no redness of the drum; it was quite opaque and lustreless, no bulging. There was no tenderness whatever in front of the ear or on pressure superficial or deep over the mastoid.

There was no indication of any pus in the middle ear or mastoid. He complained of no headache, but was very quiet and listless. A few minutes before we reached the house he had vomited, this being the first time this symptom had occurred, and because of this we considered the possibility of some intra-cranial complication, but concluded this to be improbable. The pupils were normal in size and reacted normally. From the 23rd to the 26th of February, when I saw him next, he continued to grow more and more listless; the vomiting occurred several times a day, and the pulse dropped from 65 to 60. When Dr. Mercer and I saw him together on February 26th, at 2 p. m., his cerebration was distinctly slow; slow to answer questions, and anexoria was very marked, vomiting becoming more frequent, and once he cried out with headache, clapping his hands to the sides of his head on one occasion when he coughed. This was the only time throughout the whole sickness that he said his head ached, and this he did not localize. Dizziness was present; constipation not
marked: temperature normal, pulse 54 and regular, pupils sluggish though equal and reacted to light. The drum membrane looked almost normal, light reflex was present, lustre had returned and the appearance was much better than at previous examination three days before. No mastoid tenderness, pain or swelling, either externally or on the postero-superior wall of the canal. A diagnosis of brain or epidural abscess was made and we urged an immediate operation. This was consented to and he reached the Women's and Children's Hospital at 5 p.m.

Blood count showed hemoglobin 90 per cent, reds 3,760,000, whites 24,687. Urine sp. gr. 1040, no albumin, no sugar, amorphus urates. Drs. Marlow and Locke examined him at the hospital, the former making an ophthalmoscopic examination, finding the discs normal, no optic neuritis. Kernig's sign was present. Both concurred in the diagnosis made and he was etherized at 6 p.m. An incision reaching from the tip of the mastoid, extending upward parallel with the insertion of the auricle and carried well forward in front, was made. The antrum was entered and the mastoid cells completely removed from the tip to the anterior cells at the root of the zygoma. There was absolutely no evidence of any inflammation in the mastoid. The lateral sinus was then exposed freely and from beneath the dura there was an escape of some serous exudate with which we thought we saw an occasional drop of pus mixed with the blood, but finally concluded that we were mistaken in seeing any pus, the appearance being due to the reflection of light in the blood. The tympanic roof was next exposed and some of the bone, together with a portion of the squama, removed. The probe, passed carefully under the dura in various directions, failed to reveal anywhere the presence of a epidural abscess. It was thought best not to explore the brain in the absence of any more definite focal symptoms, but await developments, especially in view of the removal of the pressure through the escape of the serous exudate. The lateral sinus was apparently not affected. The wound was dressed in the usual way and the patient left the table at 8 o'clock in good condition.

During the night he vomited a round worm five inches in length and at the morning visit we found his symptoms had changed for the better. Temperature 98 degrees F., pulse 64, respiration 20, no vomiting, no headache or dizziness, and his
mental condition was altogether clearer; in fact, he was so bright in every way that the parents insisted that the worm had been the cause of the whole sickness. During the day the pulse varied from 64 to 88, temperature 98 degrees F., respiration 16 to 24; no vomiting during the day, but during the night he vomited once. The next morning, February 28th, at 7:30, he had a severe convulsion. The interne, Dr. Rosenteil, described it as follows:

"When first seen the body was rigid, pupils equal, arms somewhat flexed and thumbs turned in the palms. In a few minutes the left pupil dilated widely, and the right became very small. There was a fine tremor in the muscles of the right thigh and leg. The left leg was turned toward the right. The pupils then began to equalize in size, the body became less rigid and the first movement was in the left arm. The convulsion lasted about fifteen minutes." At this time he was in a stuporous condition, respirations irregular, pulse 45-55, right pupil contracted and fixed. No strabismus, deviation or oculo-motor palsy. Deep reflexes, right side exaggerated, left side normal. Patellar reflex exaggerated on the right side.

Kernig's sign was present and Babinski's reflex present. He was given ether, and while under the ether the right pupil became contracted to pinhead size and left dilated almost to limit. I was assisted in the operation by Drs. A. C. Mercer, Locke, Breese, and Rosensteil.

The bone over the sigmoid sinus, which had been removed in the greater part of its length in the first operation, was now completely removed in its full extent, and in doing so the veins of the diploe bled most profusely and it was with the greatest difficulty the bleeding could be arrested, and just as it was being controlled a fresh hemorrhage from the sigmoid sinus occurred and almost proved fatal. The patient became exsanguinated and pulseless. An intra-venous transfusion of 1000 c. c. normal saline solution was given in the vein of the right arm, the pulse returned and the operation was resumed. Firm pressure with a gauze pad was maintained over the sinus during the rest of the operation, the pad not being removed for five days.

The squamous portion of the temporal bone was now freely exposed. The temporal ridge, together with a circular piece of bone of the squama three-fourths of an inch in diameter, was removed with forceps. The dura looked somewhat pale
and bulged slightly. An incision was made through the dura and a probe pointed director pushed into the temporo-sphenoidal lobe. This was immediately followed by a flow of clear fluid, evidently cerebro-spinal, and this by a profuse flow of grayish green pus, quite thick and without odor, and about two ounces in quantity. Artery forceps were introduced into the abscess cavity, distending it gently until the abscess was emptied, and the cavity, which was about two inches in depth, was packed with selvage edged iodoform gauze. The external wound was packed with iodoform gauze, care being taken to maintain pressure over the lateral sinus. The patient was taken from the operating room in a precarious condition without much hope of his living more than a few hours. Saline enemas were ordered, and these were continued for ten days (every four to six hours), and to them much of his rapid recovery is attributed. At 5 p. m. the day of the operation, temperature was 99 degrees, pulse 136, respiration 20.

March 1st, temperature varied from 99.2 degrees F. to 100 degrees F., pulse 96 to 112, respiration 18. Slept well. No headache, dizziness or vomiting. The pus from the brain abscess reported to be streptococcic.

March 2nd, abscess cavity dressed, and a large quantity of pus came with the packing. From this time on the abscess in the brain was dressed every second day, selvedge edge iodoform gauze being used. The abscess was syringed but once, at the time of the first dressing, when the quantity of pus was very great. The pressure pad over the lateral sinus was removed on the fifth day and there was no further hemorrhage. On March 28th, i. e., thirty days from the time of operation, the wound in the brain had closed, and the mastoid wound was closed one month later, all dressings being discontinued two months from the time of operation. The patient sat up on the 35th day and walked out doors on the 46th, leaving the hospital at the end of two months from time of admission. The temperature remained practically normal after the first two weeks. The pulse for a few days, as a result of the tremendous loss of blood, was about 120 to 140, but after the first week it varied from 100 to 80. Respiration 18 to 22. There was no headache, dizziness or vomiting at any time following the operation.

At time of leaving the hospital, May 1st, the blood count showed hemoglobin 90 per cent, reds 4,340,000, and whites
11,250. He has gained greatly in weight, is bright mentally, and, barring a slight limp in the right leg, is perfectly well. This limp gradually lessened so that it was gone three weeks later. On May 18th his hearing for the watch was on the right side 46 inches, left (affected ear) 25 inches.

There are several interesting features in this case. In the beginning there was comparatively slight earache for the first nine days of the otitis media, there was unusual bulging of the drum-head, complete relief of earache followed incision, 100 degrees F. and never lower than 98 degrees F., and re- and the discharge ceased at the end of four days with a healing of the drum-head at the end of ninth day, possibly earlier. From this time there was almost no complaint regarding the ear or head, but a marked anorexia, listlessness, change in disposition, and an absence of definite symptoms pointing to a brain complication until vomiting, dizziness and a slow pulse occurred ten days from time of incision of drum-membrane. Headache was conspicuously absent, excepting once. There were no mastoid symptoms at any time. The blood count six days before the first operation showed a marked leucocytosis and on the day of the operation this was very decided. Following the first operation for twenty-four hours there seemed to be a marked relief of all symptoms, attributed by the parents to the vomiting of a long round worm, by us to the relief of pressure afforded by exposing the dura and allowing the escape of an appreciable quantity of serum. Thirty-six hours from time of this operation, however, a sudden convulsion, marked lowering of pulse, pupil changes, vomiting and beginning stupor, showed the diseased area had not been reached, and that probably a rupture into one of the ventricles had occurred. This latter supposition was apparently verified by the escape of first clear cerebro-spinal fluid, followed immediately by thick pus from the abscess cavity when this latter was reached. The success of the operation was greatly handicapped by the venous hemorrhage first from the diploe and then from the sigmoid sinus, so that the patient almost died of hemorrhage on the table before the abscess was entered. Only venous saline transfusion saved him then, and the saline enemas were of great value later.

His recovery was rapid and without incident. The loss of bone was very great and the extent of dura exposed very large, and has been frequently observed in other cases, granulations
Report of a Case of Temporo-Sphenoidal Abscess.

and healing over the dura was very rapid. The abscess was in the temporo-sphenoidal lobe, was apparently as large as an egg, holding at least two ounces of pus, and the infection was streptococcic. The mastoid was entirely uninvolved, infection reaching the brain probably along the sheaths of the lymphatics or veins, passing through the tegmen tympani.

DISCUSSION.

Dr. James E. Logan of Kansas City, Mo., said the case reported by Dr. Halsted was a most interesting one. A peculiar feature of the case was the temporary improvement that followed the vomiting, and the expulsion of the worm. The case was an obscure one in many of its phases, as the symptoms that pointed to a brain abscess might also have been the result of gastro-intestinal disturbance caused by the presence of the worm. Dr. Logan said he could sympathize with Dr. Halsted in the difficulty he encountered in controlling the hemorrhage from the diploe and sigmoid sinus during the second operation. He recalled such a case in his own experience where the bleeding was so profuse that transfusion was necessary to save the life of the patient.
Nasal sinusitis, on account of the widespread interest which has been manifested for several years by the medical profession in the endeavor to arrive at a clearer understanding regarding its pathology and best methods of treatment, make the subject pregnant with interest to us as rhinologists. In the case which I report for your consideration, aside from the desirability of reporting all cases of intracranial involvement consequent upon accessory sinus disease that something may be added to our knowledge of this important class of cases, there are several points of interest.

K. C. male, age 40 years, was seen in consultation on October 13th, 1904, and the following history obtained:

Family history negative.

Personal history; for about 10 years has been troubled with "Catarrh," some nasal obstruction and dropping in the throat. For the past two or three years he had noticed a yellow discharge from each nostril, with increasing nasal obstruction. Contracted colds easily, followed invariably by severe neuralgia and a dull heaviness at the root of the nose. These symptoms would usually be relieved by an increased flow of yellow thick discharge. For several months the patient had complained of aprosopoeia, a disinclination to apply himself to his business, depression and apprehension concerning his sanity. Of this he had several times spoken to his family. His present illness began two weeks prior to my seeing him, with what was supposed to be one of his usual severe head colds. This was followed by quite severe pain at the root of the nose, finally spreading over the entire left side of the face. Two days later there appeared some swelling and edema at the upper and inner part of the left orbit, which quickly spread, involving both lids, conjunctiva, cheek and left side of the nose. At this time the infiltration and swelling of the lids and orbital
tissues was so great that it was impossible to obtain a satisfactory view of the globe. For the next week his general condition grew gradually worse, temperature running from 100 degrees to 103 degrees F. pulse from 90 to 115, mental hebetude gradually drifting into stupor and finally mild delerium developed. Proptosis increased and three days before I saw him there appeared a small swelling over the left temporal region. This slowly increased in size, and at the same time the proptosis, infiltration, edema and swelling of the left side of the face and orbital contents gradually diminished. It was at this stage I saw the case and upon examination found the following: Patient fairly well nourished, temperature 101 degrees, pulse 100, face flush, drowsy and cerebration slow and hesitating, responding to commands with a syllabic drawl. Motility of eyes was unimpaired, left pupil reacted sluggishly to light stimulation. Slight amount of swelling of the upper lid and chemosis of the conjunctiva of left eye. On a line with and about one inch posterior to the external angular process of the temporal bone, was a smooth rounded tumor about one and a half inches in diameter. This was not especially tender to pressure and fluctuation was not detected at this time. On examining the nose I found the following condition: Right nostril—Slight turgescence of the inferior turbinate, the middle turbinate pushed well over toward the median line by a number of polypi springing from the region of the ethmoid cells, pus appearing in the middle meatus between the polyps. Left nostril—General deviation of the septum to left, greatest deflection at upper part. Inferior turbinate swollen, middle turbinate pushed well over and crowded against the septum, presenting a deep bluish red congestion and a swollen boggy appearance. Springing from the region of the ethmoid and filling the middle meatus were several large polyps bathed in thick pus. With the probe dead bone could not be detected in either nostril. The history and findings in this case left little doubt as to the diagnosis. It seemed clearly evident that he was suffering from an intracranial involvement following an acute exacerbation of a chronic suppurative ethmoiditis. From the fact that this patient was in a small town some distance from the city and as I had no suitable instruments at hand, I advised his immediate removal to the hospital, where it was my purpose to give drainage to such collections of pus as could be found. He was seen at
the hospital next morning but his condition was so precarious that I did not feel warranted in subjecting him to any prolonged operative procedure, so satisfied myself with freely incising the swelling over the temporal region which proved to be a subperiosteal collection of about two ounces of pus. The patient remained in stupor with muttering delirium, sub-sultus tendinum, high temperature and pulse, involuntary urination, Cheyne-stokes respiration and died twenty-four hours later. After death the wound was examined to determine the path of infection. It was found to have originated in the ethmoid cells, broken through the os planum stripping the periosteum from the roof of the orbit extending outward and downward to the external angular process of the temporal bone and there passed out to form the subperiosteal collection of pus, referred to above. Dead bone could readily be detected in the region of the os planum by passing a probe along this route. My finger in the wound would follow subperiosteally the orbital roof, as far as the sphenoidal fissure. Although no rupture in the periosteum was detected, I think we are justified in assuming that this was the path of infection and that a rupture had taken place at some point with subsequent involvement of the intracranial structures. Our failure to find a rupture does not, in my opinion, alter the value of the evidence that this was the path traveled by the infection. It is, of course, possible that in my examination, a break in the continuity of the periosteum, may have escaped me, or again the area of disintergration may have taken place within the cranial cavity, the infecting material being poured directly into the arachnoid space with a resulting general septic meningitis.

In studying this case the points of interest are: First, the fact that this patient died from a meningitis the result of nasal suppuration is of interest as clearly exemplifying the dangers in neglected cases of this character. We need only consult the literature of this subject to be convinced that the reports of fatal cases are rare.

Secondly, the path of infection seems to have been an unusual one, the pus finding its way across the orbital cavity to the external angular process and there leaving it forming a large subperiosteal collection. Traveling backwards it entered the cranial cavity through the sphenoidal fissure, apparently remaining subperiosteal throughout.
Thirdly, the question of diagnosis and prophylaxis is probably of greatest interest, and it is for us as Rhinologists to sound the warning note and impress upon our fellow practitioners the importance of instituting appropriate treatment in all cases of nasal suppuration, before they have reached such extremity. Although fatal cases are rare, it is nevertheless a possibility in every case of suppurative sinusitis.
A hitherto unrecognized manifestation of a disease whose clinical history and pathology are well understood, should always be noted for the benefit of medical science.

The association of edema of the pharynx with acute nephritis is certainly a new observation and deserves to be mentioned on this account.

Except perhaps in one instance, no reference is made to this peculiar phenomenon. Prof. Moritz Schmidt in his excellent work on Diseases of the Nose and Throat says something concerning the subject, but as to detail of symptoms his description of the disease is not specific.

During the month of March last and extending into April, there prevailed in the city of St. Paul and vicinity an epidemic of tonsillitis. Adults and children alike were affected, sometimes members of a whole family at the same time being afflicted by the disease. Generally speaking the tonsillitis was of the follicular variety and in many instances infectious. The toxic nature of it was usually evidenced by such complications as cervical adenitis and general debility of the patient, slight continued fever and anemia; or convalescence was retarded by the systemic infection, due in all probability to septic elements which entered the general circulation through the tonsillar tissue acting as a portal.

It was quite common to find albumin in the urine and in a certain percentage of cases active inflammation of the kidneys was induced and formed a grave aspect of the disease to contend with.

The experience of this epidemic naturally leaves its impression and teaches the all-important lesson that acute exudative follicular tonsillitis is not always a local disease but may extend beyond the throat in its septic character and involve organs more or less remotely situated.

Of edema of the throat other than that of the pharynx, the following may be said: Edema of the uvula is frequently met with under ordinary circumstances, and may be due to a
The Significance of Edema.

variety of causes, but it has no connection as a factor with edema of the pharynx. When evident mouth-breathing exists, edema of the uvula is often present, or it may co-exist with peritonsillar abscess, etc., etc. Whether it be traumatic or idiopathic in its nature or as sometimes happens, it co-exists in throat affections, edema of the larynx is not an infrequent disease. But edema of the pharynx cannot be thus considered, it is a very, very rare affection.

Of special significance therefore is edema of the pharynx and as clearly demonstrated by the history of the case which I am about to relate, it bears a significant relationship to acute nephritis.

I am indebted to Dr. Chas. L. Greene, the attending physician, for having been able to see the patient.

For the purpose of furnishing definite data the following synopsis of the previous history of this case, taken from his case record, was given to me by Dr. Greene:

"E. M. W., aged 70.

Under observation for two years, suffering from occasional attacks of partial incompensation associated with double aortic disease and mitral leakage.

In March during the convalescence from a sharp attack of influenzal bronchitis, patient's temperature rose suddenly to 103 with chill, and he presented the usual signs of quinsy, left tonsil being affected. Under vigorous treatment the local lesion and fever subsided in 48 hours. On the following day, the temperature rose to 101.6 and he suddenly developed a brawny swelling at the angle of the left jaw. For 48 hours this continued to increase in size, was at first external then suddenly changed its seat and appeared internally, the superficial swelling markedly subsiding. Up to this time the urine had been normal in amount and presented no unusual appearance, being frequently examined.

On April 6th, Dr. J. E. Schadle saw the case and found no edema or evidence of suppuration though there was slight internal infiltration and the glands were very much swollen.

On April 9th, symptoms of dyspnea suggested an impending laryngeal edema. Dr. Schadle was again called and found marked edema of the pharynx, the larynx however having been found normal in appearance on laryngoscopic examination.

The urine passed on the morning of April 10th, showed an
acute nephritis which persisted for about one week acutely, subsiding gradually. The urine became normal in about 30 days.

At the present time, May 25th, it shows no trace of albumin, and normal solids. The patient is practically well.”

Nine days previous to my first visit the attending physician called in consultation Dr. Goodrich for a surgical opinion regarding the character of the pharyngeal swelling and the glandular involvement of the neck. From the behaviour of the trouble in the throat, the formation of a retro-pharyngeal abscess was suspected by the surgeon.

Dr. Goodrich told me that at the time of his first visit, March 28th, the patient presented marked tumefaction of the left side of the pharynx and swelling, and tenderness of the sub-maxillary and sub-cervical chains of glands. The adenitis also involved the chain of glands beneath the sterno-mastoid muscle of the left side of the neck.

The pharyngeal tumor not only suggested the idea of the presence of a retro-pharyngeal abscess but also that of pus deeply seated in the lymphatic region of the neck, which condition he thought was responsible for the edema of the pharynx.

He advised local applications of cold to the neck over the affected glands and a throat spray of adrenalin. In the course of twenty-four or thirty-six hours there was an apparent subsidence of the local symptoms.

After a short interval there was again a rise of temperature, acceleration of the pulse, the glands of the neck began to swell and edema of the pharynx reappeared. The same local treatment as before was again resorted to with similar results. In this manner four successive attacks took place in the course of nine days. Each attack was ushered in by chilly sensations and a rise of temperature. The mental condition of the patient varied at these times. In the language of Dr. Goodrich: “When constipated and tongue coated, edema of the parynx was intense. When not constipated and tongue clean, no edema was present and the lymphatics of the neck were much reduced.”

On April 6th, at the suggestion of the attending physician, Dr. Goodrich asked me to visit the patient with him as they were apprehensive of another attack coming on as was evidenced by the usual prodromic symptoms—chill and rise of temperature. On examination I found the lymphatic glands
of the left side of the neck somewhat swollen and tender and a digital examination of the throat and naso-pharynx revealed nothing but a slightly swollen state of the posterior pillar of the fauces on the left side. An ocular inspection by reflected light verified the result of the digital palpation. Being questioned as to the possibility of the presence of a retropharyngeal abscess, my answer was negative. The characteristic sign of such a condition were not present.

Two days elapsed before I saw the patient again when on the evening of the 9th, I was urgently asked by the attending physician to visit Mr. W. as he thought he was in a precarious condition and was suffering from severe attacks of dyspnea.

On examining the patient at this time the left side of the pharynx was very much swollen and resistently resilient to touch or pressure while the lymphatic glands of the neck on the same side were greatly enlarged and painful on pressure. A careful examination of the throat with the finger showed the existence of a tumor situated in the region of the pharynx behind the posterior pillar on the left side, extending downwards toward the larynx and across anteriorly toward the base of the tongue and immediately below the inferior margin of the tonsil. Laryngoscopic inspection revealed the tumefaction extending laterally beyond the median line of the laryngo-pharynx toward the right side of the throat, above the epiglotitis, which condition obstructed to a greater or less degree the function of respiration. Severe vomiting and retching were present. The larynx itself was seen to be normal in appearance, hardly so much as hyperemic.

The conclusion arrived at was to the effect that we had either an edema pure and simple to contend with or that there was the presence of pus deeply seated somewhere in the neighborhood of the swollen structure either of the neck or of the throat. In order to ascertain as to whether or not pus was present in the affected tissue of the throat, deep linear incisions were made with the bistoury into the pharyngeal tumor which was in the form of an elbow at right angles, i. e. a vertical and horizontal arm. No pus manifested itself; but a sanious, serous fluid issued from the incisions.

On the morning of the 10th, the tumor showed considerable reduction in size. With a view to prevent a recurrence of grave throat symptoms more incisions were made. An examination of the urine was made. It was found
by analysis that the urine contained large quantities of albumin, and also casts. It seemed to the writer that this information gave a satisfactory solution as to the cause of the local phenomena appearing in the throat and neck. The patient in my opinion was suffering from an infectious nephritis brought on primarily by an attack of tonsillitis.

My confreres at first doubted the correctness of this theory, but since the kidney lesion has disappeared and there has been no return of the pharyngeal and lymphatic complications, they confirm it.

The patient was placed daily in hot packs for a number of times and put on a restricted milk diet, accompanied by supportive heart tonics. Recovery gradually took place, without pus appearing either internally or externally of the throat.

Edema of the pharynx and the glandular disease of the neck disappeared and did not return again as improvement of the kidneys progressed.
THE ETIOLOGY AND TREATMENT OF MYCOSIS OCCURRING IN THE UPPER RESPIRATORY TRACT.

(PRIZE ESSAY BY JOHN SENDZIAK, M. D.,)

The following are the particular varieties of mycoses met with in the upper respiratory tract:

I. Mycosis leptothricia—causative agent, leptothrix buccalis.

II. Mycosis sarcinica—causative agent, a variety of the sarcina.

III. Actinomycosis—the causative agent being the actinomycetes.

IV. Mycosis aspergillosis—caused by various kinds of aspergillus.

V. Mycosis mucorina—produced by certain varieties of mucor. This, according to some authors (Cixlinski, Hewelka, Sendziak, as well as Schmiegelow), causing the so-called "black-tongue.”

VI. Mycosis oidica (soor) caused by the oidium albicans.

I. MYCOSIS LEPTOTHRICIA.

Its synonymous terms are mycosis tonsillaris benigna (B. Fraenkel), pharyngo-mycosis leptothricia (Heryng), algosis (Plycosis), faucium leptothricia (Jacobson), and finally hyperkeratosis lacunaris (Siebenmann).

In the year 1873 B. Fraenkel, a distinguished professor of laryngology in Berlin, was the first to draw attention to the hitherto unknown pathologic process—the formation on the faucial tonsils, as well as on the base of the tongue of white and grey, prominent, strongly adherent tufts, which being removed with difficulty, soon reappeared. Under the microscope, these tufts were shown to consist of epithelium and microorganisms (bacilli and coci); in the second case observed by the same author (in 1880) the examination showed for the most part leptothrix buccalis. Fraenkel found the bacillus fas-
cultatus present in this case. The course of this disease, to which the author gave the name “mycosis tonsillaris benigna” is without fever and chronic in character.

In the year 1883, Heryng of Warsaw made a minute histologic and bacteriologic examination of six cases. He gave a detailed description of this disorder, which, because of the constant existence in the tufts of leptothrix buccalis, he called pharyngo-mycosis leptothricia. These tufts are mostly composed of horny flat epithelium, surrounded by small, white, granular masses and threads of the leptothrix. These latter color blue with iodin.

Since that time great attention has been drawn to this pathologic process, and articles began to appear in all the countries of Europe as well as in America, where the greatest interest was manifested in this disease, one-third of all the papers published appearing in America. French, German, and English literature is replete with papers on the subject, but in Denmark, Sweden and Norway there has been very little written, which can be explained only by the lack of suitable material in these countries.

Besides the articles mentioned by Fraenkel and Heryng, Siebenmann of Basle (Switzerland), published the results of a minute histologic and bacteriologic investigation, from which he arrived at a different conclusion than that of either Fraenkel or Heryng. He held that the essence of this process consisted in a cornification of the lacunar epithelium:—hence his definition of the process—“hyperkeratosis lacunaris.”

The etiology of mycosis leptothricia has not been positively decided. There exists two principal theories:

(a) The parasitic, and
(b) The chemical theory.

The parasitic theory has the greatest number of adherents. According to this theory the ordinary inhabitant of the oral cavity—the leptothrix buccalis—is the causative agent of this pathologic process. As already mentioned, both Fraenkel and Heryng found this organism in this disorder. Alone, or in great preponderance over other organisms present, this agent was found by the following: Semon, Wingrave, Kinny, Gray, Santabo, Provost, Ruault, Nabias, Sabrazés, Ferré, Krakenberger, Chiari, Jacobson and others.

Some authorities (Hemenway, Rauge), while not denying the parasitic origin of mycosis leptothricia, do not regard the
leptothrix buccalis as the causative agent. They hold that other micro-organisms found normally in the oral cavity can produce this type of mycosis also (Parser, Tidswell). In justification of their opinion they cite the fact that leptothrix buccalis is often found on the gums in the neighborhood of carious teeth, a condition in which we do not usually meet with mycosis leptothricia (Hemenway). Chiari, basing his opinion on the observation that there exists only an increase in the number of leptothrix buccalis present, does not regard mycosis leptothricia as an independent pathologic process.

It was Kyle, an American, who, basing his opinion on very minute bacteriologic investigations (in the year 1891), became convinced that in this disorder the micro-organisms act a secondary part, their action principally consisting in causing a chemical reaction in the tissues and secretions. The non-parasitic origin of this disease was also held by Higuet and previous to him by Toeplitz. The claim for priority of the chemical theory, however, belongs to Prof. Siebenmann, who in the year 1895 observed and made a histologic and bacteriologic study of six cases, and who gave out the basis of the chemical theory, endeavoring to limit the role of the leptothrix buccalis in the disorder to that of a simple "saprophyte."

As the principal feature of this disorder, he regards the exceeding strongly marked cornification of the lacunar epithelium. He noted under the microscope the existence of corneous epithelium without nuclei, which protruded in shape like a corneous thorn. These thorns have a central excavation filled with detritus, mucus, and micro-organisms. The parts of such thorns which protrude from the crypts of the tonsils are covered on their external surface with a network of leptothrix.

Referring to the above-described process, this author proposes to change the hitherto used term, mycosis leptothricia, for another more suitable, viz.: hyperkeratosis lacunaris, regarding the latter as an analogous pathologic process to that known as pachyderma of the larynx, leucoplakia of the oral cavity and to a certain extent comparing it to the so-called "black tongue." In regard to the last-named disease, however, opinions are also divided, as we shall see later.

Siebenmann's theory did not find many adherents; but Kraus (Vienna), Lincoln, Friedland, Richardson (America) and Hall (London) are among those who believe with him.

Kyle maintains that we must distinguish two pathologic
forms: one which we regard as mycosis leptothricia being simply keratosis, in which condition he disagrees with Siebenmann as to the localization of the pathological process in the crypts of the tonsils, and consequently in his opinion the definition "hyperkeratosis lacunaris" is inapplicable; and, secondly, a form of typical mycosis leptothricia, i.e., a disease depending on the presence of leptothrix buccalis. Kyle also holds that there exists cases of mycosis leptothricia without the participation of the leptothrix buccalis. However that may be, in many typical cases of keratosis we do meet with this microorganism.

The greatest number of authorities, and among these I number myself, are of the opinion that we are dealing with a typical mycosis caused by the leptothrix buccalis. (Figs. 1 and 2.)

In reference to the term leptothrix buccalis which was introduced into medical science for the first time by Robin, according to Miller, the author of an excellent monograph on the micro-organisms of the oral cavity, we must understand the constant inhabitant of the buccal cavity to be leptothrix inominata, bacillus maximus buccalis, spirillum sputigenum and spirochete dentium. Of these the most important is the bacillus maximus buccalis, which Kraus claims is identical with the leptothrix buccalis of Robin.

This organism presents itself in the shape of bundles composed of parallel threads, 1 to 1.3 micra in width, which color, in a solution of iodon dissolved in potassium iiodid, a blue-violet. In the soft white sediment on the teeth, one finds leptothrix inominata as well as leptothrix maxima buccalis, and a similar organism, the bacillus maximus buccalis, which colors yellow in iodon. The iodococcus vaginatus appears usually in small chains composed of 4-8 cells sticking on the integument, and colors as follows: the cells become bluish violet, the capsules slightly yellow. There has been no success in obtaining pure cultures of leptothrix buccalis, although Jacobson maintains that in 3/4 of his cases he seemed to obtain the culture from the tufts situated in the crypts of the tonsils.

Great development of this inhabitant of the oral cavity seems to favor fermentation in the mouth, as well as to cause acidity of the saliva (Fraenkel); it predisposes to caries of the teeth (Kyle); and may aid in predisposing to gastric trouble (Donnellan, Richardson).
Mycosis leptothricia of the upper respiratory tract is by no means as rare a disease as was formerly supposed, but is rather of frequent occurrence. The literature to date places some hundred cases on record, which for the period of time—a little more than thirty years, i.e., from the first description of this disorder—is proof enough of its comparative frequency.

I observed mycosis leptothricia 42 times in about 20,000 patients: that is, once in every 500 patients. Krakenberger met with the disease much more frequently, namely, 11 times in 579 patients; on the other hand, Prof. Jurasz (Heidelberg) observed it only 3 times among 4,000 patients. What is the cause of this difference in the statistics? I am of the opinion that the reason for this lies in the fact that Jurasz's material came from the policlinic, i.e., from among the poor who were undoubtedly less liable to become afflicted with mycosis leptothricia. My material is composed of ambulatory (16 cases) as well as private practice (26 cases from among the general number of 10,000 patients), while Krakenberger's cases are mostly from his private practice.

Mycosis leptothricia is relatively more frequent in females than in males—24 to 18 was the ratio in my cases. Other authorities (Krauss, Rosenberg, Phillips) have made similar

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**Fig. 1.**
Micro-organisms of the oral cavity (leptothrix buccalis, etc.).

**Fig. 2.**
Aspergillus fumigatus.
American Laryngological, Rhinological and Otological Society

observations. Heryng had 8 cases in females and 6 cases in males.

The ages of my patients who were afflicted with this disorder were as follows:
- between 10 and 15 years there were 5 cases,
- between 15 and 20 years there were 11 cases,
- between 20 and 30 years there were 13 cases,
- between 30 and 40 years there were 10 cases,
- between 40 and 50 years there were 2 cases,
- between 50 and 60 years there was 1 case.

The above figures show that mycosis leptothricia occurs in the respiratory tract mostly in adults, especially between the ages of 15 and 40 years. 34 cases, almost 4/5 of all, occurred in these ages; before 10, and after 40-50 years of age its occurrence is very rare.

There are only two cases on record below the age of 2 years—the age of Dubler's patient was 8 months.

In reference to the influence of occupation, my cases present the following:

Of 24 females, 15 were unmarried, 7 married and 2 were widows; of the 15 unmarried, 9 were pupils and 1 was a governess; of 18 males there were 4 schoolboys and 2 students, besides 4 landed proprietors, 1 engineer, 1 cashier, 1 civil officer, 1 pensioner, 1 joiner, 1 watchmaker, 1 cook and 1 tailor.

The frequent occurrence of mycosis leptothricia in the “school age” of both sexes, markedly so in girls, is striking. That they are predisposed to it at this time is likely, although unhygienic conditions as well as overburdening them with work is also of importance. It is more difficult to understand the frequent occurrence of this disorder among landed proprietors who live under conditions that seem least predisposing to the development of this mycosis. In my cases, I have noted the frequent occurrence of mycosis leptothricia in the better classes, i.e., in private practice.

W. C. Phillips made the peculiar observation that this disease occurs especially in young women very fond of pets, such as dogs, cats and horses, and H. H. Curtis observed that almost every one of his patients had been accustomed to eat raw apples which very often had been licked by such animal pets.

In Myles' cases keratoid spots developed suddenly during an exclusive milk diet.

Undoubtedly one must reckon among the predisposing
causes of this disorder bad health (Semon), although, as I have mentioned before, healthy people are not free from this mycosis.

In five of my cases—young girls—there were distinct symptoms of anemia, and in one case, the patient had a typical chlorosis.

Rosenberg observed the disease in a pregnant woman.

Further, I noted in one of my cases—a female 33 years of age—symptoms of tubercular affection of the lungs. Richardson’s observations show the presence of more or less pronounced gastro-intestinal disturbances.

The predisposing causes of this disorder may be summed up in saying that a diathesis to this disease has been noted (Root), that any catarrhal affection of the upper respiratory tract, and the acute infectious diseases play some predisposing role—Glasgow having noted the disease as following influenza—but the abuse of alcohol and tobacco do not play an important part as a predisposing agent. I only noted the abuse of tobacco in two of my cases.

The localization of mycosis leptothricia in the upper respiratory tract: According to Siebenmann’s theory, i. e., of keratosis, the oral portions of the pharynx, especially the faucial tonsils and their crypts, are the seat of the lesion. Hemenway even proposes the term mycosis tonsillaris. I do not support this proposition. There can be no doubt that mycosis leptothricia can embrace any part or all of the upper respiratory tract extending from the nasopharyngeal cavity (Garel, Labit), affecting for the most part Luschka’s tonsil, extending even to the ostia pharyngea tubarum (M. Schmidt), and finally involving the fossa Rosenmuelleri (Law) and ending at the larynx,—or at the laryngeal surface of the epiglottis (M. Schmidt, Grant). The disease has been observed at the aryepiglottic ligament (Dubler); Root has seen it at the sinus pyriformis; the vocal cords have also been affected (Price-Brown), and even that portion of the larynx below the cords has been the seat of the disorder (Cobb, Dubler).

All these cases speak against Siebenmann’s theory. On the other hand, it is unquestionably true that the most frequent seat of mycosis leptothricia is the faucial tonsil. In my cases these were affected 15 times, the left one 8 times and the right 5 times; in the remaining two cases both tonsils were equally affected; the left tonsil alone was affected 3
times, the right alone only once. In a relatively larger number of cases the tonsils and the base of the tongue, i. e., the lingual tonsil, were the seat of mycosis leptothricia—this occurred 13 times. Both Fraenkel and Kraus believe this region the most frequent seat of the disorder. Heryng saw the affection of the tonsils, alone, 7 times and 7 times he observed the disease also involving the base of the tongue. A rather rare case of this mycosis, in which it was situated on the body of the tongue, was observed by Tuttle.

The disease is principally situated in the crypts of the tonsils; exceptionally, however—as seen in one of my cases—the principal seat of the lesion is the lingual tonsil at the base of tongue. I saw the lesion on the lingual tonsil alone in 3 cases. Rarely both faucial tonsil and pharyngeal tonsil are affected simultaneously—this occurred in only one of my cases. I saw the whole pharyngeal ring involved only once; in two cases, the faucial tonsils, the pharyngeal walls, which were covered with granulations, and the lateral folds behind the posterior arches were affected. Once the faucial tonsils, the base of the tongue, the lingual tonsil and the pharynx were the seat of the lesion, and, finally, in one case the faucial and lingual tonsils as well as the laryngeal surface of the epiglottis were affected.

Summing up, there can exist the most varied combinations as to the location of the lesion. The rare case observed by Curtis, wherein the extension of the mycosis went through the nasal ducts to the eye, besides involving the pharynx and larynx, is a case in point. Once I observed laryngeal involvement alone—typical tufts on the vocal cords—and Grey saw the region of the arytenoid cartilage involved, the corresponding vocal cord being immobile. In Price-Brown's case the affection coated the ventricular bands and in Cobb's case the vocal cords and the lower part of the larynx were the seats of the lesion.

Clinical Picture.—Mycosis leptothricia in the upper respiratory tract shows itself in the form of more or less numerous pearly white, hard tufts or spots which are situated in the crypts of the faucial tonsil, the lingual tonsil, and sometimes seen in the follicles of the posterior pharyngeal wall. These tufts are characterized above all by a corneous consistency, having the appearance of thorns, or, as described by Schmidt, of stalactites; or by Toeplitz as condylomata. They are fur-
ther characterized by their exceedingly strong adherence to the adjacent tissues, their removal being attended with great difficulty, and followed by abundant hemorrhage. The tissues surrounding them may be entirely normal or in a state of catarrhal inflammation. It is a debatable question whether this latter condition has or has not a causal relationship with leptothrix buccalis (M. Schmidt).

These tufts, as a rule, form slowly, without inflammatory symptoms, although exceptionally they do occur in more acute forms (mycosis leptothricia acuta, or angina leptothricia). Of the last named disorder, cases were described by Santabo and Dubler (a case of a child eight months of age followed by death), Ruault, Spaans and Unterholzner (each observed 3 cases). Personally I saw four cases of leptothricia acuta.

The Course of the Disease.—The course of the disease is generally slow. It may last weeks, months and even years. Generally during the later periods the tufts begin to show ramifications. Their removal is then easier (Parker). The process may cease spontaneously. Ordinarily, however, mycosis leptothricia is characterized by great resistance to treatment and relapses are frequent, even after the most energetic attempts at complete removal of the organisms.

Symptoms.—Mycosis leptothricia may occur in the upper respiratory tract without giving any symptoms of its presence. Patients come for consultation, anxious because of "white spots" on their tonsils, or the physician only accidentally discovered the spots when looking for some other disease (Micke1son, Root). I, personally, had occasion to see such cases. Occasionally this disorder gives rise to a train of symptoms, as, for instance, scratching and pricking, burning, stiffness, fullness in the throat, disagreeable taste (Root), and pain in the throat (Ingals). In most of my cases there existed a sensation of a foreign body (the so-called paresthesia pharyngis); twice I observed fetor ex ore, and in 3 cases of Ingals, there were symptoms of dyspepsia; this was also the disturbing symptom in Richardson's cases.

Naturally in the acute forms of mycosis leptothricia there may exist dysphagia, fever and enlarged lymphatic glands of the neck (Spaan, Unterholzner).

Diagnosis.—The diagnosis of mycosis leptothricia generally does not present any difficulties, thanks to its highly character-
istic symptoms, namely, the appearance and consistence of these corneous tufts situated in the crypts of the tonsils, so that even without the microscope the diagnosis is possible (Kraus). In all my cases I was able to make this diagnosis a priori, after which I proved its correctness by the microscope. As to the differential diagnosis, the condition most similar to mycosis leptothricia is "tonsillaris caseosa" and this differs from it in the consistence of the tufts; here they are soft and easily removed, and are localized to the tonsillar crypts, while mycosis leptothricia may occur, as already shown, in any part of the upper respiratory tract—except the nasal cavities.

The microscope should solve all doubt as to mycosis leptothricia, the tufts being composed entirely of the characteristic threads.

For a rapid examination, Seifert and Kahn advise that the masses be rubbed on an objective glass, acidified with a few drops of lactic acid, and then colored with \( \frac{1}{2} \) drop of a solution of iodin in potassium iodid. The large bundles and heads of the leptothrix buccalis will show themselves colored blue. (Fig. 3.)

In cases of caseous tonsillitis, we meet with various organisms from the oral cavity, among which, however, there may also be the leptothrix buccalis, but then this organism is present in small numbers. Besides, as caseous tonsillitis is the result of a desquamative inflammatory process, the tufts will be composed of corneous epithelium, mucus, leucocytes, and particles of food, etc. In my opinion, a certain number of caseous tonsillitis cases, if examined minutely under the microscope, will turn out to be cases of real mycosis leptothricia. This took place in one of my cases. A woman of 33 years came to me with soft tufts in the crypts of both tonsils—the diagnosis of tonsillaris caseosa was made, but under the microscope leptothrix buccalis was found to be the true condition present.

Of the acute inflammatory processes, the condition most simulating mycosis leptothricia is the angina tonsillaris follicularis, wherein, however, the high fever as well as the swelling of the lymphatic glands of the neck is distinctive. Less similar is diphtheria; here we do not have to deal with tufts and spots, but with a membrane. At any rate, diphtheria sometimes simulates this disorder, and a proper diagnosis can be made only through the use of the microscope.

Prognosis.—The prognosis of mycosis leptothricia of the
upper respiratory tract is in general a favorable one; spontaneous recovery is possible (Semon). It took place in one of my cases. Relatively the prognosis is not so favorable. Mycosis leptothricia is a very obstinate disease and relapses are common. In literature there is recorded only one death—Dubler's cases, a child of 8 months.

_Treatment._—Some authorities, among whom are Semon, Schmidt, Richardson and Kraus, are of the opinion that in cases without subjective symptoms local treatment is superfluous, the more so as spontaneous recovery is a possibility. Where the general health is bad, treatment should be applied to remedy this—tonics, change of air, sea voyages, etc. (Semon, Wilson). In cases where such exist, correction of disturbances of the gastro-intestinal tract are indicated (Richardson). The greater number of authorities, and to their opinion I adhere, believe that local treatment should be undertaken, and that it should be of a most energetic nature in order to avoid relapses.

Besides gargles of bichlorid, 1 to 2000 and as strong as 1 to 1000 (Chiari), 1 to 500 (Parser) and even as strong as $\frac{1}{2}$ to 2 per cent (Puterman), 5 per cent zinc chlorid has been used by Nabais and Sabrasés; silver nitrate 1 to 25 per cent has been used by Powers and Tuttle; acido salicylic, 1 to 4 in alcohol, has been employed by Tilly; absolute alcohol is the recommendation of B. Fraenkel and Baber; pyoktanin, 10 per cent, is recommended by Curtis and Lincoln; formalin, 10 per cent solution, has been employed by Lederman; tincture of iodin by Grant; nicotin in a proportion of 0.2 to 100 by Jurasz. (In one of my cases I had good results from the use of this drug.) Chronic acid is recommended by Griffin, Prevost and Wagner, and finally trichloracetic acid alone, or after the application of the galvanocautery is recommended. a procedure which netted me the best results. Stern and Arnsperger recommend a radical method of treatment, namely, that of curetting the tufts with a sharp spoon; Root follows this with the galvanocautery. The best method is to puncture the crypts with a sharp cautery. This last named method has many adherents, among whom we count Heryng, Deckert, Seifert, Hemenway, Thomas, Cheatham, Hamilton, Kenny, Wartham, Price-Brown, Hall, Phillips and myself.

Pooley recommends free slitting up of the canaliculi; and curetting them in cases where the leptothrix is situated in the canaliculi of the tonsils.
The adversaries of the galvanocautery include Spicer, Ot-
tuszewsky, and especially Semon, the latter of whom, after
having cauterized mycosis, situated on the base of the tongue,
observed parotitis take place with high fever (40° C.). In
one of my cases I had disagreeable complications after the use
of the cautery on the lingual tonsil, high fever and great pro-
stration; this occurred in a woman 25 years of age.

It must be understood that wherever there exists a distinct-
ly expressed hypertrophy of the tonsil, this should be extir-
pated, and this is best done by means of the galvanocautery
snare, in order to avoid secondary bleeding.

Finally, I must note the favorable influence of tobacco smok-
ing upon the course of mycosis leptothricia, which was ob-
erved by Jurasz, Donellan, M. Schmidt, Collin, and finally by
me in a patient 30 years of age, who, after having commenced
to smoke, remarked, after a little while, that all the tufts on
his tonsils disappeared entirely, without any other treatment.
Of this observation I am sure. We must not forget, however,
that tobacco is a two-edged remedy and as such ought not to
be recommended (M. Schmidt).

II. MYCOSIS SARCINICA.

This disease occurs in the upper respiratory tract on the mu-
cous membrane of the oral cavity in persons who suffer from
disease of the lungs, pneumonia, bronchiectasia, gangrene, and
especially in persons suffering from tuberculosis or typhoid.
It occurs in patients having any catarrhal trouble of the mu-
cous membrane of the oral cavity—stomatitis; it is present in
marasmus patients, and it may occur in healthy persons.

From the oral cavity and the pharynx, the mycosis may ex-
tend to the lungs, as well as to the stomach, where the para-
site—sarcina ventriculi—was discovered for the first time by
Goodsire (1842) in stomach contents.

Sarcina enters the upper respiratory tract from the air,
where it is present in various forms. In the lungs we find the
colorless form, while in the oral cavity its most frequent form
is the yellow-green type. (See Fig. 5.)

This parasite is found on the mucous membrane of the
tongue, as well as on the soft palate (Fischer, Friedreich) in
whitish diffuse masses similar to mould (soor). Under the
microscope they present themselves as colorless or yellow-
brown, round or small oval cells 2.5 micra in diameter, which are chained one to the other (8 examples). They form small hexagonal figures, rounded at the angles and sometimes arranged in large patches.

Recent investigation has shown that we are not dealing with a distinct type of sarcina in any one condition, but that all or any kind may occur in the body which are found in the external air. Mycosis sarcinica has no particular importance. General symptoms are lacking. On the whole, little has been written on this question, and we must refer those interested to Fischer's paper.

III. ACTINOMYCOSIS.

The parasite is the actinomyces. The cause of this pathologic process was discovered in the year 1845 by Langenbeck, and in the year 1877 Bollinger discovered it in horned cattle, among which the disease is most common. To Prof. Israel, however, belongs the honor of having first definitely described this parasite as a substantial pathologic process in man.

Some authorities (Niessen, Hesse) maintain that actinomycosis depends on other parasites, among which is the cladothrix liquefaciens (Hesse), yet Wolff and Israel, as well as Ponfick and Bostrom, the most authoritative investigators of this disease, do not agree with this opinion.
The subject of actinomycosis of the upper respiratory tract is covered by many papers, the greater number of which were published in Austria, Germany, France and Sweden.

The parasite is usually transferred indirectly to man, exceptionally it is transplanted directly from cattle. Bardez observed a case wherein infection took place from the mouth of a man to the mucous membrane of a child by means of a kiss. This author believes that flies are also a source of possible infection.

Actinomycosis is primarily located in the oral cavity, on the alveolar process of the lower jaw (Mikulicz), causing periodontitis alveolaris. It rarely spreads through carious teeth to cause actinomycosis of the lower jaw itself. Rarely a primary pyorrhea alveolaris is present. When we see the patient there is usually the growth or abscess on the lower jaw, and sometimes fistulae, from which a slight amount of secretion exudes.

On the summit of the tongue the growth is very hard and strongly circumscribed. That it is sometimes localized there, is evidenced by the cases of Flackner, Bargez, Fischer, Mayer, Hochenegg, Albert, and finally by Bonnet, who, in his dissertation in the year 1896, cited 5 cases of this kind, finding the mucous membrane of the cheek also affected in the neighborhood of the ductus stenonianus (Partsch).

The growth on the tongue, in size equal to that of a pea, shows a slight predisposition to destruction.

From the oral cavity, actinomycosis may extend to the pharynx, producing great swelling in the palatopharyngeal region, with white-yellow nodules identical in appearance to follicular abscess. Retropharyngeal abscess, caused by the actinomycosis was observed by Schlinge. It seems to avoid affecting the faucial tonsils. Butlin, the author of the best monograph on diseases of the tongue, fails to mention any case of actinomycosis of the tonsils. More recently, however, Cheatle, Emory, Wright, Thevenat, Ruge, Mikulicz, Didsbury and Bonnet would seem to deny this observation in which Israel originally concurred.

Further, actinomycoses may spread to the larynx, affecting the arytenoid cartilages and the cords, and extending to the posterior mediastinum (Mündler). The involvement of the larynx may also take place by extension of the pathologic process from the external portion of the neck to the thyroid cartilage (cases of Henrici, Kochier, Bérard, Lubliner and
Mündler). I observed such a case in a patient 53 years of age.

Primary actinomycosis of the esophagus was seen by Garde (6 cases); its appearance in the esophagus, as a secondary process, was reported by Abbé.

In general, actinomycosis of the upper respiratory tract belongs to the rare diseases. There are published in literature some 200 cases in point. In some countries it seems to be almost epidemic, namely, in Austria and Germany, where about one-half of all cases recorded occurred.

The disease is twice as frequent in men as in women, which is explained by their occupation bringing them oftener in contact with cattle than does the occupation of women. It affects those between 10 and 40 years of age; below 10 and above 40 the disease is very rare. I had one case—a landed proprietor—who was 53 years of age.

The course of actinomycosis in general is chronic—rarely sub-acute—and exceptionally acute with purulent symptoms (Roosa, Kapper). On account of secondary infection with purulent micro-organisms, lymphatic involvement may be produced (Cheatle, Emory).

The symptoms of actinomycosis of the upper respiratory tract consist, in general, of very violent pains in the region of the pathologic process—in carious teeth; in neuralgic pains on the corresponding side of the face, although some authorities (Wright) give, as characteristic, the complete absence of pain. In acute cases there are present fever, chills and attacks of suffocation and pain during the act of swallowing (Kapper).

The diagnosis of actinomycosis should not be difficult, except in the beginning forms, where the condition presents nodular infiltrations, and then the disease is apt to be mistaken for malignant neoplasms (carcinoma). The chronic course, the greatly indurated surrounding parts, the slight excretion exuding from the fistulous opening, the localization of the trouble to the face and neck (Illich) and finally the noninvolvement of the lymphatic glands—all these points help in a certain degree to make the diagnosis. When the abscess is already formed, then the diagnosis is easy, because of the characteristics visible to the naked eye, the pus examined containing suspended in it the yellow grains, which under the microscope, after coloring with potassium, show the radiant structures with mace-like
ends of the actinomyces. They also color well by Gram's methods, or better still its modification, i.e., with the addition of carmine (Gram-Günter) the threads coloring bluish-black, the butts red. (See Figs. 6 and 7.)

Relative to the differential diagnosis, we must take under consideration the following pathologic processes: Gummata, which are undergoing destruction, carcinoma of the esophagus, tubercular growths especially, chronic abscess of the tongue, suppurating cysts and, finally, cysts. In all of these processes, however, the clinical picture, the history and examination of the lymphatic glands of the neck, and the microscopic examination which will give the characteristic yellow grains in the pus, will clear up the question of differential diagnosis absolutely.

Generally speaking, the prognosis of actinomycosis is not favorable, and this is especially true where the internal organs have become affected by metastatic processes, which may occur either in the brain, pleura, kidneys, liver, heart, lungs, etc. (Hesse). The prognosis is worse in cases of the lower jaw, larynx and esophagus, where there is inclination for its extension to the mediastinum. In cases of actinomycosis of the base of the tongue, where the process is circumscribed and, therefore, operable, the prognosis is more favorable. I may
note in passing, that in one of my cases of actinomycosis of the larynx, paralysis of the recurrent nerves of the corresponding side followed.

The treatment of actinomycosis occurring in the upper respiratory tract is primarily surgical in nature. Careful curetting or excision of the pathologically changed tissue is called for. Some authorities recommend the application of a 5% solution of carbolic acid, and 1 to 1000 bichloride (Korff); the application of $\frac{1}{2}$ to 1% methylviolet is recommended by Raffa, and nitrate of silver fused on a sound and introduced into the fistulous opening is used by Koettaitz. Finally, there are many adherents to the administration of potassium iodid internally, by which they seem to obtain recovery without operation. Among those who employ this method of treatment we count Lissa, Claisse, Béard and Heryng.

Besides the already described mycosis occurring in the upper respiratory tract, i.e., mycosis leptothricia, mycosis sarcinica, and the actinomycosis, we meet with various kinds of moulds.

The principal ones of these are classed under the hyphomycetes, aspergillus, mucor, and the oidium, and finally the rarer form—the penicillium. In the botanical sense these differ only from each other by the method in which they form their spores; as, for example, the mucor, where the fruit-carrying threads arise from the entangled mycelium bearing a little bag (the sporangium) in which are the spores (conidia). In the aspergillus, however, the fruit-carrying thread is thickened in the form of a mace to whose surface small "sterigmata" adhere, carrying the spores (Fig. 2). In the oidium variety the spores adhere directly to the fruit-carrying thread (Figs. 9 and 11). Finally, in the penicillium the fruit-carrying thread has ramifications very similar to small pencils on which the spores are formed. (Fig. 8.)

Among the various kinds of aspergillus and mucor observed in the respiratory tract, there have been found aspergillus fumigatus, glaucus and nigrescens, as well as mucor corymbifer and niger, the latter of which is the cause of the "black tongue" (Cixlinski, Hewelke); finally, penicillium glaucum is also found. The most important of all the pathologic mould parasites is the oidium albicans, the o. lactis (Robin)—the cause of "soor"—French, muguet—English, thrush. To this class certain varieties of yeasts also belong (blastosaccharo-
myces), as was demonstrated by the more recent investigations of Busse, Robinowicz, and especially by San Felice. (Fig. 10.)

The best method of examining these moulds under the microscope is as follows: A small quantity of the material is put in a drop of glycerine on an object glass and divided into very small particles by means of needles. It is then covered and examined with a strong dry lens. Coloring of the specimen is unnecessary, unless examined in tissues, when the method recommended by Weigert should be followed out.

The above-named moulds develop best at a body temperature. They grow best on sterilized bread cultures. Recent observations have shown that aspergillus and oidium are not substantial forms. The aspergillus is only a form of fruit-carrying variety of the Eurotium, while oidium is the conidial form of Erisyple. The last named, as well as the Eurotium, belong to the Ascomycetes.

IV. MYCOSIS ASPERGILLINA.

This variety of mycosis in the upper respiratory tract is rarely seen. The cause of this undoubtedly is due to the peculiarity of these organs. For example, in the nasal cavity the obstacle to the development of this parasite is the constant current of air passing through the nares (Deile), as well as the
constant bathing of the nasal mucous membrane in its natural secretions; further, the existence of purulent microorganisms (coci) are inimical to the development of these parasites, and finally, the temperature of the body is not a suitable one for their development. In the pharynx, however, a poor development of the aspergillus takes place on the mucous membrane covered with mucus; it also occurs on ulcerated surfaces where the secretions are fetid (Siebenmann).

Persons working in tanneries, or those dealing in leather, are predisposed to this disease, as leather is an excellent medium in which the development of the aspergillus occurs. In gen-

Fig. 10.
Yeasts (dregs) of beer.

Fig. 11.
Oidium albicans (fuchsin).

eral, this parasite occurs as a saprophyte, and is a habitant of living mucous membrane.

In the upper respiratory tract we meet with three varieties of aspergillus—fumigatus (the most frequent type), glaucus, and nigrescens.

There are only 8 publications on record, from which I quote:
1. The case of Dunn of Richmond, who two weeks after the cauterization of the nasal septum with chloroform, found a scab covered with brown-yellowish substance looking like fruit-jam, which under the microscope proved to be aspergillus glaucus.
2. Case of Delic of Leipsic, who found on autopsy aspergillus fumigatus in both nasal cavities in a case of ozena.

3. The case of Mackenzie of Baltimore, where in a patient suffering with empyema of the antrum of Highmore, the patient expelled some of the membrane of the sinus, on which there was found (under the microscope) aspergillus fumigatus.

4. Zarniko’s case: This was an analogous case to the above—a woman 50 years of age with empyema of the antrum of Highmore—the findings were aspergillus fumigatus.

5. Schubert’s case: A badly nourished woman 75 years of age, whose nasopharyngeal cavity was filled with a dark brown-green mass appearing clay-gray externally, with symptoms of total nasal obstruction, and who expelled a cast from the nose and nasopharynx, which, under the microscope, showed the external layer to be composed of degenerated mucous corpuscles and flat epithelium, while centrally the mass gave evidence of the presence of aspergillus fumigatus.

6. Siebenmann’s case, where the fold of the pharynx of an old woman was covered with scabs, which were composed mostly of aspergillus fumigatus and a. sidulans, as well as mucor corymbifer.

7. Dick’s case: A young healthy man, who showed between the arches of the faucial tonsils tufts of corneous substance of a blackish color, which, under the microscope, proved to be aspergillus nigrescens.

I must note in passing that Guarnacia of Catania (Sicily) observed 3 cases of otomycosis aspergillus (cause—aspergillus niger), which were cured by the use of hydrogen peroxid (with 20 % oxygen).

M. Schmidt observed aspergillus fumigatus, as well as glaucus, in the nose of a case with atrophic rhinitis.

V. MYCOSIS MUCORINA.

Mycosis mucorina in the upper respiratory tract occurs rarely. It appears in two forms:

1. Mycosis dependent on the mucor corymbifer.

2. Mycosis depending on the mucor niger—the more usual form.

The first form was observed by Paltauf of Vienna. A patient, 52 years of age, was suffering from enteritis and peritonsillitis circumscripta, with fever, cough and swelling of the spleen; the patient had icterus, as well as affections of the sen-
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Sorium. After 14 days death took place, and the autopsy showed, among other things, phlegmon of the pharynx and larynx which, microscopically, was found caused by mucor corymbifer. The case of Siebenmann, mentioned above, also belongs in this category.

The second form—mycosis mucorina nigra—occurs oftener, according to Cixlinski, Hewelke, Sendziak and Schmiegelow. It forms the essence of the so-called "black tongue." We understand by this term the pathologic process characterized by the appearance on the superior surface of the tongue in the neighborhood of its base, in front of the papillae circumvallate, of more or less extended discoloration—generally black, sometimes brown (Sendziak), or even yellow (Dinkler)—of an irregular oval form, or triangular, with an even, or more frequently, an uneven hairy surface. The process may be acute, lasting two days, or it may be chronic, lasting months and even years.

The disease is not as rare as it was formerly supposed, and we meet with it recently quite frequently in literature. There are about 50 articles on the subject, the greater part of which are English; then come the French and the German. Personally, I have seen 4 typical cases of "black tongue."

The English writers on this subject include Stocker, Broatch, Brydon, Barnes, Balfour, Graham, Masters, Smith, Lediard, Lake, Potter, Abercrombie and Semon; in America, Leviseur, Lohéac, Maraval, Goodale and Johnson have written; in France, Villar, Surmont, Wollerand, Lanois, Robert, Lecocq and Weil; in Germany, Schech, Bernhardt, Brosin, Dinkler; in Austria, Roth; in Poland, Rydygier, Cixlinski, Hewelke and Sendziak; in Belgium, Massoine and Parmentier; in Holland, Sell; in Denmark, Schmiegelow, and, in Russia, Gundobin.

What is the essence of the "black tongue?" Its etiology is not quite clear. We only know that it occurs more often in men than in women. (All of my 4 cases were males.) It seems to occur at a more advanced period of life—between 40 and 70, although it may occur in children. Gundobin's case was a child 1½ years old. Of my patients, the youngest was 30 years of age.

Some authorities (Cixlinski, Hewelke, Sendziak, Roth, Robert, Volmer, Maraval and Parmetier) believe this disorder due to the abuse of tobacco, which I noted in all of my 4 cases. Others (Gundobin and Lohéac) hold that it comes from dis-
turbances of digestion and acidity in the mouth. In one of my cases, a patient 30 years of age, the whole body, but especially the breast and shoulders, were covered with abundant hairs. In another of my cases, gastric disturbances were noted. In Lediard's case, there was present simultaneously with it cancer of the tongue; in Bernhardt's case, tabes dorsalis; Vollmer's case, stomatitis mercurialis; Sendziak's case, myelitis; Masoni's case, tuberculosis; Loheac's case, pregnancy, and again in Sendziak's case, spasms of the esophagus.

Dinkler observed the occurrence of black tongue following scarlatina.

Etiology: Most of the authorities, of whom I name Rosenberg, Bresgen, Schech, Brosin, Surmont, Wollerand, Rydygier, Stocker, Leviseur, Masoni, Potter, Vollmer, Goodale, Wingrave, Augier and Johnson see in the pathologic process a hypertrophy of the epithelium of the filiform papillae with secondary cornification (hyperkeratosis—Brosin, Schech). The dark color of the tongue seems to depend on the increased corneous pigment in the normal corneous cells, so that the older, harder and dryer the corneous layer is, the darker the discolorations will be.

Although some authorities, among whom are Schech, Rydygier, Wingrave, etc., found on examination various organisms —leptothrix, cocci, bacilli, etc.—they regard these as of accidental occurrence, having nothing to do with the etiologic factor of the pathologic process. On the other hand, in one of Sendziak's cases, where an autopsy took place, the pathohistologic examination of the tongue showed the characteristic traces of "black tongue," or, more properly, brown tongue. There were no distinct changes or hypertrophy or keratosis of the filiform papillae. At any rate, the idea of the parasitic origin of "black tongue" was suggested long ago by some authorities. Dessoix and Sell regarded this disease as a mycosis, depending on the so-called glossophytons, the parasite showing itself in the form of small oval globes, strongly refracting the light and giving a dark color to the papillae. (According to Brosin, who observed the case, they were not fully developed mould parasites, i. e., soor.)

Raymond also held to the parasitic origin of the disease. He found delicate spores, round or oval in form, situated on the filiform papillae. West is also of this opinion. Dinkler found in the sediment on a black tongue closely entangled threads
with sprouting excrescences, which were sharply pointed. Roth in 2 cases found very numerous micro-organisms, which he believes depend for their existence on this pathologic process. Lake found rounded spores in cases of black tongue, which he regarded also as the cause of this disorder. Butlin—the author of the best monograph on diseases of the tongue—also holds the opinion that the trouble is of parasitic origin. With this view Launers agrees, and Gundobin, who saw 8 cases, found various parasites—leptothrix, spirochete buccalis, oidium albicans, bacillus subtilis, staphylococcus albus, etc. Again Lecocq, as well as Loheac found leptothrix and spores similar to trichophyton.

All these observations, however, by no means solve the question of the etiology of “black tongue.” None of the above named authorities has proven his opinion. Only Dinkler made cultures, and these were without positive results. Cixlinski and Hewelke, in the year 1892, cultivated the mould parasite in acute cases of “black tongue” observed by them. The chronic condition they regarded as the result of cornification of the hypertrophied epithelial cells of the filiform papillae. They found mucor niger of a form morphologically identical with mucor corymbifer, but differing from this in the want of pathogenic properties, hence these authorities propose for the acute type of “black tongue” another more scientific name—mycosis linguae nigra s. nigroties mucorina linguae.

Two years later, Sendziak of Warsaw observed two cases of chronic “black tongue.” He cultivated mucor niger, hence he believes in the mycotic origin of the disease.

Finally, in 1895, Prof. Schmiegelow also cultivated parasites of variety known as hyphomycetes (mucorinae) from 2 cases of “black tongue.” They differed a little from the parasites described by Cixlinski, Hewelke and Sendziak; Schmiegelow supposes that the negative results of the bacteriologic examination depend on unsuitably chosen culture media. He thinks the best culture media for this parasite to be a composition of white bread and gelatine kept at a temperature of 21 degrees C. At 37 degrees C. this parasite does not grow.

Regarding the etiology of “black tongue,” it is somewhat analogous to mycosis leptothrix, which, as already shown, is regarded by some (Siebenmann, etc.) as a hyperkeratosis, but by the greater number, as caused by the leptothrix buccalis. I regard “black tongue” as a mycosis, caused by the mucor niger
which I successfully cultivated in two cases. (Figs. 12 and 13.)

The course of "black tongue" is generally acute (Dinkler, Cixlinski, Hewelke, Gundobin), sometimes it runs a chronic course (Sendziak and Gundobin). In all my cases the course was chronic.

The symptoms differ; a bad taste in the mouth (Sell), sensation of a foreign body, salivation, burning, diminution of the mobility of the tongue are the more common symptoms. Sometimes there is an entire absence of symptoms, as was observed in one of my cases.

The diagnosis of "black tongue," thanks to the clinical picture of hairy black, or brown discoloration on the posterior part of the papillae circumvallate, presents no difficulties.

In the differential diagnosis, we must think first of all of morbus adressoni, in which there was observed by Fowler bluish-black colorations on the tongue, but here the discolorations were also to be seen in other parts of the oral cavity. One must remember that the application of certain drugs, as well as certain foods, drinks and also tobacco may simulate this disease.

The prognosis of "black tongue" is favorable when the process is not complicated by other serious diseases—Sendziak's case of myelitis.

The treatment of "black tongue" consists of scraping away the hairy productions, as well as using alkaline gargles. Brushing with a 5% solution of zinc chlorid, the application of hydrogen peroxid, 10% solution of bichlorid of mercury are all recommended. 5% salicylate acid, and 10 per cent resorcin are also used. Semon and Unna have employed 5% collodium. Abstinence from smoking is also important—(Maraval's case, in which after the commencement of smoking the disorder reappeared.) In cases where all symptoms are absent, all treatment is superfluous.

VI. SOOR.

(French, muguet; English, thrush)—that is mycosis soorina.

Since the days of Hippocrates, soor was not distinguished from aphthae. At the end of the 18th century this term was first accepted in France as the definition of a distinct pathologic process. This is the disease "par excellence" of childhood; one meets with it mostly in sucklings, especially in the
Fig. 12.
(Lingua nigra).

Fig. 13.
(Mucor niger) Hartuack 4, oc. 3. From culture on the bread with gelatine in the above case.

a. mycelium. b. fruit-carrying threads. c. sporangia.
first days and weeks, but it may be found to the end of the second month in artificially nourished children. Uncleanliness of the oral cavity during dentition, the weak constitutions of the children, as well as the nature of their nutrition, favor the development of this pathologic process.

It is rarer in children over two months of age, although in adults it may occur, according to Thorner, Sendziak, Gage, Oppenheim, Teisser, Tordens, Scheff, as well as Reubold, who saw 50 cases below one year, and only 10 times observed it after 20 years of age. I have seen 4 cases in adults (2 females and 2 males) between the ages of 15 and 70. Mettenheimer reports a case of a female between 80 and 90 years of age.

In adults, thrush occurs during long and exhausting diseases, as for instance, tuberculosis—I had one such case—diabetes mellitus, typhus, gastritis alcoholica. I also saw it in a case of heart disease. Thrush may also occur with parotitis (Damashino). Finally, thrush has been observed in quite healthy men by Schmidt, Schech, Frenkel, Mlinik, Freudenberg and Seifert.

As a result of acute pathologic processes, thrush occurs less frequently in adults (Forcheimer); Lori described a case of croupous pneumonia, in which, on the 7th day of the disease, during the crisis, thrush was apparent in the oral cavity, from which it extended very rapidly to the pharynx and larynx. Altman observed and described a similar case. I saw a case in a child 8 months of age. A very interesting case of thrush involving the larynx and nares was observed in a patient 17 years of age, following an attack of influenza; this case was described by Thorner of Cincinnati; Rosenberg saw a similar case following influenza.

Thrush following diphtheria was seen by Sendziak in a girl 15 years of age. The disease was also seen to follow meningitis, morbilli (Reubold, Sendziak) and scarlatina. I have seen thrush appear on the 6th day after hard instrumental labor. Thrush may occur as an endemic disease in hospitals.

There are many papers on this subject, the majority appearing in France and Germany, but America, Italy, Poland, Holland and Spain also furnish their quota.

Etiology: At the time of Robin's writing, thrush was regarded as caused by oidium albicans—o. lactis. At present we believe differently, namely, that it is caused by mycoderma vini (Grawitz), saccharomyces albicans (Rees), and endomyces albicans (Vuillermin).
According to Plaut, oidium albicans is identical with monilia candida (family, terulacae); Vuillermin numbers it with the "ascomycetes" having characteristic spores, and calls it "endomyces albicans." In general, the position of this parasite is undecided.

Infection takes place from ingested objects, from nipples, and less frequently from the air, or the infection takes place during the phenomenon of partus.

Pott connects this trouble with epidemic pharyngitis of cows, the infection being carried by means of the air. Klemperer showed that after the injection of pure culture into the veins of a rabbit, general mould mycosis appeared. Stoos and Grassed agree with his views.

Thrush localizes itself to the oral cavity, the tongue being specially affected (Butlin), principally along its edges and tip. The papillae are often prominent as red points here, as well as at the base (tonsilla lingualis—Seifert). The frenum is also occasionally affected, while the internal surface of the lips, the angulus oris, the gums and cheeks are also not free from the lesion. The tonsil is rarely the seat of the lesion, although in my cases these were often affected. From these localities the trouble extends by contiguity of tissue downward to the pharynx and esophagus (Virchow, Wagner, Schmidt, Langerhaus and Mackenzie). The last named observed three cases of primary thrush of the esophagus. Zalesky observed one in the stomach. That it occurs in the larynx, trachea and bronchi, the cases of Schroetter, Massei, Fasane and Sendziak prove.

More rarely it extends from the oral cavity upward to the naso-pharynx involving the pharyngeal tonsil (Thorner). It may spread to the ostium tubarum and fossæ Rosenmuelleri, as shown by the cases of Valentine, as well as my own observation in two cases.

An opinion existed formerly that thrush only developed on mucous membrane, whose covering was of the flat epithelium variety (Berg, Reubold, Butlin, Solis-Cohen, Jules, Semon), cylindrical epithelium not being considered favorable to the development of this parasite. In those cases where it did spread, it was considered as a simple (accidental) extension without really involving the mucous membrane. Against this belief, there are, however, the following facts: the extension of thrush to the mucous membrane of the inferior turbinate bodies, as well as to the septum in cases of hereditary cleft
palate, and the extension of thrush to the windpipe, covered with cylindrical epithelium. The cases reported by Siebemann, Sendziak, Thorner and M. Schmidt, where the localization of thrush was confined to the nose, as well as the larynx—the lining membrane of which is cylindrical—also contradicts this theory.

Clinical Picture: Thrush occurs as small, round, white spots, with small excavations in the center, easily removable at first, later, as the disease progresses, more adherent. These spots coalesce irregularly, forming a sort of membrane of a dirty color, the underlying mucous membrane being red and swollen.

The slighter forms of this disorder last only from 1 to 4 days. A severer type exhausts the patient, the whole oral cavity being covered with strongly adherent membrane, removable with difficulty, and followed by hemorrhage.

The underlying mucous membrane being swollen and red in the acute type—the angina soorica of the French authors—may change to a chronic character, then the mucous membrane loses lustre, becoming bluish, flattened, thickened papillae of atrophied epithelium.

Symptoms.—The suckling children fail to get sufficient nutrition on account of the pain, they become restless, breathe with difficulty, push the tongue forward, the power of the voice is weakened, exhaustion supervenes, vomiting takes place, the stools are green, evidencing gastric catarrh.

In adults the symptoms are less severe. Massei and Fasane saw symptoms of suffocation from the mould-masses in their cases. Sometimes there is absence of all symptoms (Sendziak), at times simply a burning and dryness in the throat, as well as difficulty in swallowing (Kronenberg).

Oidium albicans is characterized by the existence of small white threads, with double lines and transverse divisions (mycelium) ending in bulbs (sporangia) as well as rounded spores. In the membrane we find detritus and epithelium cells. The sections of tissue sometimes show the penetration of the threads deeper into the submucosa, where there are symptoms of reactionary nature.

Differential diagnosis between thrush and particles of food, or component parts of milk are easily made. Between thrush and aphthae we note that aphthae are not so round and have not so regular a form. Diphtheria sometimes shows a resem-
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blance (Schadenwald), but the absence of fever, except in cases of soorica angina, will help to clear up the diagnosis. There is also a less compact membrane and the situation of the membrane itself is of help. From syphilitic plaques it can be differentiated by the concurring skin and lymphatic gland lesions.

Prognosis.—The prognosis is not always favorable, especially in small children where complications easily occur (gastro-intestinal trouble). General infection is also possible (Hubner).

Pürcheimer saw paralysis of the esophagus following thrush. In one of my cases death occurred from acute pneumonia.

Treatment.—The best method is to observe a strict prophylaxis; to keep the nipples clear and systemic cleansing of the oral cavity also are very important. Grozs of Buda-Pest advises the use of 10 per cent silver nitrate in the oral cavity the first day after birth.

Cleaning the mouth in all cases of intestinal catarrh in children and adults is recommended. General treatment is also important.

In many cases local treatment is unnecessary, especially in adults (Sendziak). In children carefully rub the thrush spots with plucks moistened with a weak solution of boric acid. Escherich recommends a solution containing pulverized boric acid and a little saccharine. Of other drugs, the following are used in this disease: natrium boricum (3-4 per cent), kali chlor., kali hypermanganicum 0.4 per cent (Schadwald), natrium bicarbinicum 5-10 per cent, lig. alum. acet. pur. (Saltman), sublimate sol. 1:1000 (Kraus), acid carabolicum, naphthol (Cattart), and finally drugs mixed with glycerine are recommended by Boinet.

In serious cases brushing with kali. iod., sublimate sol. 1 per cent, silver nitr. 5 per cent, pyoktanin 10 per cent, hydrogen peroxide, and finally ferrum chlor. are recommended.

Where the esophagus is affected, the internal application of kali. chlor. are indicated. This must be done carefully. Vichy and emetics may also be given, but caution must be observed for fear of paralysis of the heart. Finally, rubbing the parts clean by means of esophageal sponges may be attempted.

As I have already mentioned, according to the latest researches of the Italian School, of whom San Felice is probably
the head, the mould-parasites (oidium albicans) belong to a
certain degree to the yeast-parasites (blasto-saccharomyces).
They rarely occur in man, as a pathogenic agent causing a
special kind of mycosis.
The two cases described in French literature belong to this
category.
1. Parak's case, where on the fourth day following birth,
there appeared on the base of the tongue white spots (thrush?)
which under the microscope were supposed to show not the
oidium albicans, but a variety of the yeasts.
2. Troisier's and Achaline's case, which were analogous
clinically with angina soorica in a typhoid patient, but the
microscopic examination also gave a variety of yeast similar
to that found in beer-dregs.
Finally there exists in literature some cases of mycosis of
the upper respiratory tract which are of uncertain origin and
which I report to complete the whole picture of these dis-oders.
1. Solis-Cohen's case of mycosis of the pharynx of uncer-
tain origin during the course of rheumatic angina.
2. Klaman's case, cited by Schech, grey-yellow membrane
on the posterior arch as well as on the uvula composed of my-
celium and cocci (the threads having mace-like ends).
3. Hall's case: mycosis fungoides of the pharynx and larynx
(arytenoid cartilages) in a patient 52 years of age, and finally
4. Hallspen and Jeanselmes's case with autopsy, mycosis
fungoides of the left posterior arch, tonsils, faucal as well as
lingual, aryepiglottic folds, epiglottis, and vocal cords.

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VII. BLASTOSACCHAROMYCOSIS AND OTHER MYCOSES OF UNCERTAIN ORIGIN.
MEETING OF MIDDLE SECTION, HELD AT TOLEDO, OHIO, FEBRUARY 24, 1905.

PAPER:

TUBERCULOSIS LOCALIZED IN THE THIRD TONSIL.

C. S. MEANS, M. D.

On December 14, 1904, Dr. K. came to my office, giving history as follows: hemorrhages, fever, night sweats, loss of appetite, rapid loss of flesh, great languor and general depression. His age is 29 years. Graduated in medicine in 1898. Since then has had a very large practice and is doing a great amount of county work.

In October, 1901, he began to lack ambition, appetite was poor, losing weight, could not do the work that he formerly did without getting very tired. About the last of October began to have gagging and coughing spells, especially in the morning when rising. It seemed as though there was something in his throat that would make him cough. This was soon followed by hemorrhage. Each time he would retch or cough the sputum would be streaked with blood, usually dark and clotted, but this gradually grew worse and hemorrhage became more profuse and the blood of a lighter color. Night sweats began to appear, his temperature in the afternoon ran along about 99.5 and distinct chills began to appear, usually worse at night. The night sweats increased in severity until they were very profuse.

He would rise in the morning with excessive coughing and after his coughing spell was over he was unable to eat any breakfast or scarcely able to get around. On December 12 his temperature was running 103.5 and he was sick in bed for two days. Appetite was poor and sweats profuse. After this he could bring blood at any time he would clear his throat or cough. He would also be awakened from his sleep by a choking sensation and rattling in the throat. Then he would cough and expell a considerable amount of blood. This would always
Tuberculosis Localized in the Third Tonsil.

give him relief. He had lost thirteen pounds in weight. He is a man six feet high and weighs from 175 to 180 pounds; has excellent family history, he being one of nine children, all living. Father and mother well.

He was treated with various remedies by his fellow practitioners in the town in which he was located, took immense quantities of quinin, thinking he had malaria, but he was gradually growing worse and felt that he was doomed to die unless this could be stopped very shortly.

He came to my office December 14th. I immediately had his lungs examined by Drs. D. N. Kinsman and W. J. Means. They both reported negative: nothing to be found in his lungs. Bacteriologic examination negative. I then examined his throat and found throat nearly normal except a large Luschka’s or third tonsil, with small clots of blood at several points over its surface: no breaking down or ulcerations. The tonsil was about the same in its general appearance as we find in many throats, yet from his history and from these points of hemorrhage, I explained to him that it was worth while at least to remove a portion of this tonsil and have it examined by the bacteriologist. On December 15, under cocain anesthesia, I removed a portion of this tonsil with a Gottstein curette. It being so painful to him in his weakened condition, he was wholly unable to stand a complete removal. However, the portion I did remove was examined by Dr. Scott who found numerous tubercle bacilli present, in the section of the tissue examined. None had been found in the sputum before.

I ordered him treated with daily gargles of an antiseptic throat wash, and an application of 10 per cent argyrol to the diseased surface. He returned home the next day and as he puts it, felt greatly relieved from the operation that I did. His temperature dropped to almost normal, his appetitie increased and he was generally in a very much better condition. I explained to him that, if this was really the seat of trouble, it was imperative that he should return and have a complete removal of the diseased tissue. This he did.

December 29th, under general anesthetic, I removed the remainder of the adenoid tissue.

He has never had a rise in temperature above 99 since three days after the removal. I have had a daily record of his temperature since that time until January 20, when he felt so well that he said there was no use in taking his temperature any more, that he had never found it above 99 for some days.
He is regaining all the flesh he lost and says that he is feeling better than he has for years. A letter from him February 20, states he is well, that no symptoms of any trouble are present, and that he has regained his normal weight.

I appreciate, gentlemen, that this is too short a time to say that I have made a perfect cure, but I have reported it for two reasons, first, that it is a very interesting case to me; second, that I believe it proves that we have more cases of localized tuberculosis in the tonsils or some tissue about the throat than are generally discovered.

In all the literature that I have been able to find I have seen but one case resembling this one, and it was reported cured.

If we can discover the primary lesions in tuberculosis in the throat as this was discovered, I believe a great majority of our cases can be cured.
PAPER:

THREE CASES OF TRIFACIAL NEURALGIA DUE TO INTRANASAL CAUSES AND TREATED SUCCESSFULLY BY INTRANASAL METHODS.

R. Bishop Canfield, M. D.

Case 1. Patient, J. H. W. Age 68. Widower. Occupation, literary. History of the present condition: Has suffered from right-sided trifacial neuralgia for something over two and a half years. This pain has been almost constant, although there have been remissions of several days at a time, as well as periods when it would be more severe than usual. The pain was characterized by paroxysms of extreme intensity, during which the patient suffered the most exquisite torture. During the past few months the pain has become more constant and the paroxysms more frequent and severe, until now he is scarcely without pain. This pain has always been confined to the ophthalmic division of the fifth nerve. It was first noticed as twinges in the skin covering the tip and alae of the nostril and side of the nose. Later the skin of the cheek became affected, and the ends of the hairs of the eyebrow near the median line became exquisitely sensitive to the touch: the pain would radiate upwards over the forehead; for the past few weeks a boring pain has been severe in the eyeball and behind it.

The patient has had all kinds of treatment without success. Courses of personal hygiene, of drugs usually administered in such cases, of electricity, etc., had been of no avail. Examination by an experienced rhinologist had been negative. The resection of the Gasserian ganglion had been considered but abandoned on account of the patient’s heart condition which forbade an anesthetic.

October 20th. Patient seen for the first time. He was evidently suffering great pain, was bent forward holding his head and rocking himself back and forth. Pain was at this time confined to the nose, cheek and forehead. Touching the tip of the nose ever so lightly caused severe pain deep in the orbit.
Examination of the nose was necessarily very difficult. It revealed nothing remarkable other than that the nasal septum deviated slightly to the right and that against this deviation the enlarged and somewhat deformed middle turbinate rested for an area of about a quarter of an inch in diameter. Cocain did not reduce this area nor materially affect the turbinate. The patient was told that there was some trouble in his nose but whether it was of sufficient importance to cause even a portion of his symptoms could not be said. He was advised to undergo a nasal operation and accordingly entered the University Hospital for this purpose.

November 1st. The anterior end of the right middle turbinate was removed with scissors and punch. There was no bleeding and no packing was inserted. Soon after the operation the patient began to experience relief from pain in the skin but complained of pain in the eyeball and behind it. The next day he felt somewhat better and had but little pain for two days. During these few days he was given arsenic in the form of Fowler's solution which was soon stopped as it affected his stomach. After two days the pain returned. Several injections of strychnin 1-30th gr. were made about the eye without effect. The only pain of which the patient complained was deep in the orbit. Eight days later the pain returned in full violence. Examination revealed the middle meatus filled with dry, bloody crusts. Removal was followed by relief. The next day the nose was again cocainized, and it was found that the middle portion of the middle turbinate still pressed against the septum. The middle portion was now seen to be much larger than had been suspected before operation. This was removed by the punch. It was found to be composed of two large cells filled with a semi-solid, jelly-like mass which rolled down into the pus basin looking very much like a ball of current jelly. The pain from which the patient was suffering disappeared in the course of a few hours. From this time on the patient remained free from pain except at certain times at which examination would reveal collections of dry crusts in the operated area. Removal was always followed by relief.

February 23rd. Has had no pain for three months and says that he has not felt so well in years. He can now wash his face and rub it with a rough towel without causing any discomfort. This he considers his greatest luxury.

Case 2. Mrs. P., Brooklyn, Mich. Patient has suffered from
right-sided trigeminal neuralgia for the past eight years. Pain has been almost constant but not very severe except at times when she would have the paroxysms characteristic of the trouble. Pain has been confined to the skin of the nose, face and upper lip. She had been sent to the hospital for resection of the Gasserian ganglion and was referred to the nose clinic for examination.

At that time the patient was having a rather severe paroxysm of pain. Examination revealed a considerable area of pressure between the septum and middle turbinate. The latter showed marked polypoid degeneration. Cocain and adrenalin were applied to the middle turbinate. Some relief was at once experienced. This relief became more marked after a few hours. The patient was given a spray containing a little cocain and adrenalin for frequent use while in the hospital. She remained several days under observation and during this time used the spray enough to keep the turbinate and septum separated. While under observation she suffered no discomfort. Resection of the middle turbinate was advised but refused. She said she could not remember when she had felt so well and refused to have anything done, fearing a return of the old pain. She was given a spray of adrenalin and went home promising to return as soon as she had any more trouble. She has not been heard from.

Case 3. Mr. L., 82, Detroit, Mich. Was referred from the neural clinic where he had been treated for some time.

Patient gives a history of severe attacks of right-sided trigeminal neuralgia lasting over a period of over seven years. Pain has been limited to the skin of the tip of the nose, the right side of nose and upper lip. During the last few years the pain has been almost constant.

Examination of the nose showed the middle turbinate much hypertrophied and pressing against the septum over quite a considerable area. As he was receiving treatment in another clinic he was not operated at this time, but cocain and adrenalin were applied on cotton swabs. Sprays were of little avail as the hypertrophy was of marked degree and density. After some days he began to feel a good deal of relief as long as the turbinate and septum were separated but had pain as soon as they came together again.

The larger part of the middle turbinate was removed with the punch. It was found to be composed of bone rather more
dense than the normal turbinate body. Hemorrhage was minimum. Since a few days after the operation I have not seen him but frequent messages by telephone inform me that he has had no return of his previous symptoms.

Study of these three cases shows that in each case the ophthalmic division was the one affected, the disease being limited to its nasal branch. This nerve separates from the main trunk just behind the sphenoidal fissure through which it enters the orbit. In the orbit it sends off branches, the long ciliary directly to the eyeball, and the infratrochlear which, after passing to the skin of the forehead, runs forward to terminate in filaments which supply the conjunctiva, caruncle, lachrymal sac and the skin of the upper eye lid and root of the nose.

The main trunk of the nasal nerve leaves the cranial cavity for the nasal fossa through a small canal just between the anterior extremity of the cribriform plate and the frontal bone. Here it gives off an internal branch which supplies the mucous membrane of the septum as far as the nostril, an external branch of the mucous membrane of the lateral wall of the nose and the anterior ends of the middle and inferior turbinates, and an anterior branch to the skin of the lower third and tip of the nose.

Case 1, from whom the history in detail could be obtained, shows clearly the course of the disease and the sequence of events. His pain was at first confined to the skin of the tip of the nose and of the alae of the nostril. From here it spread very soon to the skin of the side of the nose and to its interior. For some time the pain was confined to this area which is supplied entirely by the internal, external and anterior branches of the nerve. The one demonstrable pathologic condition which could be answerable for the patient's symptoms was the pressure exerted simultaneously upon these three branches at the area over which the middle turbinate rested against the septum. At this point there was then a possible source of irritation. As it was not until considerably later that pain was experienced in regions supplied by the infratrochlear and long ciliary branches, it was permissible to suppose that disease in these branches was a result of extension backwards along those nerves already affected. Each succeeding branch was implicated in direct ratio in point of time to its distance from the seat of irritation.

In Case 3, it must be noted that the skin of the upper lip
was painful. This region is supplied by the supramaxillary division. However, to have this part supplied by the ophthalmic is not an impossible variation.

It is not intended to explain even a large per cent of cases of neuralgia of the ophthalmic division of the fifth nerve as due to the cause described, but inasmuch as hurried search through the literature has revealed no reports of similar cases, it has been thought worth while to draw attention to the fact that the symptoms of this most distressing disorder may arise from this slight cause which can be corrected and for which careful search should be made before recourse is had to such serious operations as are being frequently recommended for the relief of this condition.
PAPER:

A CASE OF IDIOPATHIC HEMORRHAGE IN THE MIDDLE EAR.

C. P. LINHART, M. D.

A. B., merchant, age 42, came to my office in August, 1900, complaining of a ringing in his left ear, which had been bothering him for a week or more. There was a slight pain in the middle ear. Had never experienced any previous trouble with his ears. Upon examination I found impacted cerumen, and after its removal he expressed himself considerably relieved. On inflation, the membrane of the tube showed some thickening, with a slight catarrhal condition, which practically disappeared on two or three treatments.

On December 28th, 1904, he again reported to me, after having passed a restless night with severe pain in the left ear. He went to bed feeling all right, but waked up sometime during the night with a severe pain and feeling of fullness in the ear. By the time he came to me the pain had somewhat abated. On examination I found the left ear drum membrane very much darkened, as if it were covered with impacted cerumen. After attempting to remove the supposed cerumen with warm water, and nothing coming away, I again examined the ear to find it the same color, with membrane slightly bulging and lustreless. I then gently inflated the ear and found considerable mucus in the tube, with some rales in the middle ear. After inflation he expressed himself as feeling so much better that I decided not to incise the drum. I prescribed a teaspoonful of boric acid to a cup of hot water, to be used with a syringe, in the ear every two hours during the day. In the evening the membrane was not quite so bulging, and appeared a little more natural. The ear was again inflated with the same apparent relief as before.

The next morning there was a slight bloody discharge, quite dark in color, from a small perforation in the anterior inferior quadrant. The membrane had cleared up considerably over the upper and posterior part. On inflation some more of the dis-
charge was forced into the meatus. There was no further inflation, the discharge stopped, and the opening closed in a couple of days. Within a week's time the trouble had cleared up.

With the exception of having a tendency to constipation, which at times became chronic, the patient was in good health. He said when he was a boy he was subject to nose bleed, but since reaching maturity had had trouble of this kind only a few times. The mucous membrane of the nose was thin and easily abraded, and plentifully supplied with blood vessels. I saw him again February 20th, 1905, and found the middle ear practically normal, there being only a slight tubal catarrh. He said the ear felt better after inflation. The idea suggested to me was, the condition of the mucous membrane in the tube and middle ear was somewhat similar in its peculiarity to that in the nose, and that it was a case of simple hemorrhage in the middle ear.
PAPER:

THE PASSING OF THE GALVANO-CAUTERY IN THE TREATMENT OF DISEASES OF THE NOSE.

WILLIS S. ANDERSON, M. D.

The galvano-cautery has been used so extensively for many years in the treatment of nasal diseases that it may seem like heresy to question its value as a routine measure. While admitting its place as a remedial agent in nasal disease, I believe it has been used too extensively and that we have at our command other measures which offer more satisfactory results than the crude method of cauterization.

The cautery in the hands of the unskilled does positive harm. It is no common experience to find adhesions uniting the two nasal walls which vary from a slight bridge of tissue to almost complete occlusion of the nose. These results occur in the hands of the experienced as well as inexperienced operators. Scars, cicatrices, and unwarranted destruction of mucous membrane often result. The writer heard a practitioner remark that he had cauterized a patient's nose eight or ten times without giving relief to the nasal obstruction. The repeated use of the cautery is never indicated in nasal obstruction, and can only do harm. The mucous membrane ought not to be sacrificed unnecessarily. Any measure which is followed by scar tissue in place of healthy mucous membrane leads later to a train of disagreeable symptoms which may be nearly or quite as annoying as the original affection.

The formation of crusts or scabs over the site cauterized often causes constant annoyance for months, and may persist the remainder of the patient's life.

Cauterization, at the best, destroys the mucous membrane with its secreting surface. It is difficult to limit the effect of the cautery. It is a recognized fact that cauterization of the middle turbinal is followed by more reaction than when used on the inferior turbinal.

In the early years of my experience, when I used the cautery more than now, I noticed severe reactions in certain cases,
when it was applied to the middle turbinal. In other cases there was no special reaction. I was at a loss at times to account for this phenomenon. It did not seem to be due to any peculiarity that I could recognize before operating. The explanation is simple in the light of our present knowledge of the peculiar anatomic and pathologic conditions which may effect the middle turbinal. When the middle turbinal has the usual anatomic form and the adjoining ethmoid cells are free from infectious secretions, then the cautery carefully applied will not usually produce any special reaction.

In the cases formerly thought to be suitable for the cautery these conditions did not always exist. We know that in a certain proportion of these cases, nine per cent. according to Lothrop (Inferior Ethmoidal Turbinate Bone, Howard A. Lothrop, Annals of Otol. Rhin. and Lary., September, 1904), the middle turbinal contains normally one or more cells. If these cells are infected at the time of cauterization, marked reaction and septic symptoms may develop and even lead to a fatal meningitis. In a recent article by Packard (Laryngoscope, September, 1904), he has found reported in literature several deaths from meningitis which followed the use of the cautery in the nose. There seems to be greater danger from the use of the cautery over the middle turbinal than in other portions of the nose. It is difficult to limit the cauterizations to the area desired, and the slough which forms favors infection. The close relation existing between the nose and the cranial cavity is not generally appreciated. There is danger of infection through the vessels which communicate with the meninges at the base of the brain, and through those which anastomose with the orbital vessels.

In order to obtain the most perfect results with the minimum danger to our patients, we ought to aim for the best surgical technic, and give careful attention to details. After criticizing the too frequent use of the cautery it is advisable to suggest some methods which may be used in its place.

First, let us study some of the conditions for which the cautery is frequently used. It is mainly used for correcting hypertrophy of the turbinated bodies; for severing adhesions, or false membranes; for cauterizing the base of a polyp, in the hope of preventing its return; for the treatment of hypersensitive areas of the mucous membrane, to relieve reflex symptoms or nasal neurosis; for the control of hemorrhage; and unfortu-
nately, by a few, for the relief of cartilaginous or bony obstructions, in the vain hope that such solid tissue may be safely removed by the cautery.

Before discussing in detail the methods to be used in place of the cautery, a few general suggestions will be made. We ought to destroy as little of the mucous membrane as possible, that the secreting surface may be preserved and scar tissue avoided. We should limit our surgery to the part affected, and be careful to avoid injury to adjacent parts, that adhesions may not result. We should aim to choose the method that is least apt to be followed by a septic slough. It is far more surgical to make a clean cut with a knife or scissors, remove the obstructing portion and cover the exposed surface with a flap of mucous membrane. The result obtained is nearer ideal than when the cruder method of cauteryization is used. Surgical cleanliness should be observed, in the instruments used, as well as in the field of operation.

Let us consider first hypertrophy of the inferior turbinal body. The galvano-cautery is still used as the routine treatment for this condition. The object sought, by one or more lineal incisions with the cautery knife, is to destroy a certain amount of tissue and depend upon the resulting cicatrix to bind down the mucous membrane to the turbinated bone. This method is not adapted to those cases where the bone itself is hypertrophied, or deformed. In selected cases good results undoubtedly follow this method, but at a sacrifice of mucous membrane and with the result that dried mucus accumulates over the cicatrix. If the septum is touched adhesions often result.

Let us consider some of the methods that may be used to replace the cautery. In those cases where there is an engorgement, or intumescence of the turbinal, and where under cocain the tissue shrinks to a marked degree, submucous puncture is a simple and efficacious method.

The technic is as follows: The mucous membrane over the turbinal is cocainized by a pledget of cotton saturated with a four per cent solution of cocain. It is better not to cocainize to such an extent that the mucous membrane is shrunken too tightly to the bone. A sharp cataract knife is inserted under the mucous membrane, parallel with its surface and close to the bone. The knife is inserted on an average of about one-half inch, the distance depending on the size of the turbinal.
The sharp edge of the blade is then turned towards the bone, drawn along its surface, then turned outward and the end rotated in order to destroy a portion of the vascular sinuses. The knife is then withdrawn and a pledget of cotton saturated with adrenalin chlorid solution is applied over the bleeding point. After all bleeding has ceased, the small opening in the mucous membrane by the knife is sealed with collodion, or if preferred, the nose may be packed for twenty-four hours. We have by this method destroyed enough of the vascular tissue to cause cicatricial contraction with relief of the obstruction, without the sacrifice of any mucous membrane. No after treatment is necessary except possibly a cleansing spray. In a few weeks contraction will have taken place with complete relief, with no visible cicatrix and with a normal appearance of the turbinal. The submucous introduction of the cautery knife is advocated by some. This gives good results, but it is difficult to limit the amount of tissue destroyed, and I have seen sloughing of the greater portion of the turbinal follow. The cautery possesses no advantages over the knife and it has several disadvantages.

In true hypertrophy of the turbinal, when simple submucous puncture is not sufficient, I have found the flap operation most satisfactory. After the application of adrenalin and cocain, an incision is made along the lower edge of the hypertrophied tissue, then with the knife, or sharp pointed scissors, a flap is dissected up and a wedge-shaped piece, with the base of the wedge downward, is removed. The size of the wedge removed depends upon the amount of hypertrophy. If the bone is hypertrophied, a small portion is removed with a saw. The flap is replaced and a suture inserted. Packing with a strip of lint, impregnated with subnitrate of bismuth, renders a suture unnecessary. If the suture is used, then the line of incision can be sealed with collodion. In a few days the flap has united, no visible scar remains, and no crusting or accumulation of dried mucus results.

In hypertrophy of the middle turbinal, it is usually necessary to remove the anterior end. As this includes the bone, the cautery is never indicated, but rather the snare, the saw or the scissors are to be used. If the soft parts only are involved, then the snare is to be preferred, and can be used without danger of infection common to the cautery.

The use of the cautery for the severing of adhesions, or
false membranes, can be discarded and better results obtained by making flaps of tissue to cover the denuded surface, thus preventing the formation of synechia.

The cauterization of the base of polypi after their removal is a well recognized method, but in many instances the base of the growth can not be seen. We know that polypi frequently originate from the edge of the ostium maxillare, or from the ethmoid cells. It is better surgery to use the curette in these cases, breaking down the walls of the ethmoid cells, if necessary, in order to eradicate the origin of these growths.

The cauter has a place in the treatment of hypersensitive areas in the nose in certain neurosis of nasal origin; but even here it is used largely in a tentative manner, without well defined indications.

If the cautery is to be used in these conditions, care must be exercised that only the hypersensitive areas are touched, and no other area. Where hypertrophy exists its removal, rather than cauterization, is indicated. There will remain a certain well defined, though limited, use for the cautery until such a time as we shall have a better understanding of these peculiar neurotic conditions.

The cautery is often used for arresting hemorrhage from the nose by touching the bleeding point. There is no doubt of its efficiency, but by its use we often substitute one unfortunate condition by another. The slough formed by the cautery is apt to give rise to severe secondary hemorrhage when it comes away, and the ulcer remaining is an additional source of annoyance. If we have the conveniences at hand, it is better to apply adrenalin over the bleeding point until the hemorrhage is controlled, then pack the nose carefully with subnitrate of bismuth lint. After several days it can be removed, the bleeding point will be healed and the danger of secondary hemorrhage and sepsis is avoided. The use of the cautery for the removal of cartilaginous or bony obstructions cannot be too strongly condemned.

At no time in the history of rhinology has the demand for accurate surgical technic been as great as it is today. With cocain and suprarenal extracts as aids, we can do more extensive and more accurate surgery in the nose than would have been thought possible twenty years ago. The cautery has been a valuable agent in the past, and still has a limited field of usefulness, but in view of more accurate and better methods we should not cling too closely to the old.
A study of the nose and its accessory sinuses in different animals shows that these structures are comparatively simple ones in macrosmatic animals (animals which do not have an acute sense of smell), but in microsmatic animals (animals which have an acute sense of smell), the nose and its sinuses are highly specialized and developed. A good example of this remarkable development is found in the nasal organ of the American bear.

The bear's nose is a very complicated organ of respiration and olfaction, and may be considered as a fair type of the nose in carnivorous animals. These animals in their wild state obtain their food, for the most part, by being able to find it through their acute sense of smell and frequently it is necessary for them to pursue their prey, so that both the respiratory and olfactory functions of the nose play an important part in the maintenance of their existence and hence are especially well developed.

The anterior half of the bear's nose is used almost exclusively for respiratory purposes, the posterior half is divided into a respiratory portion and an olfactory portion. The septum is a thin plate of bone and cartilage situated in the median line, as in man. From each side of the vomer, a thin shelf-like plate of bone (Plates I and II, Figure 1) extends laterally across each fossa, subdividing the posterior part of each fossa into two superimposed cavities. The superior cavity is the larger one of the two, contains almost all of the ethmoidal turbinals (Plates 1 and II, Figures 2, 3, 4, 5 and 6) and forms the greater part of the olfactory portion of the nose. The inferior cavity (Plates I, II and III, Figure 7) is a round, tube-like structure leading directly backward from the maxillary turbinal to the naso-pharynx (Plate I, Figures 8 and 9) and is used simply for respiratory purposes. The maxillary
turbinal is a very complicated structure situated in the anterior part of the nose (Plates I and IV, Figure 8). It springs from a broad base attached to the superior maxillary bone. From this base, numerous branching processes are given off which form an intricate labyrinth, almost completely filling the anterior third of each nasal fossa.

The ethmoidal turbinals are exceedingly complex structures. There are five in each fossa, which radiate from the convex surface of the cribiform plate of the ethmoidal bone (Plates I and II, Figures 2, 3, 4, 5, and 6). Each ethmoidal turbinal
Nose and Its Sinuses in American Bear.

consists of a mass of delicate wavy plates subdividing into almost innumerable branches which intertwine with each other and form a dense labyrinth. This labyrinth is lined throughout by a mucous membrane in which the numerous branches of the olfactory nerves are distributed and thus a tremendous expanse of olfactory mucous membrane is contained within a comparatively small space. The distribution of the olfactory nerves over such a large area makes the bear’s sense of smell correspondingly acute. *Some of the numerous branches of the ethmoidal turbinals extend into each of the accessory cavities of the nose, and so in the bear’s nose, the accessory sinuses*

![Plate II](image)

Transverse section through the posterior part of the right half of a bear’s nose, looking posteriorly.

1—Lateral wing of vomer.
4, 5, 6—Ethmoidal turbinals.
7—Posterior part of the respiratory portion of the nose.
11—Ethmoidal cells.
15—Frontal sinuses.
17—Brain cavity.
18—Orbit.
19—Palate.

*all contain some olfactory turbinal structures and are a part of the olfactory portion of the nose.*

The superior ethmoidal turbinal (which corresponds to the middle turbinal in man) is the largest of the ethmoidal turbi-
nals, and one of its processes, extending anteriorly, overlaps the maxillary turbinal throughout its entire length. All of the ethmoidal cells are formed by some of the numerous branches of this turbinal uniting with each other or with the surrounding bones of the skull (Plates I, II, III, and IV, Figure 11). There are five well developed ethmoidal cells, in each lateral half of the skull, all of which contain some branches of the ethmoidal turbinal.

The maxillary sinus is hollowed out of the superior maxillary bone (Plates III and IV, Figure 12). It begins just

![Diagram](image-url)

**PLATE III.**

Transverse section through the median portion of the right half of a bear's nose, looking posteriorly.

6—A portion of the ethmoidal turbinal forming an incomplete partition between one large ethmoidal cell (11) and the maxillary sinus (12). Just posterior to this lateral process of the ethmoidal turbinal, these two sinuses unite and form one large cavity.

7—Respiratory portion of the nose.

11—Ethmoidal cells.

12—Maxillary sinus.

14—Hiatus semilunaris.

18—Orbit.

19—Palate.

behind the posterior end of the maxillary turbinal and increases in size as it extends backward. The ostium maxillare is a large, irregularly oval opening extending downward almost to the floor of the cavity, which is considerably above the floor of the nose (Plate I, Figure 13). This sinus has prac-
tically no roof, for one large ethmoidal cell opens directly into it, being only partially separated from it by a lateral process of the superior ethmoidal turbinal (Plate III, Figure 6).

The hiatus semilunaris (Plate III, Figure 14), is a well defined groove in the ethmoidal turbinal leading directly from the frontal and ethmoidal cells into the maxillary sinus, so that these cells all drain into the maxillary sinus and thence directly into the nose, for the ostium of this sinus extends down to its floor.

There are two frontal sinuses in each lateral half of the skull (Plates I and II, Figure 15), separated from each other in the median line by a thin bony septum. The ostia of the frontal sinuses are in the inferior part of each of the cavities and small processes of the superior ethmoidal turbinal extend through them into the sinuses.

There is one sphenoidal sinus in each half of the skull (Plate
I, Figure 16). The partition between them is somewhat irregular but it is situated about in the median line. From the posterior superior part of each sinus, a diverticulum extends laterally into the lesser wing of the sphenoidal bone. The ostium sphenoidale is large and through it one of the ethmoidal turbinals projects directly into the cavity (Plate I, Figure 2).

Considering the bear’s nose as a whole, it is an exceedingly highly developed organ. The turbinals are all very complex structures and the ethmoidals or olfactory turbinals are especially well developed.

The accessory sinuses are comparatively large and all contain ethmoidal turbinal tissue. They form a series of cavities extending over the external surface of the ethmoidal turbinals, and some of the cavities in each lateral half of the skull communicate with each other, but not with those of the opposite half of the skull. Their function seems to be to provide space for the tremendous development of the ethmoidal turbinals, to conduct air over the external surface of these structures and to furnish a system of drainage for them.

Comparing the nose and its accessory sinuses in man, with similar structures in the bear, we find that in man the turbinals have all degenerated (or reverted) into comparatively simple structures. The number of the ethmoidal turbinals has decreased from five to two, but rudiments of the third, fourth and fifth ethmoidal turbinals are frequently seen in the embryo and sometimes in the adult. The relative position of the turbinals has changed owing to the tremendous development of the fore-brain and the consequent change in position of the bones in the anterior part of the skull. The relation of the cranium to the nasal cavity has also changed, for the cranium, in man, has enlarged so that it is situated directly over the nose instead of being posterior to the nose, as it is in the bear.

The accessory sinuses, in man, no longer contain any of the ethmoidal turbinal structures, but rudiments of these structures are occasionally found in some of the sinuses. The sinuses themselves are almost completely shut off from the nose by the contraction of their ostia and their functional activity is lost. Therefore, the accessory sinuses of the nose, in man, seem to be simply rudimentary structures.
PAPER:

A NEW TECHNIQUE FOR THE SUBMUCOUS RESECTION OF THE CARTILAGINOUS SEPTUM—THE SWIVEL SEPTUM KNIFE.

WILLIAM LINCOLN BALLANGER, M. D.

I present herewith a swivel septum knife for the removal of the cartilaginous portion of the septum in the submucous operation. While the idea is novel, and as far as I know, original in the armamentarium of the surgeon, it seems to be of the greatest utility in the performance of this operation. The submucous operation by the technic formerly in vogue, while very successfully performed, had nevertheless some points which were rather difficult to master. Not least among these was the removal of the deflected portion of the cartilaginous septum after the muco-perichondrium had been elevated upon both sides. In the old way it was necessary to remove the cartilage piece by piece with cutting forceps, or with knives more or less adapted for the purpose. By this method considerable time was consumed, and the frequent introduction of the knives or forceps often resulted in considerable traumatism of the mucous membrane. I devised this knife to shorten the time of the operation and to do away with the traumatism referred to.

The swivel blade of the knife (Fig. 1) is pivoted to the extremities of the tuning-fork-like prongs of the instrument and swings in a circle. By the resistance of the cartilaginous tissue through which it passes it may be made to cut in any direction in which the distal ends of the prongs are directed. If, for instance, the knife is passed through the cartilage directly backwards along the floor of the nose the blade swings backward between and parallel with the prongs, with its cutting edge directed backwards; if the prongs are directed upward the blade swings downward thus presenting its cutting edge upwards; if the prongs are pulled forward the blade swings backwards away from the tip of the prongs between which it is suspended, thus presenting its cutting edge anteriorly to the operator; if, on the other hand, the tips of the prongs are made to
pass downwards the blade swings upwards, thus allowing the cutting edge to follow the movement of the prong tips.

All other angles besides those just described are also assumed by the swivel blade as it passes through the cartilage in the circumscribed route roughly outlined in the foregoing description. In other words, if the prong tips are made to describe a perfect circle the blade will follow and excise a circular disc of cartilage. Indeed, the blade will follow any movement of the prong tips, thus enabling the operator to remove just the exact portion of the cartilage he deems necessary in order to correct the cartilaginous deformity.

The technic of the operation, as I now do it, is after the Menzel-Hajek method with the exception of the removal of the cartilage. In the Menzel-Hajek operation, the cartilage is removed piece by piece with punch forceps; whereas, by my method, it is removed in one piece with one cut of the swivel knife. The time required for the removal of the cartilage after the muco-perichondrium has been elevated need consume but a few seconds; whereas, by the Menzel-Hajek method, it takes from a few to several minutes for its removal. Using a special knife (Fig. 2) I make a curved incision in the septal mucosa of about one inch in length, beginning near the floor of the nose and curving forwards and upwards, as high as I can, through the vestibule of the nose and about one-fourth inch posterior to the anterior margin of the cartilage. I have not found it necessary or expedient to make the incision on the convex side of the septum, as is commonly recommended; but I find it advisable to make it on the left side of the septum regardless of whether this is the convex or the concave surface. I do this because it is convenient to use the knife with the right hand while the forefinger of the left is inserted into the right nostril. Having made the curvilinear incision through the muco-perichondrium on the left side of the septum, I next resort to the
semi-sharp elevator of Hajek (Fig. 3) to elevate the anterior portion of the muco-perichondrium from the septum after which Hajek's blunt elevator (Fig. 4) should be used. The semi-sharp elevator should only be used to start the elevation, as to continue its use might result in a perforation of the mucous membrane, whereas, the dull elevator can be used with great rapidity without danger of perforation.

The next step in the operation consists in carrying the anterior curvilinear incision of the mucosa through the septal cartilage to the perichondrium of the opposite side. This is done with a small bistoury (See Fig. 2), the forefinger of the left hand being inserted in the right nostril to detect when the cartilage is completely incised. After one has had considerable experience in the incision of the cartilage with a knife, he may not find it necessary to introduce the finger into the opposite nostril as he can readily appreciate when he is through it by the sense of touch or by the resistance felt with the hand holding the knife. The semi-sharp elevator of Hajek may be used to perforate the cartilaginous septum along the line of the curvilinear incision by rubbing it to and fro in the muco-perichondrial incision, the index finger of the left hand being inserted in the right nostril to exert counter pressure and to detect by the tactile sense when it is completely broken through.

The incision through the cartilage having been made by either of the above methods, the semi-sharp elevator should be inserted through it with the flat side turned so as to lie against the right side of cartilaginous septum, and, while in this position it should be moved up and down and insinuated between the cartilage and the muco-perichondrium of the right side. To facilitate this procedure, the tip of the nose should be turned towards the patient's right side thus exposing the curvilinear incision through the mucosa and cartilage, and making it possible to introduce the semi-sharp elevator on a
plane parallel with the septum. After this side is started, the dull elevator is used to complete the separation. Care should be taken to lift the muco-perichondrium from the entire deflected area, as to fail to do so makes it impossible to remove a sufficient amount of the cartilage.

The muco-perichondrium on both sides of the septum now being elevated, the prongs of the swivel knife are introduced through the curvilinear incision, one prong being on the right side of the septum, the other on the left. The instrument should now be directed backwards parallel with the floor of the nose until the posterior limit of the cartilage is reached, when it should be directed upwards, and forwards following the outline of the anterior end of the perpendicular plate of the ethmoid to the bridge of the nose, when it should be pulled downward parallel with the ridge of the nose to the upper extremity of the curvilinear incision. In this way almost the entire cartilaginous septum, except the anterior tip which is left to support the tip of the nose, is removed. The excised cartilage should now be seized with a pair of dressing forceps and removed through the curvilinear incisions. The cartilage thus removed is usually roughly triangular in shape, the acute point of which represents the posterior end of the cartilage.

It is obvious that this method of removing the cartilage is a rational one as it does it with ease, rapidity, and without traumatism or laceration of the mucous membrane.

I also present herewith a number of specimens of septal cartilage removed with my swivel knife for the correction of septal deformities. Some of them have, unfortunately, been broken in handling subsequent to the operations. Since the first three or four operations, not more than fifteen minutes has
been required for the completion of any operation, from the first cartilaginous incision to the introduction of the light tampons at the close of the operation. The shortest time was four minutes. In the earlier cases, requiring more time, I was so unfortunate as to lacerate the muco-perichondrium in my endeavors to start the elevation with the semi-sharp elevator. In my later operations, I was very careful not only to make the initial incision through the muco-perichondrium, but to carry it a little way into the septal cartilage. By this method, the elevation of the muco-perichondrium was readily done without perforation or laceration.

My purpose in presenting the swivel knife is two-fold in character, first, to call your attention again to the sub-mucous resection of the septum, as it bids fair to become one of the most effective and popular operative procedures for many types of septal deformity; secondly, to call attention to the swivel knife which I believe removes many of the difficulties and objections heretofore met with in the performance of the operation. The knife is extremely simple in its construction, having no complicated parts to get out of order. Its use can be mastered in a single operation, and its use converts one of the most formidable nasal operations into one of the most simple.

The instrument is made by F. A. Hardy & Co., of Chicago, who exercise great care in its construction with the view of so adjusting the swivel blade that it swings with great freedom between the prongs.

I have also constructed another universal cutting septum knife, made with a fine steel wire stretched between the prongs. While this knife cuts the cartilage, it does not do it as readily as the one with the swivel blade. I have still another swivel-bladed knife mounted upon a single prong the model of which was made by the DeVilbiss Co., of Toledo, Ohio. This knife is shaped somewhat like a reap-hook, the handle of which
forms the pivot in the end of the prong. I have only used this knife once and while it was satisfactory in this instance, I must await further trial of it before passing judgment upon it.

A description of the removal of bony deformities is not given because it is not germane to the subject, i.e., the swivel knife. I will present, however, a sub-mucous septum gouge for the removal of bony ridges. (Fig. 5.)

The following claims are made for the swivel knife:

(a) Extreme simplicity in construction and use.
(b) Its cutting edge is universal, i.e., that it will cut a circular or any other shaped piece of cartilage from the septum without introducing it more than once between the elevated muco-perichondriums.
(c) The cutting can be done in a few seconds.
(d) Its use is devoid of traumatism and shock.
(e) Healing takes place in a shorter time than by other methods attended by traumatism.
(f) Its use will not result in laceration or perforation of the muco-perichondrium.
(g) The entire specimen is removed in one piece and is thus available for inspection, showing the varying thicknesses and deflections of the cartilage removed. (The specimens are best preserved in a solution of glycerine and water to which a little formalin is added.)
PAPER:

SOME OBSERVATIONS ON THE SURGERY OF OTITIC BRAIN ABSCESS.

John F. Barnhill, M. D.

Twelve years have elapsed since MacEwen published his classical work on the surgical diseases of the brain and spinal cord. It is strange that this author has remained silent as to his subsequent experience. It is equally strange that so interesting and practical a subject has not been taken up by some one else at the period of abandonment by the brilliant Edinburgh observer, and dealt with as exhaustively as the array of accumulated facts concerning this branch of surgery would seem to justify. Instead of such a publication of individual experience, or of even an adequate compilation of the world's progress in intra-cranial surgery, there has appeared during this time but little more than such information as is contained in the case reports of individual operators, each valuable in a way, but of itself giving so little detail either as to pathology, diagnosis or treatment as to form an unsatisfactory guide to the surgeon who proposes to do this class of work.

Several works on otology omit mention of otitic brain complications; others treat the subject too briefly to be of any service, and Dench, whose work as a whole is the most commendable text-book in our language, deals with the matter too briefly to become a good diagnostic or operative guide.

In view of the fact that the mastoid surgeon may at any time encounter a brain complication, and that he must then deal with it radically and without delay, it is highly important that the most perfect technic pertaining to the steps of operating, and the most approved methods of after-treatment, shall be available for his guidance. Unfortunately, such information is at present neither as available nor as well established as is desirable; and therefore in operations for brain abscess, the aural surgeon is almost certain in any case to encounter conditions concerning the surgical dealing with which he will
have neither an established guide or even precedent, and hence will be forced under hurried and often trying circumstances, to decide upon a plan independent of rules, based wholly upon conditions presenting at the time, upon general surgical principles, and upon his own unaided judgment.

It is not expected that the brief presentation of the subject as given here will greatly help to fill the gap that seems to exist in the surgical aspect of otitic brain complications; but it is earnestly hoped that the discussion it may evoke will materially aid the future operator, whose duty it will be to deal most wisely with intra-cranial invasions from the septic ear.

My limited experience in this class of surgery leads me to the very positive opinion that thoroughness in dealing with every step of the operation is most essential to the successful outcome of any case. Of course there should be a reasonable limit both to the extent of the incisions through the soft tissues, and to the area of dural surface that is uncovered. Careful consideration of such detail should be given to the extent of not seriously hindering the operation by making the incision so small as to compel the surgeon to work through a cramped exposure on the one hand, or on the other, of not cutting more broadly than is actually necessary to secure good inspection of the diseased parts, and to afford an opportunity to manipulate the deeper tissues, unhindered by the smallness of the openings.

MacEwen's method of clearing out all the diseased mastoid tissues and of removing both the tegmen tympani and antri, in combination with a trephine opening through the squamous plate of the temporal immediately above the external auditory meatus, must stand as good surgical procedure in most instances today; but there are undoubted cases in which this amount of dural exposure is not sufficient, and I am convinced that I lost one of my cases by strict adherence to such limited uncovering of the abscess site. A cramped exposure may be sufficient, if it happens to be made directly over the abscess, but if the bulk of the abscess cavity lies in any direction away from the center of the small primary opening, it is best to remove the bone with a rongeur over the dura sufficiently to give the greatest advantage of manipulation in the after dressing of the wound, as well as to secure the thorough evacuation of the pus at the time of the operation. In the cases of
chronic temporo-sphenoidal abscess I have seen, it has seemed wisest to secure the permanent drainage through the combined area of the tegmen antri and tympani. Drainage at this point is practically from the bottom of the abscess, and since the semi-reclining position of the patient should early be assumed, no other site so efficiently favors the discharge; then there is but little muscular tissue surrounding the external wound at this point to become hypertrophied, granulate and otherwise hinder the efficient after dressing. The immediate proximity of the infected mastoid wound, and the consequent liability of further intra-cranial infection from this source, is of course an objection to this site as a choice for drainage purposes. However, if care is taken when dressing the wound to first cleanse and pack the mastoid opening thoroughly and separately before removing the dressing from the cerebral abscess, such objection can be largely overcome, and the advantages arising from the cranial opening in this location are so great as to entirely outweigh them.

After the dura is exposed, extra-dural pus may be found, but the management of this condition seems sufficiently clear. If the abscess is intra-dural, and the history of the case has been sufficiently positive to justify further operation, exploration of the intra-cerebral tissues becomes a most important step, and it seems to me much more additional light is needed as to the extent to which such exploration may be carried. To what extent is an operator justified in making exploratory brain punctures or incisions in his efforts to locate an abscess? Operators who have written most concerning the matter have advised the use of the hollow needle, trocar and cannula, and bistoury, as proper instruments for brain exploration. When pus is located MacEwen advocates the employment of a slender forceps to divulse the cerebral wound. Dench urges the use of the little finger for the purpose, while Whiting argues the benefits arising from the employment of the encephaloscope which he has invented, and which gives direct illumination of the interior of the abscess. The exploratory incisions made for the purpose of discovering and evacuating the abscess are advised to be made downward, inward and forward; upward and forward; inward; inward, backward and downward. There is a possibility in any case of temporo-sphenoidal abscess that none of the above explorations may penetrate and
evacuate the collection if the same be small and deeply seated. The very practical question then arises as to whether or not the operator is justified in going further in his exploratory efforts in a given case. While the previous history, the facts determined at previous examination, and the present condition of the patient must to a considerable extent determine the justification for more extensive exploration, yet there ought to be established, if possible, reasonable limitations to which carefully trained operators may be justified in exploring the tissues without incurring too great a danger to the life of the patient. It must of course be clear that a considerable number of incisions into the brain substance, made in close proximity to each other, may break down or impair the nutrition of the parts to such an extent as to cause sloughing, or may give rise to another condition which will prove equally serious, namely, the extrusion of a portion of the intra-cranial structures in the form of a cerebral hernia. The surgeon may, therefore, because of conscientious fear of these serious consequences from over-operating, fail to explore the parts thoroughly, and will therefore fail to evacuate an abscess that is present; or he may, on the other hand, be induced to over-explore the brain in his efforts to find a non-existent collection, because the previous history of the case has so certainly indicated the presence of an abscess, that he would not consider that his full duty had been performed to his patient until pus had been sought for deeply and in every direction.

The following two cases illustrate the above statement: G. W., 15, a mute, and a student at the Indiana School for the Deaf, had measles February, 1904, with suppuration of right middle ear and mastoid involvement. Intense pain over the right temporal and about the external orbital process developed and persisted; frequent vomiting occurred, sub-normal temperature was recorded, and the pulse averaged 60 per minute with a minimum of 45. These symptoms taken in consideration with the reflexes present, and the rapid decline in the strength and appearance of the boy, were sufficient in the opinion of Dr. C. S. Goar, physician to the institution, and Dr. Wm. Chas. White and myself, consultants, to justify the diagnosis of a brain abscess. Operation was therefore advised and the patient taken to the hospital, where after due preparation the mastoid was rapidly ablated and the antrum
opened. Both cells and antrum were filled with pus. The skin incision was extended above and around the pinna for an inch toward the external auditory meatus. The dura appeared ashen in color and slightly thickened, but no extra-dural pus. The previous symptoms pointed so clearly to abscess that it was confidently expected one would be entered at the first puncture. The dura was therefore opened and a slender knife inserted inward, forward and downward without result. This incision was rapidly followed by the others recommended by Dench, but all without effect. Lack of established knowledge as to the extent the surgeon may be justified in going in such cases deterred my further efforts. The dura was therefore partly replaced and sutured, but the external wound was kept open with a gauze packing extending to the dura. Following this operation the pain was greatly relieved owing no doubt to the mastoid drainage. Pulse and temperature both remained sub-normal. During the dressing of the wound four days later, I was tempted to gently probe the brain, and in following the tracts I had previously explored was rewarded by a very considerable flow of pus, estimated at from one and a half to two ounces. A rubber drainage tube was then inserted for two days and the after-treatment carried on in the usual way. A moderate sized cerebral hernia shortly occurred, which together with excessive granulation and hypertrophy of the temporal muscle very greatly hindered efficient dressing, endangered the successful outcome, and greatly prolonged the recovery. The hernia was cut away, the granulations cauterized and the hypertrophy finally subsided, the patient returning home in six weeks apparently well. Now after one year he is in school, strong and with mentality unimpaired.

Failure to find the abscess in this case caused me to give the matter much thought, with the result that I censured myself for not being bolder under circumstances in which the patient's life was in imminent danger, and in which pus seemed so certainly present, even though surgical precedent gave no warrant for such action.

Accordingly when C. K., aged 6, was brought some months later with a diagnosis of brain abscess by the family physician, and when after the case had been under observation for several days, and after careful study of the record, after repeated examination and consultation, this diagnosis was confirmed, and
operation determined upon, resolution was made, if necessary, to be more persistent in the exploratory efforts.

The steps of the operation were exactly as in the former case with the exception that, on account of its being a chronic case, the radical mastoid operation was performed, and the dura freely exposed over both tegmen antri and tympani. The dura was much injected, almost livid, and bled quite freely when incised. A large quantity of cerebro-spinal fluid poured through the opening. Incisions into the brain tissue were made in number and direction as in the previous case, and each incision was somewhat divulged according to MacEwen's directions, all without discovering pus. The history, chart and localizing symptoms in this case seemed clearly indicative of abscess both to Dr. White and myself; and these, taken in connection with the experience in missing the former abscess because of timidity, induced me to continue the exploratory punctures, and consequently an incision was made between each former one, but unsuccessfully. The dural wound was not entirely closed owing to the very considerable serous outflow. The dressing consisted of gauze loosely packed extra-durally; the skin flap was left partly unsutured. The former hemicrania which had been most unbearable, disappeared entirely, and the child seemed quite comfortable on the following day. The first dressing was allowed to remain five days and the wound appeared to be doing splendidly at this time. At the third dressing, however, a small cerebral hernia was present which increased to the size of a half English walnut, inflamed, granulated, bled easily and, as I believe, complicated the case most unfavorably. At the same time there was an elevation of temperature and the beginning of stupor. all of which symptoms continued to increase up to the time of death, a little more than three weeks subsequent to the operation. Meanwhile the wound was several times explored through the former incisions by means of a sinus probe, but there never was any evidence of suppuration. No post mortem was obtained, and if an abscess was present, explorations beyond the established limit failed to find it.

Clearly then the subject of intra-cerebral and intra-cerebellar exploratory incisions are of vital importance to the aural surgeon, whose work is leading him brainward more and more; and the collected experience and results of operators is most urgently desired concerning it.
In general surgery, the operation itself is often the one
great essential of the successful outcome of the case, and good
results may be obtained by the surgeon who may go to a dis-
tance to do the work though he leaves the after care to the
home physician. But this will probably never be true of the
operative work under discussion because the successful ter-
mination of any case of brain abscess depends as much upon
efficient, and, in chronic cases, upon the continuous drainage
of the cavity, as upon early diagnosis and thorough operation.
The after-treatment therefore requires the continuance of that
same skill, and an application of the experience of the same
surgeon who has done the original operation. For this rea-
son, the patient should, if possible, be in a hospital and con-
veniently near to the operator. Patients at a distance should
be transported, because the risk of a long journey, even when
the patient is critically ill is entirely compensated by the ben-
efits to be obtained from the daily examination and after treat-
ment of the operating surgeon, who alone knows best the
entire nature of the delicate brain wound which he has made,
which must be drained uninterruptedly and healed with the
least possible harm to surrounding healthy tissues. Many
cases of brain abscess have been reported in which early diag-
noses were successfully made, and upon which operations were
performed which were surgical triumphs in so far as relieving
the present condition was concerned, but in which from lack
of ability to secure perfect drainage, secondary abscess or other
complication arose, and the patient finally died. I lost one
such case several months after the original operation, after the
patient had returned to his home, and after there had been every
reason to believe that he was entirely well. The success in
this case had been so great an inspiration that the reinfection,
subsequent abscess and death was of course the greater shock.
A post mortem examination proved to be the greatest lesson
taught by all those several months of strenuous effort to save
the patient's life. (The specimen is exhibited.)

After opening the abscess MacEwen advises that the cavity
may be gently syringed in order to further secure the complete
evacuation of its contents and its better sterilization. Whiting
and Dench believe this practice a bad one, in that even with the
most gentle syringing, and where ample provision is made for
the return of the fluid, there is danger of washing away healthy
brain tissue, and of carrying infective material into new and dangerous quarters. Dench therefore advises packing the abscess with gauze and seems not to differ, in this respect, in his method of dealing with acute and chronic abscess. Whiting uses his encephaloscope, which he warmly recommends, and with which he states that he is enabled to see into and thoroughly inspect the abscess cavity and thus judge whether it is acute or chronic. This information becomes of the first importance in the method of after-treatment and drainage, and although I have never used the instrument, I believe it is valuable for both diagnosis and treatment purposes, and therefore become an invaluable aid in the treatment of one of the most delicate and dangerous of all surgical ailments. The acute cases of abscess I have seen and treated lead me to fully agree with Whiting that there was no structural sack retaining the pus collection, for in one case the disease which caused the abscess had not lasted over ten days, and the other only three weeks. In acute cases, Whiting saw through the encephaloscope only "pinkish walls with here and there shreds of plastic lymph." Such being the pathological fact in the acute cases, only the most delicate manipulations within the same are permissible. MacEwen's percentage of cures following his method of washing the cavity after evacuating its contents, had led me to adopt the plan of gently syringing; and yet I always feel the greatest timidity concerning its employment. It would, however, seem difficult to recognize a greater danger arising from this plan of careful cleansing, especially when provision for a free escape of the infected fluid has been provided, than would be inflicted upon the unprotected brain substance by the insertion of the little finger, or by the most deft introduction of an instrument like the encephaloscope. This step of the treatment is by any method a most delicate one, and the surgeon's best judgment and most gentle handling are imperative, whichever one he may choose to apply. The one or the other method may be equally successfully used provided the greatest gentleness governs its employment. If the acute abscess cavity is large and gaping after evacuation, no objection could be raised to through and through drainage by means of the rubber tube, entering the cavity through the tegmen tympani and antri. My only two acute cases were so managed and both recovered. The best opinion seems at present to favor the in-
sertion into the cavity of the acute abscess of the smallest wick of gauze that will serve as a drain, and that acute abscess cavities should never be so tightly packed with this material as to distend them. Daily dressing should be the rule, although McEwen indicates that the first may sometimes be left on for as long as three weeks, and that upon its removal the wound is found to be satisfactorily healed. No approach to such fortunate circumstance occurred in either of my acute cases, and daily dressing seemed most imperative.

The chronic abscess being well encapsulated, and therefore walled off from the surrounding brain substance, must be managed very differently in the after-treatment. Once evacuated the cavity refills, often within a surprisingly short time. This results from the changes taking place in the limiting granular membrane, and has its pathologic analogy in chronic abscess elsewhere. These granulations may be healthy, and when such is the case the abscess cavity will close satisfactorily if only free exit for the pus is provided and maintained. However, a too vigorous granulation may occur, and the surface of the limiting membrane at some point may be covered with necrotic polypi so as to greatly weaken the membrane, render it liable to leakage, and thus lead to secondary abscess, rupture into a ventricle or other damage of a serious or fatal nature. The limiting membrane may also be wrinkled, and septa sometimes divide it into pockets, thus adding greatly to the difficulty of thoroughly cleansing and disinfecting every part. The mere maintenance of an opening large enough to permit free exit of the pus is therefore not sufficient in the majority of chronic cases. The method of packing with sterile or medicated gauze into all the irregularities, and of changing the same as often as the material becomes well saturated, has its advocates; and if the cavity is large, the case of long standing, and therefore the limiting membrane quite firm, it is beyond question the most rational and successful measure.

If this method of gauze packing is determined upon, the insertion of the gauze strip should be made after a carefully considered plan. To avoid wadding of the material, the most distant portion of the cavity is first filled, and over this the coils are loosely inserted in such a way as to absorb and dry the entire area of the disease. Careless, rude or unskilled management of these drainage strips may, and no doubt would
defeat the purposes for which they are intended and therefore the final outcome is greatly determined by the skill with which they are introduced. The strips should usually be not over three-fourths inch wide, cut straight, free from ravelings, and drawn directly from the freshly sterilized package at the moment of their use.

Both in the beginning and throughout the management of the chronic brain abscess, the encephaloscope should be found most useful. The limiting capsule is here usually so strongly built up that the cavity collapses but little or not at all after evacuation of the pus and insertion of the instrument can therefore be accomplished without the slightest injury to brain substance. By means of this instrument and a Kirstein lamp, every part of the cavity can be inspected, and therefore accurate information can be gained upon which to determine the line of after-treatment. Thus if the limiting walls are firm, gentle syringing will be a proper means of completely evacuating and disinfecting the cavity; or a cotton mop may be used to dislodge inspissated pus; or a curette could be gently and deftly employed for the same purpose, under direct illumination of course, and with the operator seeing exactly what he does. It is in the efficient packing, however, that this instrument should have its greater use, for through it the bottom of the cavity can be seen, and into it the gauze placed as above directed. The instrument also acts as a protection to the wounded edges of the opening through the capsule, and in this manner prevents the inevitable contusion that would otherwise arise from even the most gentle insertion and withdrawal of the gauze. The pain resulting to the patient from this same source would thus likewise be avoided.
PAPER:

REPORT OF A CASE OF MELANCHOLIA RELIEVED BY ETHMOIDAL OPERATION.

Wm. B. Shields, M. D.

The nervous derangement accompanying many cases of retention empyema of the ethmoidal region has been recognized for many years, varying from slight headaches to severe cerebral disturbances, usually manifesting itself in melancholia. Grünwald speaks of having seen two cases of this nature in which the melancholia was so profound that suicide was attempted. One of these cases was treated by Grünwald and, quoting his language, "The man was reduced to apparently complete imbecility, so that for six months he sat brooding and was incapable of attending to any business. He finally attempted suicide and had to be constantly watched. He was operated on for double empyema and was completely restored to health. The other case of a similar nature was treated by Killian with the same result."

Orwin, of London, has reported a case of mania which had been confined to an asylum and upon whom he operated for nasal polypus, the patient making complete recovery after the operation. Lennox Brown has reported three cases of nasal polypi accompanied by mania, the latter being cured by removal of polyp. In my opinion it was the drainage of the ethmoidal cells allowing the egress of pathological secretions that resulted in the relief of the mania.

The case reported here by me: J. H., newspaper man, American, aged 29. Had for two years been suffering with a dull aching headache which was worse at times, accompanied by dullness and inability to fix his attention to business. One year previous to my seeing him he had been treated by a neurologist and while under treatment had attempted suicide by cutting his throat. He was confined to an asylum for six months and was discharged in an improved condition. Two months after the discharge he began to suffer from some of the old symptoms, headache, extreme melancholia and loss of
memory. He was recommended to me by a medical friend on account of his complaining of extreme pressure at the root of the nose. Upon examination I found the patient had a half degree of fever, was very nervous and in a condition of extreme depression. The nasal examination revealed the middle turbinates on both sides enlarged and wedged in between the septum and outer walls of the nose. By the use of suprarenal gland, I managed to discover pus on one side. Posterior rhinoscopy failed to reveal pus, but showed the posterior ends of middle and lower turbinates enlarged. I was convinced that the aprosexia, headache and melancholia were the result of the local condition. The patient readily agreed upon an operation in hopes of relief as his sufferings at that time seemed intense. I operated under cocaine anaesthesia on the right side, which had revealed pus on examination, taking away the anterior half of the middle turbinate and then scraping out the ethmoidal cells. I found some pus but not so much as I expected. In a few days the patient said his head felt lighter, otherwise the symptoms were the same. In ten days I operated on the other side and found more pus than the first operation revealed, which no doubt, was due to better drainage on the right side. In both ethmoidal regions I found the bone eburnated. I did a second curettage on both sides a month later as some pus was still present.

The patient whom I had under immediate observation for four months, improved slowly but decidedly and three months after the first operation resumed his business as a newspaper man. I have seen him several times during the past year and he tells me that his mind is perfectly clear, memory as good as it ever was and that he feels that he has been completely restored to health. He is now living in Chicago, being connected with one of the large daily papers in that city.
Dr. A. M. Mayfield of Montmorenci, this county, had the writer called November 19th, 1904, to consult with him over a case of spontaneous hemorrhage of the right tonsil. The history is briefly this: Clarence C., age 30, well nourished, a farmer living seven miles west of this city, is subject to attacks of peritonsillar abscess. Two days prior to this date the doctor had opened and evacuated a right peritonsillar abscess. The quantity of pus thus evacuated was very great and the odor fetid. The tonsil and peritonsillar tissue were so swollen that the mass extended way past the median line, nearly touching the other tonsil, leaving only a chink for difficult breathing. No hemorrhage in particular followed the incision made by Dr. Mayfield. The patient's health had been very good save for the recurrence of the quinsy. About 1 o'clock in the morning of the date above mentioned he began to bleed from the throat. The doctor was summoned in due time and the usual remedies having failed to check the hemorrhage, the writer was summoned at his suggestion, and arrived at 10 o'clock in the morning. He found the tonsil and its surrounding tissues swollen as above, the hemorrhage evidently being posterior. After trying for an hour and a half to stay it without success, the patient was removed to St. Elizabeth Hospital, where he arrived at noon. In the meantime Dr. George F. Beasley was called as additional counsel at the suggestion of the writer, fearing the necessity of litigation of the carotid. We ran the gamut of remedies usually used for the control of hemorrhage, seeing it finally cease at 2 p.m. He insisted on leaving the hospital the Tuesday following. He went out against our will. The same night at midnight the writer was telephoned that the hemorrhage had recurred. He was ordered to be brought to the hospital again without delay, which was done. Again the oozing was very marked posteriorly and did
not cease until 2 o'clock of the same afternoon. We found a
spot of hemorrhage anteriorly which was packed to its depth
with absorbent cotton worked full of equal parts of antipyrin
and tannin. It ceased at that point. The case being very un-
usual, the writer asked several of the doctors as they came to
the hospital to also see the case. At the suggestion of Dr.
Charles Hupe, we gave him eight grains of calcium chloride
every two hours until three doses were taken. The hemor-
rhage ceased as soon as the second dose was taken. Our pa-
tient was much exsanguinated and weak.

The condition then was as follows: The tonsil and peri-
tonsillar tissues were swollen in all directions, and nearly
touched the other tonsil passing the median line. It was quite
hard and dense; malignancy was suspected. However, as soon
as the hemorrhage ceased, it began to decline in size until,
when he left the hospital, December 3rd, it was down almost
within its pillars in the fauces.

As to the relation of the hemorrhage to the abscess: The writer
was asked by the family if the incision made by Dr. Mayfield
could have caused this hemorrhage. The answer was unqual-
ifiedly "No." The hemorrhage was distant from the incision.
The incision was in the peritonsillar tissue, the hemorrhage evi-
dently in the tonsil and posteriorly. The patient was in im-
minent danger of suffocation when the pus was evacuated.
Had the abscess not been opened the hemorrhage would prob-
ably have been worse because undoubtedly it would have eroded
its way into larger vessels than it did, probably into the carotid
itself.

The relation of the hemorrhage to the patient's general condi-
tion: Because of a similar experience reported by the writer
in The Laryngoscope, November, 1898, in which albuminuria
was no doubt the cause of the spontaneous hemorrhage, the
urine of our patient was examined. The result was negative.
In fact, a careful physical examination revealed nothing which
could have been a cause.

A few cases like the above have been reported: Somers
read a paper before the Section of Laryngology of the Amer-
ican Medical Association at the 1904 meeting (Journal A. M.
A. Oct. 15, 1904), in which he covers the subject thoroughly.
He quotes Jenkins (Journal A. M. A. Vol. XXX) as having
observed in an epidemic of 65 cases of tonsillitis, a fatal case
from hemorrhage caused by the sloughing away of the left
tonsil. This occurred upon the ninth day of the disease. Also Bokay and Alexy (Jahrb. f. Kinderh. 1881) observed a boy of four years who with tonsillitis of four weeks' duration had two hemorrhages with death following. Autopsy showed the tonsil and surrounding tissues filled with pus, and communicating with the carotid artery. Again Jacobi and Ewing (Phila. Med. Jour. June 4th, 1898) reported a case of a child who had four hemorrhages at intervals of several days. Five months later autopsy showed a large cavity between the right tonsil and pharyngeal wall filled with blood from a perforation of the carotid artery.

He further reports a case of Brewer's (Yale Med. Jour. Dec. 1898), where spontaneous rupture of a peritonsillar abscess occurred with slight hemorrhage which was repeated several times. The patient died of exsanguination.

Another case which he reports is that of Dunn (Med. News, May 9, 1891), where a hemorrhage took place twenty-four hours after the abscess discharged spontaneously. It was repeated in forty-eight hours, and several severe hemorrhages occurred within the next three days. The patient's condition became so critical that it became necessary to ligate the common carotid artery. Rapid recovery occurred. Chappelle (Jour. Laryngol. Rhinol. & Otol., June, 1900), reports ten cases in which but two recovered, and these had their carotids tied.

Prognosis. It is certainly grave; especially in view of the cases quoted by Somers in his article. To say the least, they are not pleasant to meet, and give the surgeon very great anxiety whenever he meets such a case.

Treatment. This resolves itself into anything in the ways of remedies usually used for that purpose. Attention is especially directed to the use locally of adrenalin chloride solution (1:1000) and the mixture of antipyrin and tannin (equal parts with just enough alcohol to dissolve). Internally calcium chloride given in eight grain doses every two hours until three doses are taken promises much. If the hemorrhage is very severe indicating involvement of larger blood vessels, no time is to be wasted with local remedies. Surgical interference by the ligation of the carotid is indicated judging from the frightful mortality without it, and the excellent results with it. Chappell reports a case of spontaneous hemorrhage in which he opened the abscess cavity, cleaned it out and packed it.
PAPER:

CHRONIC LARYNGITIS.

E. Fletcher Ingalls, M. D.

Synonyms—Chronic catarrh of the larynx—Laryngitis chronica.

Pathology. The variation from the normal in chronic laryngitis even of long duration, may be slight and superficial, and limited chiefly to modification of secretion and circulation; but in the severer grades, in the course of time, structural changes take place which profoundly and often permanently alter the mucous and sub-mucous structures. The changes visible to the eye will be described with the laryngoscopic appearances. The modifications of structure shown by the microscope are mainly hypertrophic and affect the epithelium mucosa and sub-mucosa.

The histologic changes in the epithelial layer in inveterate laryngitis consist chiefly in the ciliated variety and in increase in the number of layers of squamous cells in the parts of the larynx normally bearing pavement epithelium. These are: the cord, the upper part of the inter-arytenoid space and the free border of the ary-epiglottic folds and ventricular bands. This change to the cutis-like epithelial lining of the larynx is especially marked over the region of the processus vocales and here at times form warty masses with large papillae and epithelial prolongations into the sub-epithelial tissue. Similar verrucous outgrowths may appear upon the free border of the cords and the whole laryngeal lining in rare cases may become dermoid. The change to pavement epithelium is accompanied by the formation of papillae which appear even where there is normally a smooth basement membrane under ciliated cells. The papillae may branch as do those of papilloma so that there is close histologic relation between papilloma of the larynx and the superficial hypertrophies of chronic laryngitis.

Erosions of the pathologically altered epithelium may occur and the ulcerative process may even reach into the sub-epithelial tissues but not deeply enough to create permanent loss of sub-
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stance. The favorite seat of erosions is the free border of the cords and the inter-arytenoid mucosa, where they commonly appear as small, yellowish, triangular spots, the apices of which extend six or eight millimetres upward from the posterior ends of the vocal cords.

Connective tissue hypertrophy is even a more marked feature of chronic laryngitis than thickening of the epithelium. In the earlier stages there is much round cell infiltration and creation of young connective tissue, with an abundance of vessels, but later spindle cells and vessels are less numerous and the hypertrophic swellings consist of hard and dense connective tissue, which is especially characteristic of sub-glottic chronic laryngitis. Even in this late stage, a good deal of leucocytosis is generally found under the epithelium. Atrophy of the histologic elements of the laryngeal mucosa is an infrequent sequence of hypertrophy which is most apt to result from chronic dry suppurative catarrh with crust formation analogous to nasal ozena.

The venous congestion attendant upon chronic laryngitis induces the hypertrophic states mentioned by furnishing an excess of plasma to the tissues. Deep-seated, connective tissue changes may lead to atrophy and fatty degeneration of the laryngeal muscles. The improperly nourished walls of the veins lose their elasticity and give way to the blood-pressure so that they become varicose and ectatic in some instances. This condition is especially well shown upon the cords but it may involve other parts of the larynx.

Étiology. An important cause of chronic laryngitis is disease of the upper air passages more especially hypertrophic rhinitis attended by intermittent mouth breathing so that the air is not properly warmed before it reaches the larynx. Again nasal obstruction from whatever cause necessitates an undue effort in the use of the voice to overcome the obstacle to sound whereby congestion is increased and a chronic catarrhal inflammation finally results. The type of chronic laryngitis thus produced, although common, is seldom attended by pronounced anatomical changes, so that freeing the nasal passages alone may result in its cure. Atrophic rhinitis and pharyngitis sicca are sometimes accompanied by a similar dry catarrh of the larynx and trachea with adherent scabs and crusts. The nasal ozena may precede that of the larynx and trachea for years, but does not always do so as laryngitis sicca may exist with a normal nasal and pharyngeal cavity.
Naso-pharyngeal catarrh, chronic follicular suppuration of the tonsils and purulent discharges from the nares or from the accessory sinuses of the nose sometimes appear to cause chronic laryngitis.

Pulmonary tuberculosis is a frequent cause of the hypertrophic forms of laryngeal catarrh and it is therefore important to examine the lungs in every case of persistent laryngeal inflammation. It should be remembered, however, that simple chronic non-tubercular laryngitis is a common accompaniment of phthisis.

Conditions that obstruct the return flow of blood through the veins of the larynx, such as tumors of the neck, goitre, mediastinal tumors, chronic valvular disease of the heart or pulmonary emphysema produce persistent venous hyperemia that predisposes to chronic laryngitis and as the causes mentioned are often lasting, they produce an intractable form of laryngeal disease.

A considerable proportion of youths passing through the change of voice called mutation become afflicted with chronic laryngitis, which is at times sufficiently severe to render the patient hoarse and this may continue a year or two.

Dry pharyngeal and laryngeal catarrh may be caused by diabetes and should therefore always lead to an examination of the urine for sugar. The influence of the elongation of the uvula as a source of laryngitis has been exaggerated; but in a few cases this condition is doubtless the source of cough and consequent mild catarrhal irritation of the larynx.

Chronic laryngitis is often caused by habitual alcoholism. Such cases are often attended by irremediable hypertrophic changes that deform the laryngeal interior and sometimes result in the typical pachydermia laryngis of Virchow. Overuse of the voice especially in the open air often causes this disease; examples of which are often seen in political speakers, singers, newsboys and peddlers. It has been observed by teachers in the poorer city districts that the boys do so much shouting on the noisy streets that their voices are unfit for singing on account of the resultant hoarseness.

Repeated attacks of acute laryngitis are perhaps the most frequent cause of the chronic, especially in patients whose resistance to disease is weakened by poor health and in those who are compelled to use the voice when hoarse, as so often occurs among actors. The inhalation of irritant matter, dust, espec-
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Chronic laryngitis, is a source of chronic laryngitis particularly in mouth breathers. Tobacco smoke and dry over-heated air act in a similar way.

Adenoid vegetations, nasal polypi and other causes of persistent mouth breathing, in my experience very seldom cause chronic laryngitis, although intermittent nasal obstructions, especially is rhinitis intumescens is a most frequent cause; indeed it appears to be the main etiological factor in this disease. When the nasal obstruction is persistent, the larynx accustoms itself to the inhalation of air which has not been moistened or freed from dust by the nasal passages, just as the trachea after tracheotomy will in a few weeks bear respiration through a canula without catarrhal reaction.

Infectious diseases, especially scarlet fever, typhoid fever, influenza and measles, not infrequently leave chronic laryngitis in their train. The influence of cold and damp climate in the production of this infection is marked.

Symptoms. The sensations of which complaint is usually made by the patient are dryness, tickling and burning in the laryngeal region. There is often annoyance caused by the feeling of a foreign substance in the throat, the location of which can not be accurately defined but which seems to prick the mucous membrane. In other cases the patient speaks of a lump in the throat when he swallows. There may be a constant desire to clear the larynx with the hope of bringing up mucus even if there be no secretion in the larynx. This is apparently caused by swelling of the mucous membrane. In some cases the patient speaks of a constant inclination to swallow.

In some patients cough is violent and constant, especially if the sensitive inter-arytenoid region be the seat of erosions. In others, tickling sensations cause frequent efforts to clear the throat, but in some the cough is very slight and in others this symptom is entirely absent. Dried secretions usually cause cough until expelled but where the epithelial surface of the mucous becomes dermoid, as it often does in laryngo-tracheitis sicca, the mucous membrane loses its sensitiveness.

Spasms of the glottis is an occasional and distressing symptom, especially when the irritable inter-arytenoid region becomes eroded and raw by the frequent efforts to clear the throat. The spasm may even cause suffocative attacks and syncope.
The voice may be altered from slight huskiness to complete aphonia, according to the pathological changes in the mucosa, the quantity and character of secretion in the larynx and the condition of the laryngeal muscles. The vocal tones are usually deeper than normal and rough or grating, seldom higher pitched than in health. The hoarseness may appear only during singing, or the singing tones may be clear while the ordinary voice is rough. In some patients huskiness is present in the morning until the vocal cords are freed from mucus, the voice then becomes clear and remains so for some hours until the larynx becomes congested from speaking. In some instances the taking of food greatly clears the voice. In almost all forms of chronic laryngitis continued speaking or singing soon produces sensations of fatigue which are at first confined to the larynx, but if the exertion is continued, a feeling of general physical exhaustion may come on after twenty or thirty minutes.

The amount of secretion varies greatly. Some patients do not have to clear the throat at all and have no disagreeable sensations in it, especially if the inflammation is confined to the cords. Some raise only a little clear mucus or saliva while others expectorate quantities of pus or muco-pus and still others with difficulty, bring up crusts of mucus, sometimes, mixed with blood.

Serious stenosis due to hypertrophic changes in the larynx at the level of or above the cords is extremely rare, but the swelling of the sub-glottic mucous membrane occasionally causes dangerous dyspnea. Accumulation of dried secretions may also lead to attacks of suffocation.

The laryngoscopic view in chronic laryngitis may show either localized or diffuse congestion of the mucous membrane, varying from a slight pink color to a deep red or cyanotic hue.

In the milder types of the affection all that may be seen even after years is a diffuse red or pink color of the cords not differing from that of acute laryngitis, with little or no swelling while the rest of the larynx appears normal. Where the epithelium is thickened, the color may be grayish white. Dilated veins may form a network of vessels upon the cords and in other regions.

Instead of the soft inflammatory swellings seen in the acute affection, in chronic laryngitis, there is often dense hypertrophy of the tissues combined with chronic edema which is usually
limited to certain parts of the larynx. The epiglottis is rarely affected but may lose its elasticity and become clubbed and stiffened, while its color becomes dark red and tortuous veins and vessels appear on its surface. The aryteno-epiglottic folds are seldom thickened, but the ventricular bands are very prone to hypertrophy. They usually retain their general shape and form smooth, red or grayish-red pillow-like swellings, that interfere with the voice by lying as dampers upon the vocal cords. The latter may also be held apart by the swollen ventricular bands meeting in the centre before the cords can come together. In these instances the glottis can not close, so that the voice is lost or the approximated false cords vibrate in place of the true ones, emitting a harsh tone. In rare cases the swollen ventricular bands are said to hang down between the cords. Instead of being smooth the hypertrophic false cords may be wrinkled and convoluted or nodular, and their substance may be very firm and tough.

Chronic laryngitis may be mostly or altogether confined to the posterior commissure or inter-arytenoid space. In the milder cases there may be only a dull whitish thickening of the epithelium, while the mucosa, which appears smooth during abduction of the cords, wrinkles into vertical folds during adduction, which may be mistaken for vegetations. In severer cases the hypertrophic inter-arytenoid mucosa forms a uniform or nodular prominence which wedges itself between the processus vocales and causes hoarseness or aphonia. Krieg found that inter-arytenoid hypertrophy was a frequent cause of chronic hoarseness in children. The inter-arytenoid mucosa is the most sensitive portion of the larynx, and chronic catarrh of this region is therefore often the cause of severe cough, especially as secretions are prone to lodge here in the irregularities of the hypertrophic surface. The constant motion of the part also creates and perpetuates erosions and epithelial defects. The mucosa covering the arytenoid cartilages and the cartilages of Santorini and Wrisberg has normally a somewhat pyramidal form and allows the contour of the cartilages to be seen, but when thickened by chronic inflammation, these parts assume a hemispherical form and become flabby and succulent, so that the cartilages are hidden. These arytenoid swellings are liable to pressure during deglutition, and they sometimes give rise to the feeling of a foreign body in the throat.

The cords in chronic laryngitis usually lose their normal
sheen and may appear red, reddish gray or even pale, and may appear smaller than normal or more or less swollen; sometimes they form red cylindrical clumsy folds. Their surface is often irregular; when marked by numerous small elevations, the condition is termed by Türk chondritis tuberosa. When numerous papillae are hypertrophied they present a granular appearance called laryngitis granulosa.

A serious and irremediable result of chronic laryngitis is softening of the cords. As a result of the chronic inflammation, the membranous portion of the cords may undergo degeneration and absorption leaving in their place two flabby cushions incapable of sound vibration.

Chronic sub-glottic laryngitis affects the loosely attached mucosa of the under surface of the cords and usually appears as two grayish, pink or red folds that may be continuous with the lower surface of the cord or be separated from it by a furrow. In other instances the hypertrophy may cause an irregular mass and may be confined to one side. In these cases the vocal cords may be involved in the swelling or may remain normal. Sokolowsky, who describes a number of such cases occurring in young adults, states that the disease commonly begins with hoarseness, which is followed by gradually increasing dyspnea and later by suffocative exacerbations that may require tracheotomy. Krieg considers the affection most frequent in children and regards it as a basis for attacks of pseudo-croup, due to temporary increase of the swelling at night.

Pachydermia of the larynx is a term used to describe dermoid changes of the laryngeal mucosa with thickening of its epithelium which acquires the many layered and horny character of the cuticle. Hyperplasia of the papillary and sub-papillary connective tissue commonly co-exist. The classic seat of this condition is over the processus vocales, but it may occupy any part of the larynx. At the vocal processes it forms the typical pachydermia laryngis of Virchow. At first two small, smooth, reddish cushions of mucosa are seen, one upon the inner surface of each cord. At its posterior third, as these grow, they force the cords apart and create hoarseness. Gradually the compressing force of the adductor muscles causes one of the prominences to sink into a groove or hollow in the other so that the cords in time may come together again and the hoarseness lessen or almost disappear. Later the pachy-
dermatous projections become of a yellowish pink color, and the surface becomes cracked and has a warty appearance so that they may resemble papillomata. Pachydermia may extend over the entire cord as a flat white epithelial thickening or as whitish verrucous masses. The inter-arytenoid region is also a common site and the pachydermatous tissue here may form irregular nodes, or whitish warty thickenings, so that in some cases the inter-arytenoid region is filled with tumor-like masses.

Atrophic conditions are comparatively rare in chronic laryngitis. They usually result either from chronic suppurative catarrhs as in laryngitis sicca or from tuberculosis. When atrophied the cords lose their straight and even border and acquire a concave or wavy edge so that they do not approximate well. The false cords shrink and permit a view into the ventricle while the general contour of other portions of the larynx becomes thinned and the voice becomes weak or hoarse.

In laryngitis chronica sicca, blackish or grayish green crusts adhere to the mucous membrane, especially upon the cords or in the inter-arytenoid space; but in severe cases the entire laryngeal interior is coated with dried gummy muco-pus, and the same condition extends to the trachea. When the adherent secretions are removed the mucous membrane appears velvety red but is not much swollen. Below the cords adherent scabs may be seen lining more or less of the trachea and at times even extending to the bifurcation.

Adherent muco-pus in chronic laryngitis often causes the appearance of ulceration and it may need to be removed in order to determine whether the underlying mucosa be intact or not. Paresis of muscles due to chronic laryngis is most apt to affect the arytenoideus transversus and the thyro-arytenoidei muscles; in the former causing a triangular gap behind the tips of the processus vocales when the cords are adducted, and in the latter, resulting in an elliptical shape of the glottis in front of the processus vocales. These muscular changes are often irremediable.

Where the cords lose their function in chronic laryngitis the ventricular bands are made to approximate and take their place, creating a harsh coarse voice.

Diagnosis. The diagnosis of chronic laryngitis can not be made without the laryngoscope as the symptoms are not sufficiently characteristic to exclude other affections.

Neglect of laryngoscopy is responsible for the frequent con-
founding of early carcinoma of the larynx with chronic laryngitis, because for months, or even years, the chief symptoms of carcinoma may be merely hoarseness, and as this is the most striking characteristic of chronic laryngitis the two affections may be easily confounded if one relies on the symptoms alone.

Diffuse, smooth, infiltrative forms of carcinoma may for a time resemble the hypertrophies of chronic laryngitis, but the usual unilateral seat and congestion of carcinoma are in contrast with the diffuse hyperemia and symmetrical location of the swellings in most cases of chronic laryngitis. Carcinoma often causes fixation or impaired motion of one cord. The impairment of motion due to chronic laryngitis commonly is bilateral, never complete, and it is generally due to obvious mechanical hindrances caused by swellings or hypertrophies. Fixation of the arytenoids does not occur in chronic catarrhal laryngitis but it is often symptomatic of carcinoma.

The typical prominences of pachydermia may appear like the papillary form of early carcinoma but they are found upon the processus vocales which are almost never the seat of carcinoma. They are bilateral while carcinoma is in the beginning unilateral.

White, pachydermatous, horny excrescences in other than the usual location may resemble the warty forms of carcinoma and need the microscope for diagnosis. The later stages of carcinoma with characteristic pain, ulceration and exuberant growth cannot be confounded with chronic laryngitis which produces nothing that would appear like a neoplasm and gives rise merely to erosions and not to ulcers.

The irritation of tubercular sub-mucous infiltration may create chronic inflammatory states that from inspection alone cannot be distinguished from the hypertrophies of chronic laryngitis. This is especially true of the inter-arytenoid region where pachydermatous thickening may have tuberculosis as a basis. In these doubtful cases the diagnosis must be made by the exclusion of the signs and symptoms of tuberculosis elsewhere and by observation of the case. The lungs should be examined and the temperature watched in all cases of chronic laryngitis; but it should be remembered that a temperature of 99.5°F. is not uncommon in simple catarrhal inflammation of the larynx and trachea and the latter is often involved in chronic laryngitis. In the regular forms of tubercular laryngitis the laryngoscopic image is sufficiently characteristic to warrant a diag-
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nosis at sight. The typical paleness of the mucosa in tuberculosis, the edematous pyriform swellings of the aryteno-epiglottic folds, the thickened immovable epiglottis and the ragged, ill defined ulcers with fungous granulations are unmistakably tubercular, and almost invariably associated with pulmonary tuberculosis. In the non-infiltrative forms of laryngeal tuberculosis the destructive ulceration of the cords and proliferations of the granulating ulcers in the inter-arytenoid region are unlike the deforming, but not destructive changes of chronic laryngitis. A daily temperature elevation of two or three degrees is almost sufficient in doubtful cases to settle the diagnosis in favor of tuberculosis, but an elevation of only one degree is often present in catarrhal inflammation of the larynx and trachea.

Syphilitic laryngeal catarrh occurs about the time of the secondary eruptions. It is chronic, is accompanied by cough, and presents to view general or localized inflammatory congestion and swelling, usually without ulcerations or papules, so that it closely resembles simple chronic laryngitis and is often mistaken for the latter, until other secondary symptoms or ulceration make the matter clear. Erosions following papules upon the cords or in the inter-arytenoid region may also be confounded with those of laryngitis. Gumma of the larynx is very rare, is usually single and unilateral in its location, but it may be multiple and looks like a smooth, red, hemispherical neoplasm rather than like an inflammatory product. When it acquires a yellow centre or break down it becomes too characteristic for error. The deep ulcerations and cicatrical formations of later syphilis do not resemble chronic catarrhal laryngitis. Syphilitic non-ulcerating, diffuse infiltration is usually unilateral or localized while the rest of the larynx is intact; chronic catarrhal laryngitis is generally symmetrical in location, and commonly evenly involves the interior of the larynx. Anti-syphilitic remedies may be needed to make the diagnosis clear.

The characteristic immobility of the cords combined with the otherwise normal appearance of the parts or the larynx suffice to distinguish the various laryngeal paralyses from chronic laryngitis.

Prognosis. Even the milder cases of this disease may prove intractable or be capable of only slight improvement, though they may usually be cured by suitable treatment in a few weeks or months.
The swellings of the mucous membrane due to inflammatory edema or infiltration will recede under proper treatment but the organized connective tissue of the hypertrophic states will remain. Atrophy is also irremediable, though the dry form of laryngo-tracheitis that sometimes causes it, is capable of great improvement or recovery.

Pachydermia over the vocal processes may disappear if it be treated in its beginning, but if well developed it is generally permanent.

No treatment seems of much value where softening of the cords has occurred, and paretic states of the laryngeal muscles developed in the course of chronic laryngitis are usually lasting. Chronic laryngitis associated with pulmonary tuberculosis is sometimes capable of a good deal of improvement, though usually the constitutional disease must improve before we can hope for betterment of the larynx.

Where chronic laryngitis is manifestly superficial and practically limited to congestion and excess of secretion, it offers the best outlook, especially if the cause, such as nasal obstruction or voice abuse be removable. The prognosis is better in robust people and in those of good habits than in delicate persons and those of irregular life.

Treatment. Treatment will be of little use or it will be followed by constant relapses, unless the causes of the disease be removed. When nasal obstructions, such as hypertrophic or intumescent rhinitis, serious 'septal deflections or spurs, etc., exist, these should be removed in the beginning of the treatment, for applications to the larynx alone can scarcely cause permanent benefit. I think that from 80 per cent to 90 per cent of all the cases of catarrhal laryngitis that I see result from nasal obstruction or are at least kept up by that condition. In these the nasal trouble must be removed in order to cure the larynx. It appears also that the intermittent obstruction, occuring especially at night, due to intumescent rhinitis is a more important etiological factor than any other. Septal deflections and spurs that do not materially reduce the calibre of the naris should not be looked upon as causative factors and should not be removed. The more permanent obstructions, as for example, mucous polypi, that cause continuous mouth breathing, appear to have less effect on the larynx, which seems to habituate itself to the constant irritation; but in these cases also appropriate nasal treatment should be carried out. Chronic
nasopharyngeal catarrhs must receive simultaneous attention. The patient must also be carefully examined for underlying affections such as diabetes, tuberculosis, Bright's disease or digestive disorders, which must receive appropriate treatment in order to cure the local affection: therefore, a general knowledge of medicine is necessary to fit one to treat chronic laryngitis.

Patients who work in a dusty atmosphere would be benefited by wearing a respirator but they can seldom be persuaded to do so. In the simpler hyperemic types of the disease, voice rest is of great importance. The patients should be told to speak but little, to avoid singing and talk only in a low voice. Complete rest for the cords may be obtained if the patient can be induced to whisper only. Though voice rest has a favorable effect upon inflammatory edema and hyperemia it will not benefit the permanent hypertrophies or atrophic conditions, therefore, where these after effects of inflammation are much in evidence it will not help the patient to spare his voice. After removing the nasal causes, in the treatment of chronic laryngitis, and its common associate chronic tracheitis, regular frequently repeated and persistent topical applications of stimulant, antiseptic or alterative remedies are very important.

The various substances used for this purpose may be applied in the form of powders, sprays, pigments or inhalants. Sprays are preferable, though occasionally powders are of service, and sometimes pigments applied by means of a cotton probang are effectual. These applications should be made every day for one or two weeks, until acute congestion has been excited; then once in two days for a week or two, and after this less frequently, according to the improvement; at the same time the patient may himself use weaker applications by sprays or inhalation each morning and evening, or a small pocket inhaler may be employed, wherewith applications may be made several times a day. Different larynges vary exceedingly in sensitiveness, so that an application which will cause no discomfort whatever in one, may in another produce extreme pain. It is, therefore, necessary to try weak medication at first, and to gradually increase the strength of the remedies used. It is seldom practicable for these patients to visit the physician as often as such applications are necessary and rarely do we find patients who can make thorough applications to the larynx, or any application at all to the trachea, with
atomizers, however good the instruments. Usually the physician can not see these patients more than one or twice a week. At these visits he should make some stimulating or astringent application of sufficient strength to cause discomfort for one or two hours, the particular remedy being of much less importance than the stimulation (measured by the amount of discomfort) that it produces. In the interim between these treatments, I have long directed the patient to use two or three times a day some application, generally with an atomizer, to the larynx with the endeavor to get some of it into the trachea. Aqueous solutions have been commonly employed but very little if any of these can be taken into the trachea. Oily solutions of thymol, menthol, iodine, terebene, eucalyptol, etc., when applied with an atomizer or nebulizer may be more readily inhaled; but commonly, as employed by the patient, they have little effect, because so little is deposited on the mucous membrane that the action is very transient and because the applications are not made often enough. For several years I have employed with good effects a small pocket inhaler known as the Gale & Blocki (or shorter the G & B) inhaler which the patient is urged to use every two or three hours during the day. This inhaler consists of a short, hard rubber tube, the ends of which when not in use are closed by hard rubber caps that screw in. The inhaler is 3 inches long and 5/8 inches in diameter. It is packed with blotting paper which absorbs the medicament. Each morning, the patient is directed to drop into it five or ten minims of some stimulating solution such as given below and from this he is to inhale every two or three hours during the day by removing both stoppers and inhaling deeply two to eight times or sufficiently so that he will feel the effects in the larynx and trachea for five minutes. The following solutions I have used most:

R Formalin ¼ ounce, Menthol ½ ounce, Tr. Iodin ii. ounces, Alcohol, ad i drachm.

R Formalin ½ ounce, Menthol ½ ounce, Tr. Iodin iv ounces, Alcohol, ad i drachm.

R Thymol grs. iii, Menthol gr. xxx. Tr. Iodin drachm i.

This plan has given satisfaction but I have found difficulty in getting sufficiently strong effects on the larynx and trachea, and I have often been disappointed by finding the patient unable to obtain an effect that he could feel for more than half a minute. Lately I have adopted another plan with the same
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instrument that promises to be more satisfactory and which enables me to get any desired degree of stimulation, the patient being directed to inhale just long enough to feel the effects for five or ten minutes as observation proves most efficient. With this method the druggist removes the blotting paper packing and cuts away about $\frac{3}{4}$ of an inch from its middle then he re-introduces one part of the packing into one end of the tube. He then puts in Methol gr.x, Iodine crystals gr.v and on top of it gr.x more of menthol. The end of the inhaler is then packed with the remaining piece of blotting paper and the instrument is charged so that it will last several weeks.

In chronic laryngitis, it is often important to improve the patient's general nutrition by the employment of tonics and occasionally Ext. of Hyoscyamus in doses of gr. ss or gr. i three or four times a day or other remedies as needed to quiet irritating cough. Bromide of ammonium is often a valuable adjuvant in cases where the cough is annoying. Opiates should not be employed excepting in the rarest cases.

The topical remedies commonly employed in this disease consist of zinc sulphate or chloride in solutions varying in strength, from gr. ii to xxx ad drachm i of distilled water; alum mol gr. xxx to gr. i ad drachm i; phecine gr. xxx to gr. lx ad drachm i; solutions of iron chloride; mlx to cxx ad drachm i; iron and ammonium sulphate, gr. v to xxx ad drachm i, or copper sulphate gr. x to xx ad drachm i; silver nitrate, gr. x to lx ad drachm i; tannin, gr. xxx to lx ad drachm i. The zinc and copper salts have proved most generally satisfactory in my hands, although the alum mol or phecine often answer well. Usually in the beginning I apply a spray of a solution of zinc sulphate, gr. ii, menthol gr. ss and acid boric gr. vii ad drachm i, and if this causes no discomfort a small quantity of a solution of zinc sulphate gr. xxx ad drachm i, is applied immediately afterward, and should no smarting result, a more thorough application of it is made, the aim being to produce a reaction which the patient will feel for one or two hours. I usually make these applications in the form of spray with an air pressure of thirty or forty pounds to the inch.

The substances most commonly used in the larynx in the form of powder are bismuth, boric acid, iodoform, iodol, gum benzoin, myrrh, alum, zinc sulphate, and silver nitrate. Boric acid alone is slightly stimulating, and specially useful when the secretion is excessive. Equal parts of gum benzoin, bis-
muth, and iodol or iodoform make an excellent powder, still more stimulating. Tannin, in the proportion of from two to ten per cent, with sugar of milk, is sometimes useful. Equal parts of alum and sugar of milk answer well when a decided effect is desired, or alumol, one part to sugar of milk, 10 or 15 parts may be similarly employed. With most of these powders it is well to combine about two per cent of pulverized starch to prevent packing, and all of them should be thoroughly triturated.

Among the modern local remedies for purulent catarrhal states, protargol has gained a permanent place and it is not less useful in the larynx than elsewhere. It is best to apply it in five to ten per cent solution by means of the spray or in powder of similar strength and it is especially serviceable in the superficial forms of chronic laryngitis with excess of secretion. Its influence on the deeper seated inflammatory swellings and hypertrophies is slight.

When the trachea is affected as well as the larynx or when the ordinary atomizer tip does not carry the spray into the larynx because of close approximation of the epiglottis to the posterior wall of the pharynx, Freer's long intra-tracheal spray tube is a valuable instrument as it may be made to hold the epiglottis forward or to pass between the cords to deliver the spray directly into the wind-pipe. It is especially useful in laryngo-tracheitis sicca. Freer recommends for this condition a solution of potassium permanganate, 8 to 12 grains to the ounce of water, sprayed into the larynx and down the trachea.

Where the laryngeal mucosa has undergone dermoid changes with epithelial and papillary hypertrophy, as in choriditis tuberosa or inter-arytenoid verrucous conditions the milder astrigents are ineffective and mildly caustic applications are most useful. As a preliminary to their use the larynx must be anesthetized with a ten per cent solution of cocaine to avoid laryngospasm and permit accuracy of manipulation. Nitrate of silver, from 30 to 100 grains to the ounce of water, may be applied with a small swab by means of a laryngeal applicator, and should only touch the diseased area, and if this be large only a portion of it at a time.

Chromic acid is an excellent remedy in obstinate cases. A small portion of this should be fused on the end of a guarded applicator with which the part should be accurately touched. The stronger caustic applications cause a good deal of inflam-
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In chronic sub-glottic laryngitis tracheotomy is generally needed in the course of time, and it should precede all vigorous attempts at endo-laryngeal removal of the swellings. The most thorough method of dealing with these is extirpation after laryngotomy.

For the treatment of chronically swollen vocal cords softened by venous dilatations Krause makes small longitudinal incisions three to four millimeters apart, along the cords from the anterior commissure to the processus vocales. The incisions pass through the entire thickness of the vocal cords. He states that in some of his cases, recovery resulted from conditions that had resisted astringents for months.
MEETING OF THE EASTERN SECTION, HELD IN PHILADELPHIA, FEBRUARY 4th, 1905.

PAPER:

TECHNIQUE OF THE RADICAL OPERATION FOR CHRONIC SUPPURATIVE OTITIS MEDIA.

John D. Richards, M. D.

It is scarcely necessary more than to allude to the fact that the operation in question is one of the most beneficent in modern surgery. At the same time it is one of the most difficult, and there are few procedures which depend more for a successful issue upon careful attention to the detail of technique. It is from this source that any further advancement in the operation may be expected; it is upon this basis that the operation has reached its present high degree of efficiency.

There are a few points in the technique of the operation as here described, which I have not seen advocated and which may be of some slight advantage. The sterilization of the field of operation, instruments, etc., and the preparation of the patient, we are all familiar with, and therefore their recital is unnecessary.

If a curved line is so placed that one extremity is at a point immediately above the mastoid tip, the other at a point on the scalp corresponding to the top of the pinna, and its center passes through a point about one inch posterior to the line of auricular attachment to the head, a proper incision will have been outlined. This incision is not bound internally by the bone excavation, but is posterior to it, two advantages resulting, namely, that should granulations sprout in the line of incision they do not project into the bone cavity; and what is more important, should infection occur in the line of section, the bone cavity is not involved. The resulting scar of this incision is inconsiderable, and in its major portion corresponds to the hair line or is within it. Better apposition of the lips of the wound is obtained when the section is made far back as it is then "bolstered up," or splinted, by the even surface of the mastoid cortex. This is an important point and has a direct bearing upon the size of the resulting scar. The approxi-
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mation of the lips of the wound can be made with nicety when the section is so placed.

When the incision is made near the line of auricular attachment to the head, the lips of the wound having no support, tend, when sutured, to invert into the bone excavation; nor does this tendency cease even if we overcome it, at the time when the sutures are tied. The gauze packing in the bone cavity does not form an even and firm support, and pressure from without by the bandage is continually exerted upon this irregular base. Not only will the resulting scar of this incision be generally larger than that of the incision placed further back, but in addition it shows a tendency to become depressed.

Careful observation will also establish the fact that the section when made close to the line of auricular attachment to the head is more likely to suppurate. When infection occurs, with the incision so placed, the bone cavity is at a decided disadvantage, and the whole wound not infrequently must be opened.

The knife should sink to the bone all along this curve, except in that part above the posterior zygomatic root; here only down to the temporal fascia. To sever the temporal muscle is unnecessary, as with a hoe-shaped (Langenbeck's) periosteal elevator, the muscle can be retracted upward without injury. The division of the temporal muscle contributes little to the forward displacement of the auricle. To sever the cutaneous structures only, and to avoid cutting the muscle, grasp the pinna of the ear between the thumb and first finger, and, while making the incision in its upper portion, pull the auricle in a direction from the head, thereby lifting the adjacent scalp from its base, the temporal fascia and muscle. The disadvantage of dividing this structure arises when infection occurs. To this accident we are always liable, for in this operation our asepsis is but relative.

On several occasions, I have seen a complete undermining of the temporal muscle, this structure resting upon a bed of pus, and in one of these cases considerable portions of the muscle were cast off as slough. When the temporal fascia and muscle are undivided the fascia acts as a shed to any superficial infection; when severed it is as a roof that has a hole in it. Suppuration occurring in the planes of the temporal muscle affords an ugly complication, and the division of this structure predisposes the auricles to sag.
The next step is to displace the auricle and flap forward. In doing this the periosteum should not be torn but preserved in its entirety, for the semilunar flap attached to the auricle forms in part the outer wall of the bone cavity, and, when its periosteum is sacrificed, its inner surface facing the bone excavation later becomes a mass of exuberant granulations over which the process of epidermization advances but slowly.

The posterior lip of the curvilinear incision should not be retracted.

The indiscriminate clamping of every oozing blood vessel paves the way for non-union in the postauricular wound. Bruising of tissues should particularly be avoided, and with the retraction of the auricle, the majority of bleeding points will cease without ligation. Those that do not may be tied. Catgut ligatures should be used sparingly. Before the final suturing of the wound, after reaction has been discontinued, every vessel which at this time bleeds should be ligated, particularly if skin grafting is to be done at the time of operation (a practice which I do not advocate):

The cartilagino-membranous canal is next separated from the bony canal, and some gentleness is necessary to avoid tearing the soft tissues. A periosteal elevator or a pair of small blunt-nosed scissors serves this purpose. At this period of the operation, an ordinary sharp retractor is best for holding the detached auricle and flap forward. A strip of gauze introduced through the membranous canal and brought out through the postauricular wound may be used for this purpose, but the cartilagino-membranous funnel is usually torn when the gauze strip is used.

Before proceeding with the bone excavation we should inform ourselves of the depth and general direction of the auditory canal, ascertaining whether its axis assumes a more vertical or horizontal position than usual, i.e., if the canal “looks” upward and inward, or directly inward. By this, we gauge in a general way the direction in which we should excavate, and get some idea of the depth of the excavation. The removal of bone should be commenced by enlarging with the gouge the postero-superior arc of the bony meatus backward, lowering the postero-superior canal wall simultaneously as the excavation is carried inward. This method is advocated instead of that by which the antrum is entered primarily for the reason that by removing the postero-superior canal wall as
we proceed inward we utilize it as a guide and cannot miss the antrum. By its removal we create in the beginning of the operation the maximum amount of working room, and by removing the bone from the meatus backward the most favorable route is chosen for avoiding the sinus.

The attempt which we often witness to outline upon the surface of the mastoid the limit of the bone excavation is, in reality, an unconscious effort to prognosticate the limits of the antrum and to prejudge the amount of involvement. It is a waste of time for no other purpose than the indulgence in a guess, and unfortunately if the operator takes this attempt seriously and begins removing the bone near the posterior confines of this mapped out area, instead of working from the meatus backward, he not infrequently enters the sinus or exposes the cerebellum. As a rule, the exposure of dura brings with it no evil results, and our admiration for its ability to resist invasion so increases with our familiarity with it, that unconsciously we reach that point where we cease to regard it as an accident. We are in error; for, during the observation of any considerable number of operative cases, there will invariably arise instances of meningitis or intracranial infection, whose origin can be traced to no other palpable source. In children, in whom the membranes are less firmly knit and the avenues of communication with the endocranial lymph sac more open and relatively abundant, dura exposure becomes significant.

The practice of entering the antrum primarily, later removing the posterior bony canal wall, is an unwarrantable procedure, and next to the original Stacke operation, is, at the same time, the most dangerous and inconvenient route that can be chosen, working as we are upon mastoids in which the ordinary relations are notoriously disturbed, performing an operation in which injury to the sinus constitutes an absolute inconvenience, and attempting to reach an unknown location (the antrum) through an insufficient opening, placed at an uncertain point, and without a guide.

If at this period of the operation, i.e., before the antrum is opened, the upper margin of the bone excavation is not carried higher than the roof of the auditory canal, we avoid the middle fossa. Having once entered the antrum, the upper limit of the bone cavity can be raised until it becomes tangent to the floor of the mid-cranial fossa by removing the over-
hanging bone which represents the superior portion of the external antral wall. The lower limit of the mastoid excavation should slope down by an even curve into the floor of the auditory canal.

As the excavation in the bone is carried inward (and it is always safer to lower the roof of the cavity in advance of its floor, on account of the external semicircular canal and vertical portion of the facial), the antrum, being more superficial than the tympanum, will be entered first. A bridge of bone will then be left separating the mastoid excavation from the inner end of the auditory canal. This bridge represents the extreme inner end of the posterior canal wall and in part the tympanic ring.

A hook-shaped probe then introduced into the antrum and passed through the aditus, its point emerges through the opening in the drum membrane into the inner end of the auditory canal, and in its concavity is held this bridge of bone referred to, and with the removal of which, the antrum and tympanum are merged into one cavity. As the antrum is entered, a bent probe should be made use of to ascertain the limits of this cavity. To have at all times the maximum amount of working room is a desideratum, and we at once enlarge the excavation backward, removing the over-hanging bone as far posteriorly as the probe has revealed the posterior limit of the antrum to be. Superiorly we ascertain the amount of over-hanging bone included between the upper limit of the excavation and the roof of the antrum, i.e., the floor of the mid-cranial fossa, which is our upper limit, and we remove this. We then have the maximum amount of working room through which to attack the tympanum and to remove the "bridge" previously mentioned.

For the enlargement of the excavation outlined above, I know of no instrument which is comparable in safety to the strong round curette, to be used in increasing sizes as the excavation is enlarged. The rim of the bone cavity affords the proper fulcrum, under which circumstances the curette becomes one of the most powerful instruments in the mastoid kit, capable of being used to advantage even in bones of extreme density. The removal of the "bridge" is next to be effected. For this purpose the Jansen forceps has been devised. The operator skilled in the use of the chisel would, however, scarcely lay aside this instrument to use the forceps; and the same may
be said of those accustomed to the curette. My own preference is for the latter instrument. The cutting edge of the curette is placed beneath the bridge, its back faces the internal wall of the aditus, the posterior margin of the excavation gives fulcrum, and by twirling the cutting edge of the instrument through a semicircle, the bridge of bone is easily removed and without danger to other structures, for we are working in a direction which is from within outward, and in this respect the curette is safer than the chisel. At this period of the operation, i.e., during the removal of the bridge, injury to the facial nerve is altogether unnecessary, and moreover is but rarely committed; it is later that the nerve more commonly suffers, and the use of those variously devised instruments for its protection decreases proportionately to the operator's familiarity with the anatomy of the parts; their elimination is a step toward simplicity, and should be encouraged.

The bridge having been divided, the resulting isthmus is widened at the expense of the bone representing its upper pillar, until this superior pillar has been made to recede upward to the under surface of the mid-cranial fossa. With a small curette the remnants of the ossicles (with the exception of the stapes) and the membra tympani are swept out into the trough of the bony canal, and removed; they may be extracted with the forceps, if visible and present.

Owing to the bleeding from the granulations in the hypotympanum and those in the region of the tube, considerable time is saved and the necessity for sponging lessened by early removing these granulations with a ring curette, and filling the tympanum with adrenalin. The assistant's duty of sponging the tympanic cavity and keeping it cleared of blood, is not an altogether irresponsible trust. A visit to the dead-house, if we choose to make the experiment, will soon convince us that in the act of sponging the stapes is dislocated or driven through the oval window with far more frequency than is generally supposed. To this is often due that dizziness and vertigo which is occasionally to be observed after such operations, and in which injury to the semicircular canal and the structures of the inner tympanic wall has not been committed by the operator. To prevent this accident, it is advisable to diminish as far as possible the amount of sponging, by early removal of granulations and the use of adrenalin and the complete lowering of the "inferior pillar," i.e., the ridge
overlying the vertical portion of the facial nerve and also protecting the stapes, should be reserved as a later step of the operation, the assistant being required to sponge over this ridge from the direction of the mastoid excavation, and not through the bony canal.

The external attic wall should next be removed. With this a distinct advance was made in the techique of the operation. When this ledge is allowed to remain it often conceals diseased pneumatic structures which keep up a protracted suppurition. Particular attention should be paid to the extreme anterior end of this ledge; it should be thoroughly removed and not allowed to remain as an irregularity in the upper and anterior portion of the vault of the cavity. The dome of the excavation as it curves forward should pass insensibly into the curve of the inner end of the anterior wall of the auditory canal, it should be smooth and even, with no irregularities, and all pneumatic structure should have been removed.

The next step is the lowering of the "inferior pillar," i. e., the ridge which overlies the vertical portion of the facial nerve, and sometimes is referred to as the facial ridge. The failure to sufficiently lower this is responsible for many an unsuccessful outcome. When left high it shuts off the mastoid excavation from the tympanum to such an extent that proper drainage of the former cavity is not secured; secretions stagnate therein, profuse granulations arise, and the posterior portion of the cavity is cut off from inspection.

As we dress the wound through the meatus we are forced to pack the mastoid portion of the cavity over the brow of the hill. As the patient lies in the operative position (except in anomalous positions of the nerve, which are rare) this ridge from the floor of the aditus to the floor of the auditory canal, can be safely lowered till level with the summit of the external semicircular canal. For this purpose I prefer a broad, round-nosed curette with its cutting edge turned slightly backward. We occasionally see the rongeur used. This is of all instruments the most dangerous in this locality, for the ridge is composed of exceedingly brittle bone and often fractures far beyond the bite of the forceps, the fracture not infrequently involving the Fallopician canal.

By holding the curette vertically, placing its nose upon the summit of the external semicircular canal, using the superior rim of the bone cavity as a fulcrum, and working towards the
tip, the ridge can be shaved down to the desired level with the utmost ease, and the danger of injuring the nerve is practically eliminated; for the plane of action of the curette is either parallel to the course of the nerve or else in the direction from it, and the cutting edge is (if the instrument be held vertically) slightly above the convexity of its nose. Even though the nose of the instrument rests upon an exposed nerve, that structure is practically insured from being cut across. Not only is the curette more effective here than the chisel, but, what is more important, it is immeasurably safer.

Even in anomalous positions of the nerve, in which the nerve in its vertical portion rises superficially and is consequently more oblique, there is, when using the curette as above described, but little danger of injuring it. The intratympanic horizontal portion of the Fallopian canal is always to be seen at this period of the operation, and if we choose we can follow the nerve in whatever direction it may take, exactly as we would a blood vessel after having once found it. The danger of the chisel is that we have to work from without inward, never knowing that the nerve may not be at the point we are chiselling. The safety of the curette lies in the fact that we see the level of the nerve, or rather a point immediately above it, the external semicircular canal, and commence the removal of the superimposed ridge from that point, working from within outward. I have never seen a nerve paralyzed by the curette when used in the manner above described. Owing to the small, pit-like character of the cavity when the chisel is used for shaving down this ridge, its action is not only from without inward—the direction of danger—but from the nature of the instrument, the plane in which it cuts, if continued (as by a slip) crosses the course of the facial nerve. For any instrument to embody the quality of safety, its action must be parallel to the course of the nerve, and the chisei cannot meet that requirement. So far as I have been able to observe, the advocates of the chisel are forced to either of two disadvantages:

First, in order to insure a proper lowering of the ridge, the mastoid excavation is unnecessarily enlarged, and for no other reason than that the instrument can then be used at a safe angle, i.e., in a direction more nearly parallel to the course of the nerve. This is one reason why many advocates of the chisel insist upon making an unnecessarily large mastoid ex-
cavation, even though the vertical process of the mastoid is in no way involved. It secures a large amount of working room which, for the safe use of the chisel in the locality above referred to, is a necessity; but this delays epidermization.

Secondly, if the limits of the cavity are confined to their proper proportions, it is with great danger to the nerve that the ridge can be lowered to its most advantageous level with a chisel, and this requirement is more rarely met with than it should be. Not that recoveries do not occur with the ridge improperly levelled, but it is to commit an error of technique which, if persisted in, will contribute in a series of cases its percentage of the failures. When, for instance, the hypotympanic space is deep, lowering of the ridge to its absolute limit becomes a necessity.

The inner end of the floor of the auditory canal should be lowered until it recedes to the level of the floor of the hypotympanum; in other words, the external wall of the hypotympanum should be removed. As the cavity is then dressed through the meatus, its floor in all its parts is open to inspection, the round and oval windows are easily to be seen, and there is no portion of the cavity shielded from the eye. The failure to remove the external wall of the hypotympanum is a common but grievous error; depending upon the depth of the hypotympanum,* which varies with the individual bone, secretions effectively stagnate, a pit for concealed granulations is afforded, and the cavity justly deserves its name "the cellar."

Immediately posterior to the round window and in a posterior portion of the hypotympanum, there are often to be found pneumatic cells, which, if the external celllar wall is not removed, remain hidden and keep up a protracted suppuration. These cells, after the above requirement has been met, may be removed under direct inspection, and the danger of injuring the nerve is thus lessened.

For the lowering of the inner end of the floor of the auditory canal, both the chisel and the gouge are eminently instruments of danger for the reason that this bone is intensely hard and brittle, it requires considerable of a stroke of the

mallet to engage a bite of it, and to remove it, and when it gives it does so with a suddenness. The point of the instrument, directed from without inward, may, if by chance the chisel slips or the stroke of the mallet be misjudged and in excess of that needed, produce injury to the following structures: the dome of the jugular bulb, the facial nerve, the joint of the inferior maxilla, the structures of the internal tympanic wall; and at times the carotid artery is not so very far distant. Each of these accidents, with the exception of the latter, I have seen occur to experienced manipulators of the chisel. The most common injury is to the facial nerve. A safer instrument by far is a round curette with its cutting edge turned slightly backward, to be used from within outward, in a direction away from the structures mentioned above. Provided the instrument be used as a cutting instrument and not as a pry, it works admirably.

A factor which, on paper, seems unworthy of note, but which in actual experience often amounts to a handicap, particularly to one who operates but infrequently, is that at this period of the operation the fingers by constant holding of the chisel have become tired and cramped, and are incapable of their best effort at a time when this is most needed.

It not infrequently happens that the floor of the auditory canal presents about its middle, from without inward, a marked convexity. Particularly is this true of those canals whose antero-posterior diameters are short, in other words, in a canal the cross section of which represents an ellipse with its long axis inclining to the vertical. This hump should be levelled, otherwise, as we view the cavity through the meatus, the floor of what was the hypotympanum remains hidden from view.

The next step is to widen the floor, or trough, of the auditory canal at the expense of the base of its anterior wall. In some instances this is unnecessary, but in others the anterior wall of the auditory canal presents a marked convexity backward, so that in attempting to see the region of the tube through an artificial meatus of moderate size, our view is hidden by the curve of the anterior canal wall. This wall is an exceedingly thin, brittle partition of bone separating the lumen of the auditory canal from the joint of the inferior maxilla. A vertical section will, however, reveal the fact that the partition is thicker at its base than at a point higher up.
With a sharp, round curette it is possible to gain (and with safety) considerable space by removing thin shavings of bone from the prominence of the convexity, and particularly from the base of the anterior wall of the auditory canal. It is surprising to see how much the field of view can be enlarged with the removal of a minute shaving of bone, and until every portion of the bone cavity has been made easily accessible to the eye through the meatus, we have fallen short of a proper ideal. My reason for advocating the last mentioned procedure is to avoid having to make an unnecessarily large and consequently deforming meatus in order to get a proper view of the region of the tube. By carrying out the above procedure, the meatus in the vast majority of cases can be kept within cosmetic limits and need not be noticeably enlarged.

We occasionally meet with a bone in which the convexity of the anterior canal wall is so marked that we cannot lessen this to the required degree without endangering the joint cavity. Inasmuch as a proper view of the region of the tube must be had, we then must make an opening in the concha sufficient for that purpose, regardless of the appearance.

The region of the tube is essentially a region of trouble, but to the tube itself failures are often attributed for which it is not responsible.

One of the most important of these is the failure to remove the extreme anterior portion of the annulus tympanicus. When this structure is prominent, as we look forward at the tube from the mastoid excavation, the annulus presents the appearance of a rim or flange of hard white bone which juts out into the lumen of the cavity, which partially conceals the mouth of the tube and under the ledge of which granulations are easily overlooked. These granulations having been thoroughly removed, the rim of the annulus, the lip overhanging the tube orifice, should be removed so that the anterior portion of the tympanic cavity will resemble in shape the small end of an almond with its sides converging and with the smooth and round end of the tube at its apex. A very small, round curette or a burr may be used to remove this portion of the annulus.

One great disadvantage of allowing the annulus to remain is witnessed during the period of healing. As the process of epidermization advances toward the region of the tube, upon reaching the rim of the annulus, the course of the epithelial
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growth is suddenly diverted and directed out into the lumen of the cavity, the flange of the annulus acting as a jetty, onto which the epithelium runs. As cell proliferation continues, the summit of this jetty, by the piling up of its epithelium, is gradually made to extend across the cavity to the anterior portion of the internal tympanic wall. The extreme anterior portion of the tympanum and the mouth of the tube are then shut off from the main cavity by this epithelial curtain, anterior to which granulations form. In some instances the curtain is incomplete and sickle-shaped. In looking into such a cavity we are frequently struck by what appears to be a perfect result. Upon careful examination, however, it will be seen that from the extreme anterior end of the cavity a crust may be removed, beneath which there may appear either a point of pus or a granulation, presumably at the mouth of the tube. This apparent mouth of the tube is, however, nothing more than a hole in the "curtain" to allow of the escape of fluid contents pocketed anterior to it. When the curtain is broken down the true condition is revealed, but inasmuch as the annulus remains, the curtain is liable to reform, and once we have failed to remove the annulus at the time of operation it practically becomes impossible to do so later; depending upon the prominence of this structure, which varies with the individual bone, is the likelihood of trouble. This complication can be prevented by either primary or secondary grafting or by firm packing, and is most commonly seen in cases which are not grafted and in which little or no packing has been used.

The accessible portion of the tensor tympani muscle and cochleariformis, the semi-canal or curled lip of bone supporting the tensor tympani muscle, should be destroyed; otherwise the tube, considered from a surgical standpoint, is divided into an incomplete upper and lower compartment, and though the tube proper (the lower) is thoroughly curetted and cleaned, granulations persist in the upper portion and keep up a protracted suppuration. Another source of considerable and frequent annoyance is the failure to remove the diseased cells often found in the vicinity of the tympanic orifice of the tube and for which the tube is generally held responsible.

Before making the flaps, in order to insure as clean a cavity as possible, irrigation with normal salt solution, followed by ninety-five per cent. alcohol, should be practiced, and particular care should be exercised in wiping out the cartilaginous
The meatus be made, making able to poor larger, than accordance problem to cations the finished meati the ridge). After trial of the various flaps which have been advocated, I am of the opinion that an essential feature to a good flap is, that it be made so as to allow at least a small portion of it to be turned down, sufficient, that is, to give the lower flap the proper direction for growth and to prevent its curling upon itself, and to some extent to cover the inferior pillar (the facial ridge).

The flap from which I have obtained the best uniform results is made as follows: The point of the knife is placed at the junction of the lower and middle thirds of the cartilaginous meatus, in its posterior half, and from before backwards is made to pierce the auricle. The incision is then carried horizontally outward into the concha for a distance sufficient to insure a good opening. It is then curved upward, and as it continues, a trifle forward, and terminates on a level with and immediately behind the postero-superior margin of the cartilaginous surface. The posterior wall of the cartilagino-
membranous funnel is then slit inward to its apex, and so divided as to give the upper two-thirds of its length to the upper flap, the lower third to the lower flap. As the above incision is carried out into the concha and as it curves forward, the knife is so held as to allow the entire incision to be bevelled at the expense of the posterior surface of the concha.

So far as I know, this is a point which has not been embraced in any flap yet advocated. The advantage to be derived from bevellimg the posterior surface of the artificial meatus is, that as we dress the wound and insert into the meatus the cylinder of gauze to hold it open, the plug carries before it and infolds the bevelled edge, and epidermization proceeds rapidly, for the infolded skin margin is at once given the proper direction in which to grow. This infolded edge, moreover, protects a rim of otherwise bare and exposed cartilage, and those of us who have ever had the misfortune to have develop here a perichondritis will adopt any means to avoid a second. It decidedly lessens the likelihood of such a complication; it prevents the formation of those granulations which generally sprout just within the posterior margin of the artificial meatus and which cause so much delay in the process of epidermization by blocking the attempt of the conchal epithelium to override the cartilaginous rim of the orifice.

The upper flap is next freed of all redundant tissue, the included cartilage is dissected out, and this portion of the flap is now represented by a skin membrane which, as the ear is later drawn back in position and the wound sutured, slides in over the dome of the excavation. Only one catgut suture should be taken to hold this flap in position, and it should pass through the extreme anterior and external edge of the flap; it should be anchored to the upper portion of the anterior lip of the curvilinear wound at a point corresponding to the superior rim of the bone cavity. The temporal muscle as it lies in its undisturbed position offers an inviting point at which to anchor the flap, but it should not be used for this purpose. For the same reason it seems particularly prone to become infected under these conditions. The requirement to be met is so to anchor the flap as to prevent its prolapse into the meatus and to hold its outer end up to the vault of the bony cavity, the inner end being held in contact with the dome by the gauze packing introduced through the meatus. When more than one suture is taken, the second suture which is placed at a point in
the flap internal to the first, when tied, pulls the flap away from the vault of the cavity and crumples it upon itself. It accomplishes no good purpose, introduces more catgut in to the wound and adds to the probability of infection, and prevents the flap from reaching as far inward over the dome of the cavity as it should; it consequently delays epidermization.

The lower flap representing the inferior third of the membranous canal and meatus, and the inferior third of that portion of the concha used for the purpose of flap formation is next turned down and held in position by a mattress suture, which is anchored to the anterior lip of the curvilinear wound below. Before this flap is anchored, the cartilage is dissected out as in the upper flap, and before the conchal portion of this flap is turned down the original curvilinear incision in the concha is carried down to the level of the floor of the cartilaginous meatus. The outer end of the lower flap is then represented by a tongue of skin, and as the mattress suture is drawn tight, the inferior flap is held down in contact with the floor of the bone cavity and in proper direction for epidermization to proceed.

The advantage of a slight inferior flap is that it covers a portion of the cavity which is notoriously tardy in becoming epidermized, and certainly the time of healing is shorter than when the entire posterior membranous canal is utilized for an upper flap. When the latter is done a small skin graft should be applied to the inferior pillar (the facial ridge) at the time of operation. If the graft takes, it serves the purpose of the inferior flap, but primary grafts are notoriously uncertain; we are grafting upon a septic base, and when they cover large areas of the cavity, particularly areas which are in proximity to the dura, or if the dura itself is exposed, are not altogether free from danger.

The curvilinear incision should be sutured with silkworm gut: four sutures are generally sufficient, and while these are being introduced, the points of puncture should be supported so as to prevent traction upon the flaps as the needle is passed through the tissues.

The temporary packing is now removed, the cavity wiped dry and packed through the meatus with small squares of gauze. On the third day the cavity is dressed and the sutures removed. As soon as a good firm bed of clean healthy granulations arises, a secondary skin grafting is done through the
meatus. It is unnecessary to anesthetize the patient for this purpose; by holding a block of ice upon the thigh for several minutes, there is little pain, and the vitality of the graft is not impaired.

In an ear which possesses a useful amount of hearing, I do not place grafts immediately over the round and oval window, but graft as close to these as possible without covering them. At the same time the tendency to the formation of granulations is kept down so that the least possible barrier to the sound waves is interposed. The attempt in these cases should be made to get epidermization in this region as quickly as possible with the least amount of tissue blanketing the windows. In order to carry out these manipulations satisfactorily, it is essential that the facial ridge be lowered to its absolute limit, and the pyramid, if prominent, destroyed.

We occasionally get brilliant results by grafting, but often the healing of the cavity is not materially shortened. I think a fair estimate of the value of grafting is, that we may generally expect to shorten the period of healing by several weeks.

An excellent result, whether grafting is or is not practiced, is complete epidermization at the beginning of the fifth week. In cases of encapsulated cholesteatoma the post-auricular wound should be left permanently open; if sutured, we will probably have to reoperate at a later period. All adenoid vegetation should have been removed from the nasopharynx, as it constitutes a menace to the ear cavity.

I do not believe in primary skin grafting as it stands today, and as I have seen it practiced. It is not in accordance with surgical operations. By our operation we have removed the protective barrier of granulations; we have exposed a large area of raw, absorbing surface; we have opened innumerable small vessels, and their mouths stand ready to receive infection; the field is septic, and with our skin grafts we blanket this infected bed, which stands not only in dangerous proximity to, but in direct vessel connection with the endocranial lymph sac. On two occasions I have seen meningitis and death follow primary skin grafting, and in these cases it would have been very difficult to have attributed these deaths to any other cause. I have been unable to get results which would lead me to adopt it as a routine practice, nor have I seen such results obtained by others. In a procedure so simple in its technique it seems strange that operators so vary in the results reported.
Of 22 consecutive chronic cases, in none of which was the duration of the disease under three years, operated upon according to the above technique, complete and apparently permanent epidermization has followed in 21 of these cases. One patient disappeared from the hospital about the sixth day after the operation, remained without treatment and with a dressing in the ear for two weeks. Returned at the end of this time with an abscess of the auricle, a perichondritis, the meatus completely closed, and the cavity a pool of pus and foul granulations. In this instance curetting of the cavity and a plastic operation was later necessary.

DISCUSSION.

Dr. Arthur B. Duel: Most careful attention to technic is of the greatest importance and Dr. Richards' paper must have impressed this upon all of us. In the first place, I consider it exceedingly important to have the skin surgically clean. The incision, in my mind, should not be carried through the periosteum with one stroke of the knife; you do not get a clean surface and this is particularly true in the upper part of the wound where if one endeavors to carry the incision to the bone he is bound to cut the temporal muscle. The temporal muscle should be pushed up and away without wounding it. In separating the cartilaginous from the bony canal, it is very important that the anterior portion should not be torn away from the bony canal. I think frequently this is caused by the assistant tugging too strongly with the piece of gauze passed through the canal to be used as a retractor. In those cases, where I feel certain that it will not be necessary to remove a very large portion of the cells, I am inclined to make the incision for the tongue flap at first; thus furnishing more room and avoiding the danger of separating the cartilaginous canal anteriorly. Of course, in those cases where, from the history of the case, one feels that he might have to remove a large amount of the bone, this preliminary flap cannot be made. In making the bony excavation I have found it very convenient to go directly into the antrum first. The danger of wounding the sinus is not great if one proceeds carefully, and that of not finding the antrum in its normal position I have never realized. If an anomalous sinus is encountered it is a simple matter to change the point of attack. The antrum, in my
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mind, always lies in the same position. I always go straight into the antrum and then remove the superior and posterior bony wall. In doing this I have recently found that these forceps designed by Dr. Kerrison are most useful in breaking down that bridge rapidly and without any danger of injury to the facial nerve. I agree with Dr. Richards that the danger of wounding the facial nerve is not in removing the bridge of bone, whether with the chisel or any other instrument. In the majority of cases operated upon for chronic suppurative otitis media eburnation of the bone has taken place, and in leveling the ridge there is danger of injuring the nerve, on account of the brittleness, if one is not extremely careful. It is hardly necessary to call attention to the fact that failure in these operations is frequently the result of lack of care in removing the cells in the hypotympanum.

Unless the vertical cells and tip are to be removed, which is sometimes necessary in these cases, I have found that the Körner tongue flap gives all that is necessary for subsequent dressing of the wound and the entire cavity can be kept under the eye, with less deformity than in the other flap. Where it has been necessary to remove all of the cells, I have found that by cutting along the superior and posterior boundaries of the cavum conchae, making an angular flap which can be turned into the bottom, gives better results, with less deformity, than when the T-flap is made. In either case I think it is important that the cartilage be dissected from the skin which is turned back. I thoroughly agree with Dr. Richards in his proposition that the curette is a much safer means of lowering the ridge than by means of the mallet and chisel after one gets into dangerous territory. By working with the chisel, or rongeur, down to the point where we are in close proximity to the nerve and then using the curette, we can get along much faster. In regard to skin grafts, I am greatly in favor of placing small islands of skin over the vault and Eustachian tube about ten days or two weeks after the primary operation, when the bottom of the cavity is covered with healthy granulations. This can very often be done without great discomfort to the patient without any anesthesia whatever. The removal of these small pieces of skin is not very painful and through the plastic opening there is sufficient room to place them in position. The small grafts are much more likely to "take" than large ones. The practice of placing grafts at the
primary operation over an area of the dura which has been exposed certainly subjects the patient to the danger of meningitis, since there is a great possibility of locking infectious material in the cranium. The only safe thing to do with exposed dura is to secure efficient drainage from it by a wick of gauze placed against it and leading out into a large dressing. To seal it up by means of a skin graft is, to my mind, an unsurgical procedure and should be condemned.

Dr. Ard: I have been very much interested in Dr. Richards' paper. I have had an opportunity of frequently working with him in the dead house, and I believe his conclusions are well founded. He has certainly demonstrated to me the value and safety of the blunt-nosed curette in the preparation of the cavity after the initial work has been done with the chisel. I regret that he did not bring the curettes with him. It is remarkable with what ease, after a little practice, one can prepare the cavity in the way Dr. Richards has described. I do not find it necessary now to alarm the patient previous to the operation by telling him of the possibilities of injuring the facial nerve, for I consider the danger of injuring the nerve remote.

I would like to impress upon operators the value of dead house work. Too little of it is done. If we do this operation over and over again in the dead house we acquire a degree of skill and a knowledge of the anatomy of the parts that would almost enable us to do this operation with our eyes shut. With this experience injury to the facial nerve will be rare.

I would like to call your attention to a method of closing the wound after the operation has been completed. Small flexible metal clamps are used which are grasped in a specially constructed forcep. On each end of the clamp is a sharp, tooth-shaped projection which sinks into the tissues on each side of the linear incision. By compressing the forcep the clamp is bent, bringing the lips of the wound into close approximation. The clamps are placed in the same position as sutures and are easily removed. They can be applied with such rapidity as to save almost all of the time required suturing. I first saw them used by Jansen in Berlin, and have used them several times since in my own practice with very satisfactory results.

Dr. Geo. L. Richards: I would like to ask Dr. Richards if, when he does not use the skin grafting, the result of the
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operation is any different? In other words, is skin grafting an absolute necessity for the perfect doing of this operation?

Dr. Sprague: I have been very much interested in this paper and discussion. I have never yet done skin grafting and my cases have given good results without it. In this operation I almost entirely depend upon the chisel and mallet. I have never yet had any trouble with the facial nerve with the chisel, and in some cases I should think the curette fully as dangerous in working around the semicircular canals. I think if one is careful in the use of the chisel he will have no trouble, but the use of instruments is a matter of individual choice. Most of the cases have healed by first intention giving good smooth surface behind the ear. The opening of the canal I have maintained in a way of my own by placing a large rubber drainage tube which enlarges the canal sufficiently to do your dressing through. This is kept in position for about a week and is removed easily with no pain to the patient. This gives a good smooth round opening to do your dressing through and gives a nice cosmetic result when it is finished. Most of the cases have been done by taking away the outer wall of the attic and antrum and then working outward. I am always careful to see that the cavity is perfectly smooth in order to prevent cholesteatoma or granulations in the wound. In most of these cases where the suppuration has existed for a number of years, the bone has been so hard that it is rarely necessary to work very far beyond the enlarged antrum; the bone is usually so hard that it is not necessary to remove it. The after treatment, to my mind, is very important and I think here is where a number of the cases fail. The way the operation was originally done, the cavity was packed closely with gauze at the time of the operation. This causes great pain to the patient when it is removed at the first dressing and it tears open blood vessels and newly formed tissue. Since using the drainage tube I do not pack the wound at the operation, but at the end of a week when the drainage tube is removed I pack with wicks of gauze, cutting the length according to where I want to pack; for the Eustachian depression I cut them one-fourth inch in length, for the upper part of the attic the same size and as I come to the tympanic, antral and mastoid cavities I cut them larger. This allows a good smooth epidermal surface. Of course, it is a very tedious procedure, but I think a very necessary one and one is
well paid for pains, taking case by good results. When I speak of close packing of the newly made cavity I do not mean tight packing, for I think tight packing is harmful and unnecessary.

Dr. Jackson: I have quit suturing the flap. I tried four cases of suturing the flap and every one in which I did so I found full of pus, while those not sutured were comparatively clean. I concluded that it was the catgut, which was undoubtedly sterile when it went in, but it afforded a good culture medium. In regard to warning the patient about facial paralysis, I think we would be on the safe side to tell them. In a case which I had in which the temporal bone had been fractured by a baseball my curette lifted a sequestrum right off the vertical portion of the facial nerve. There was no paralysis here until 24 hours after, evidently from neuritis. The patient gradually recovered after a number of months. I think we had better state that it sometimes occurs from inflammation.

Dr. Arnold Knapp: I cannot agree with Dr. Richards' advice to use the curette in removing the innermost part of the posterior canal-wall and prefer the chisel. The dissecting away of the anterior wall of the canal to overcome an unusual convexity is apt to be followed by necrosis and the healing thus very much delayed. This condition can be better treated by conducting the after-treatment through the post-aural wound. In fact after an experience of eight years in doing the radical operation, during which time I have tried every method, I have returned to the old method of after-treatment in many of the cases, as the after-treatment through a partially closed post-aural wound is easier and more thorough; it is, moreover, very much easier to insert grafts through a posterior wound than through the meatus. I should like to say one word in regard to the dressings after the radical operation. I think the tendency today is against tight packing. Too tight packing, besides being painful, tends to keep up excessive granulations in the tympanic cavity.

Dr. Richards, closing: In regard to going into the antrum first, we will without doubt see many cases in which the middle fossa reaches a lower horizontal level than the antrum; in these cases the antrum is relatively so high, that if we attempt to enter it as the first step of the operation we will perforate the middle fossa. And the sinus in these cases is liable to come close to the posterior wall. In regard to skin graft-
ing, the point I wished to bring out was this, that by grafting we do not get such superior results, but that we do better with grafting than without and that secondary grafting is the one which should be done. I think we can generally expect to shorten the period of healing by a couple of weeks if we do skin grafting. In reference to primary skin grafting, certainly we see septic cases which take place after this procedure, particularly if we fill the cavity completely with the grafts. I have seen a number of cases in which after primary grafting we get a temperature of 103 degrees to 104 degrees, and on removing the grafts the temperature immediately drops, as the pent up pus is freed. A resulting meningitis is not altogether uncommon.

In regard to suturing the flap, I only use one catgut suture which holds the outer end of the flap up to the vault of the cavity. Unless this is done the flap is liable to prolapse into the meatus. In regard to the use of the chisel, of which Dr. Knapp spoke, I still think that the tendency is to either make these mastoid excavations too large or to insufficiently lower the facial ridge. In regard to shaving down the base of the anterior wall of the auditory canal, if a curette is used, this can be done with safety; the joint cavity is not opened and we secure a splendid view of the region of the tube. Contrary to the statement made by Dr. Knapp, it is altogether unnecessary to detach the membranous canal from the anterior canal wall, for the portion of the anterior wall which is shaved down is farther in than the point to which the cartilaginous canal reaches. I believe in tight packing in the region of the tube.
PAPER:

REPORT OF A CASE OF OSTEOXYELITIS OF THE TEMPORAL BONE.

CHARLES W. RICHARDSON, M. D.

Having during the past few years written several papers upon the subject of acute osteomyelitis of the temporal bone, I propose in this paper, only to report a case, which has all the evidences of such an infection, except that the temperature course was not of that degree of intensity as was usually observed in the other cases which I have seen. The case also presented other unusual and interesting features, which will be brought out in the history.

On November 5, I operated on a young girl fourteen years of age for adenoids, enormously hypertrophied tonsils, and a marked deflection of the septum into the left nasal cavity. She progressed favorably until the fourth day, when she developed an acute inflammation of the left middle ear, which subsided in the course of ten days. Two weeks after the onset of the acute inflammation, there developed tenderness over the mastoid antrum, with severe neuralgic pain over the anterior temporal region. The membrana tympani at this time had assumed a normal appearance. Active treatment instituted for several days to combat the mastoid seemed to be resultful, until the third day after the onset, when there was a rise of temperature—101°—attended with some slight edema over the mastoid. Mastoid pain greater and more extensive. The next day a report of no improvement was made from patient, and she was ordered to hospital for operation. On seeing her the following day, the day of the operation, I was somewhat astonished at the extent of the infiltration over the mastoid and the temporal region. This infiltration extended over an area fully an inch and a half from any point of the edge of the auricle. Anteriorly it extended to the margin of the orbit, being sharply limited below by the margin of the zygoma. The patient was heavy and sluggish, uncomplaining unless disturbed. The skin was sallow and the tongue heavily coated. The pulse 120 soft and compressible; temperature 101°.

The infiltration gave a peculiar expression to the face. The
infiltrated area was somewhat firm, not pitting as deeply as the infiltration usually encountered as secondary to mastoid involvement. The incision was made through a colloid like tissue fully an inch in thickness before the bone of the mastoid was reached. The external surface of bone appeared perfectly normal. On chiseling through the cortex, the diploic structure of the bone was found to present that peculiar vascular appearance and friable nature seen in cases of osteo-myelitis in the early stages. No pus was encountered until just before entering the antrum, when about ten or fifteen drops of thin watery pus flowed out. When the mastoid antrum was opened it was found to be filled with granulative tissue. The granulation tissue in the antrum was found to extend forward into the aditus, as well as into the zygomatic cells. Not the slightest evidence of pus was found after the antrum was opened. After all the granulations were thoroughly removed, the case was dressed as usual. The somnolent condition was very marked for the first three days after the operation. Daily afterwards the patient's condition improved, although it was ten days after the operation before the infiltration had fully disappeared from the anterior temporal region. The recovery was uneventful.

The interesting features in this case were the occurrence of mastoidal inflammation after a non-perforative inflammation of the middle ear; the rapidly occurring and extensive edema of the soft tissue; the presence of such extensive granulation in the antrum and zygomatic cells; and the presence of all manifestations of osteomyelitis without the typical temperature curve.

DISCUSSION.

Dr. McKimmie: I assisted at the operation in the case which Dr. Richardson has just reported, and it occurred to me that there might possibly have been a perforation, but none was discovered at the time of operation. The point of most interest to myself was the manner in which the infection took place, the infection extending so far anterior. In the nasal cavity and pharynx we have multitudes of organisms waiting to get in their work. There must have been pus in the middle ear, not enough to cause rupture of the drum membrane, but it must have infected the mastoid, and from the infection spread in all directions. It seems to me that in a case of this kind we would do well to have the organisms cultivated and see what germs were present.
Dr. Harland: May I ask whether heat or cold was used in combating the involvement of the mastoid?

Dr. Stucky: May I ask if an examination of the pus was made and what was found? I recall only one case in which there was an examination made and this showed streptococci and pneumococci.

Dr. Dudley: This case resembles in some respects a patient under my care some five years ago. The patient, a physician, had an acute otitis media—strepto-infection—with moderate mastoid swelling, edema and pain about a week after the onset of the otitis, which did not disappear under the ice coil. Operation was refused. In the second week he began to have pain in front of the ear above the root of the zygoma, accompanied by great prolapse of the anterior wall of the auditory canal. Although operation was frequently urged, he did not consent until a month after the onset of the disease. At this time there was found a moderate amount of softening of the mastoid with small amount of pus and granulation tissue in the antrum, but at the root of the zygoma was found a subperiosteal abscess with necrosis of the temporal bone, nearly the whole thickness of the structure.

Dr. Richardson, closing: I was asked whether heat or cold was employed in combating the mastoid involvement. Cold was used. In regard to the question of a perforation of the outer table anteriorly, I would say there was not. Even for the first five days after operation we were extremely anxious about the edema anteriorly. The posterior and superior edema all disappeared immediately after the operation. The result of the operation and not finding any perforation, together with the fact that the infiltration subsided completely would seem to prove that there was no perforation in the outer table. I should be censured for omitting the bacteriological examination, but there was none made.
In the following paper I have taken for consideration and report, the histories of a few cases that certainly belong to the exudative form of non-suppurative middle ear disease. In some of them there was a sero-mucous collection in the tympanic cavity while in others the exudate was purely mucous. Following this, the various classifications and subdivisions of non-suppurative middle ear disease, as given by our leading authors in their most recent pronouncements, are briefly reviewed, and some of their disagreements noted.

Case I. M. S. male, aet. 33, sailor, born in Denmark.

As the result of a cold in the head, has had, for one week, deafness and tinnitus (constant hissing) and blocked feeling in A. D. H. D. W. R. c/120. Tuning forks show trouble in the conducting apparatus. Great retraction and opacity of m. t., no l. r.; m. t. moderately congested. Eustachian tube opens poorly by catheterization, with sound of fluid in t. c. Mucosa of nose and naso-pharynx congested. Tube inflated and AgNO₃, gr. 20 applied to vault. Two days later no change; m. t. incised with escape of considerable stringy mucus. Two days later, still discharging mucus; H. D. W. 24/120. Two days later, m. t. closed and H. D. W. 30/120. Treatment stopped because of his ship sailing, but patient seemed in a fair way toward complete recovery. Treatment: incision once, repeated inflation and application of AgNO₃ to vault, and bougie used once.

Case II. W. S., male, aet. 38, horseman, born United States. As the result of a cold in the head, has had for two weeks deafness and tinnitus (rumbling), and blocked feeling in A. S. Moderate quantity of fluid visible in t. c. when first seen, May 14, 1902. Eustachian tube opens poorly by catheterization, with bubbling of fluid, but bougie passes without difficulty. Tried inflation and treatment of vault twice before opening m. t., with but little effect. Incised drum membrane, May 23, June 5 and July 17, after which patient had no further trouble.
Case III. C. P., male, aet. 40, clerk, born in United States. One month ago without evident cause had pain in A. D. which was followed for two or three days by discharge; since then there has been deafness and tinnitus (hissing) with a blocked feeling; H. D. W. R. ½ inch. M. t. shows great retraction, marked irregular opacity, some irregularity of surface; l. r. diffused and irregular in shape. Eustachian tube opens poorly by catheterizing, with evidence of fluid in t. c.; effort to pass bougie failed. Patient hears better when lying down. Two treatments by inflation, etc., made no lasting improvement, whereupon I incised m. t., with great immediate gain in hearing and lighter feeling in head. In three weeks there was again fluid in t. c.; second incision, with gain in hearing. Heard nothing further of patient. Probably no further trouble.

Case IV. Mrs. P., aet. 38, born in United States. As a result of washing her hair, has had, for five weeks, deafness and tinnitus (roaring) in A. S. and for the first two or three days moderate pain, which she thought was a toothache. H. D. W. L. ¾-inch. Eustachian tube opens easily by Politzerizing. M. t. very greatly retracted, no opacity; l. r. a central point of light. T. C. evidently nearly filled with exudate. M. t. was incised, and a large amount of mucus was cleared out by inflation. P. T. W. 6½-7. Six days later I re-opened it with escape of mucus, seventeen days later do., after which there was no further trouble, even in the face of a severe cold shortly afterwards. Treatment, besides three incisions, inflation and sol. of AgNO₃ applied to vault and mouth of tube. No special pathological condition of nose and throat, except that mucosa of vault was slightly hypertrophied, with slight excess of secretion there.

Case V. Mr. P., aet. 48, lawyer, born in United States; a so-called uric-acidemic. As a result of cold in the head, has had for eight weeks, deafness, stopped-feeling, with tinnitus (like insects) severe at first but less so at present, and for the past two weeks grumbling (“as if they might ache at any time”) in both ears. H. D. W. R. 22 inch. L. 14 inch. Right m. t. in about a normal position; considerable opacity; l. r. lessened and broken; left m. t. in about a normal position, very translucent; l. r. small and central; t. c. seems to be about 2/3 full of fluid. Right tube opens fairly well to catheterizing, with large mucous rales. Left tube—scarcely any air
passes upon catheterizing, but, after incision, air passes freely upon Politzerizing. Several nasal polypi have been removed during the past month or two; still one or more in right middle meatus. Patient has attacks of vaso-motor rhinitis brought on by driving (exhalation from the horse). A good deal of secretion in nose, but not much in throat. Left m. t. incised at first visit 12/11, '01, with escape of considerable sero-mucus; polyp removed from right middle meatus. 12/13, great improvement; 12/17, incised again. 12/20, incised again, after which hearing was greatly improved. One month later, 1/27, '02, had a cold with pain in A. S. followed by a most profuse sero-mucus discharge. Perforation now closed. 2/20, left m. t. again incised. 4/14 reports having felt all right until last night; had pain in A. S.; fluid now visible in t. c. M. t. incised with escape of mucus. Seen once afterward and felt all right. Treatment—Incision five times, inflation, removal of polyp from nose, adrenalin spray, and AgNO₃ applied to vault and mouth of tube.

Case VI. C. K., aet. 41, in mercantile life, born in United States. As a result of cold in the head, had been deaf (no other symptom) in A. D. one week, in A. S. one day. H. D. W. R. and L. 5 inch. Both m. tt. show great retraction and opacity, no l. r. and while no fluid line is visible, there is an appearance suggestive of fluid in both tympanic cavities. Right tube opens with much difficulty upon Politzerizing, left tube opens rather easily. Inflation and adrenalin spray, the latter used at home for twenty-four hours, having failed to do good, the next day, 10/21, '01, bougie and catheter were used, still without relief. I incised right m. t. after which by Politzerizing, I blew out a considerable quantity of rather thin mucus, with great gain in hearing. 10/26, incised left m. t. with similar result. 11/7, right t. c. again full; m. t. incised. 11/11, do. 11/22, left m. t. again incised. Patient ceased coming 12/3. H. D. W. R. 20 inch, L. 42 inch. Treatment—Inflation, adrenalin spray, incision of right m. t. three times left twice: AgNO₃ applied to vault, saline laxative, Turkish baths, limited use of tobacco.

Case VII. F. K., aet. 19, student, born in United States. As the result of a cold in the head, has had deafness, tinnitus (like boiling water) and slight pain in A. D. two and a half weeks, deafness in A. S. one week. Tuning forks show some internal as well as middle ear involvement. H. D. W. R.
C. L. 3 inch. Both membranes show marked retraction and opacity, and l. r., small, together with considerable congestion. In the left t. c. some appearance of fluid. Good-sized hypertrophy of 3d and 5th tonsils. Both tubes open easily to Politzerizing. Both membranes incised with escape of moderate amount of sero-mucus. One month later, the enlarged 3d and 5th tonsils were removed. Two months later, no evidence of fluid in either t. c. H. D. W. R. 3/4 inch. L. 20 inch. Right-ear was the one which had originally shown the most nerve involvement. Treatment—Incision of both drums once, inflation, removal of 3d and 5th tonsils. Later, strychnia and phospho-albumen internally.

Case VIII. A. F., male, aet. 45, salesman, born in United States. As a result of cold in the head has had for two and a half weeks deafness, tinnitus, autophonia, and stopped feeling in A. S. Hears his own breathing in this ear. Tube opens easily to Politzerizing. H. D. W. L. 3/4 inch. Clear picture of fluid in t. c., which on incision proved to be largely serum, with small amount of mucus. Only the one incision was needed, the hearing returned to normal after a few inflations, and applications of AgNO₃ to vault.

Case IX. Mrs. D., aet. 48, born in United States. As a result of cold in the head has felt for ten days deafness and stuffy feeling in A. S. H. D. W. L. c. Small quantity of fluid (probably largely serous) visible in t. c. Tube opens easily to Politzerizing. Fluid disappeared with simple inflation and AgNO₃ application to vault. Symptoms recurred five months later, but again yielded promptly to same treatment.

Case X. J. D., aet. 41, clerk, born in Ireland. Apparently as a result of a very slight cold in the head for five or six days, deafness and tinnitus, with autophonia and a plugged feeling in both ears, the onset being sudden. H. D. W. R. 5 inch. L. 7 inch. Right m. t., great retraction, marked irregular opacity, l. r. half size, tube opens with great difficulty to Politzerizing; left m. t. great retraction, moderate opacity inferiorly, l. r. almost full size. Tube opens with moderate difficulty to Politzerizing. With bougie, inflation, and AgNO₃ to vault both ears recovered, but six weeks later had another cold, and A. S. showed evidence of fluid in t. c. Incised m. t. and blew out some very thick mucus. After another treatment had no further trouble.

Case XI. H. B., aet. 35, salesman, born in United States.
As a result of blowing the nose too violently, has had, for five or six weeks, deafness and tinnitus (like hum of mosquito) in A. D. with numbness of auricle. H. D. W. R. 5 inch. M. t. shows marked retraction and is very translucent; l. r. small and marginal. Though no fluid line is visible, it looks as if there was fluid in t. c. Tube opens easily to Politzerizing. Rather excessive secretion from naso-pharynx. Fauclal tonsils moderately enlarged. Treated by inflation, and applications of AgNO₃ to vault. During the treatment patient developed an acute inflammatory attack in the same ear. This subsided, fluid disappeared, and patient heard W. 5 feet after about two months. On account of the continued numbness of auricle I incised m. t. with escape of moderate amount of mucus, after which that symptom subsided.

Case XII. Mrs. B., aet. 34, born in United States. Without apparent cause, deafness and tinnitus in A. S. three years, in A. D. six months. Tuning forks show slight nerve involvement. Right m. t. shows considerable retraction and opacity; l. r. lessened; left m. t. shows great retraction and opacity; l. r. small. Both tubes fairly open to catheter. This case is mentioned briefly here because on two or three occasions, when catheter was used, small plugs of mucus have been dislodged from the right tube with temporary gain in hearing. But I have never seen fit to incise the membrane because on no other occasions have there been symptoms which would lead one to think of a collection of mucus in either ear.

The cases described up to this point are, perhaps, not unusual; most of them are not difficult of diagnosis and when the diagnosis is properly made treatment is usually attended with gratifying results. As much cannot be said of the following cases:

Case XIII. W. S., aet. 62, born in United States. In mercantile life. First seen 1/4, '96. Deafness and tinnitus in both ears some fifteen years. Previous to an attack of pneumonia, nine months ago, had occasional stopped-feeling in one or other ear, which since then is constant in both. Has had nasal polypi removed fifteen years ago, again six or seven years ago, and there are now more or less of them in both middle meatuses. H. D. W. R. o. L. 3/4 inch. Cicatrices and chalk deposits in both membranes, which respond very poorly to Siegle. Both tubes open poorly to catheter, and bougie passes only with great difficulty. Six years later, when under
treatment, there seemed to be fluid in both t. c.'s, which after m. tt. were incised proved to be a very thick mucus; this continued discharging some days (at one time over a week) after incision. Following this the patient had a lighter feeling in the head, but did not hear materially better. Radical work in the nose was not allowed, so I had to be content with keeping a breathing space open. An essential part of the treatment in this case, the thing that really made his ears feel more open, and temporarily improved hearing, was, besides repeated incision, the introduction of large Eustachian bougies and leaving them in place several minutes at a time. Patient later died of malignant disease of either stomach or liver.

Case XIV. Mr. A., aet. 62, merchant, born in United States. Without known cause, has had deafness and feeling of weight in A. D. fifteen or twenty years. H. D. W. R. o. conv. 5 feet. M. t. has a bulged appearance (as if from blowing the nose too hard); great opacity, considerable congestion; no l. r. Tube opens very poorly to catheter. 10/11, '01, (first visit). M. t. was incised, after which inflation brought out a moderate quantity of very thick mucus; 11/11, again incised; 12/13, do., with expulsion of a large quantity of thick mucus; 12/21, do.; 12/26, do.; 12/28, edges separated and cavity emptied again; 12/31, again opened. 1/3, '02, do.; 1/6, do.; 1/13, do. This last opening did not close until 1/30, and in the meantime there was pretty constant escape of mucus from the ear. I now began the use of a large bougie once in five to seven days, leaving it in the tube five to ten minutes, and by this means the hearing was kept as good as by repeated incisions, but no permanent result was obtained, and patient, although improved, after six months of faithful treatment ceased his visits. As complicating, and perhaps causative, conditions, were a suppurating frontal sinus and nasal polypi, while the patient's general health made a radical operative interference very undesirable. Treatment consisted of—incision twelve times, Eustachian bougie (large size) and inflation with catheter, removal of nasal polypi, washing out of frontal sinus. Adrenalin solution, 3% camphor-menthol oil, and other things were injected through the catheter, Eustachian tube and t. c.

Case XV. Mr. W. M., aet. 58, in shipping business, born in United States. Without known cause, unless it was "the use of a spray in the nose," has been dull of hearing one
week, with a dull ache (relieved by pulling the tragus forward) in A. D.; the trouble seems worse morning and evening, passing off during the day. H. D. W. R. 18 inches. Some congestion of canal walls; m. t. shows marked retraction, moderate opacity, l. r. small and dim. Tube almost too open, and air enters t. c. with a perfectly dry sound. Inflated twice, stopped atomizer, and ordered albolene in compressible tube, after which there was no further trouble for nearly eight months, when on 12/31, '03, he reported sensations in the same ear similar to those of the previous attack. Has considerable mucous secretion from nose and naso-pharynx. 1/8, '04. For the last twenty hours has had some pain in A. D. for which I ordered leeches, dry heat, and applied AgNO₃ gr. v.—oz i, to vault and tube-mouth. This attack subsided under inflation and application of AgNO₃ to vault, until on 3/4 he reported that for a week there had been a plugged feeling in the ear; m. t. inflamed, but there was no pain. 3/12, H. D. W. up to 2¼ inches. 3/17, ear again more stuffy. By using catheter and the Politzer bag as an exhaust drew some thick mucus out of the tube with improvement in the feeling of the ear. 3/18 and 3/19, do.; 3/24, I incised m. t. and with Politzer bag blew out a large piece of solid mucus. By 3/28, the stuffy feeling had returned, and with the catheter I blew out another large piece of mucus through the opening made last time. Injected through the catheter, Eustachian tube and t. c. 3% camphor-menthol oil as I had already repeatedly done. 3/29, ear has felt stopped up all day; some tenderness over the region of the Eustachian tube; m. t. much reddened. Did nothing but apply AgNO₃ gr. 20 to tube mouth and ordered dry heat. 3/30, patient reports severe pain early part of last night, followed by free discharge. 3/31. more or less pain throughout yesterday, worse last night. Ear discharging profusely; slight tenderness at mastoid apex. Almost continuous, loud, pulsating tinnitus. 4/1, pain and tenderness less. 4/2, discharge profuse; very little tenderness; complains of a continuous dull ache, and continuous pulsation. 4/5, almost no change except that today temperature rose to 101.5°. 4/6, temperature, 3 p. m., 100°. Dr. Gorham Bacon saw him with me this evening and although discharge was free. advised additional opening of m. t. which was done early the following morning as an "internal Wilde's" incision. 4/9, There having been no change in the symptoms the mastoid
was opened. There was found an astonishing amount of pus and dead bone, involving the tissues around the antrum, uncovering the lateral sinus, extending far posteriorly, as well as to the apex, which came away in one piece. Healing of the wound was uneventful, dressings ceased 6/3. The hearing has never improved in this case as we expect it to after mastoid operations. At present H. D. W. ¼ inch-½ inch. No trace of mucus in Eustachian tube or t. c.

Case XVI. Mr. M. H., act. 41, salesman, born in Germany. As a result of "catarrh," progressive deafness in A. S. one year, beginning at that time with severe earache lasting three or four days, for which he says m. t. was incised but without discharge other than blood immediately following the incision. H. D. W. L. 1½ inch, P. Pol. 12 inches. M. t. shows very great retraction, great opacity, l. r. small and central. Slightly congested, responds scarcely at all to Siegle. Eustachian tube opens with the greatest difficulty to Politzerizing. In A. D. for the past three or four months patient has felt what he described as a drawing or pulling sensation, which is increasing. H. D. W. R. 5½ feet. M. t. shows great retraction and opacity; l. r. small and central; considerable congestion of malleus and attic region. Moves very little to Siegle. Eustachian tube opens with difficulty to Politzerizing. Patient says he is very largely a mouth-breather, due in his judgment to contracted condition of the upper part of throat, the result of removal of adenoids and uvula four years ago. The nostrils seem sufficiently open. The whole naso-pharynx and pharynx seem contracted, with reddening and thickening of the mucosa, this condition extending markedly to the epiglottis and the false chords. It was not until the patient had been more or less regularly under my care for five or six months that I suspected the presence of mucus in the t. c., when, owing to the continued stuffy feeling, the tendency of the hearing to retrograde, and the somewhat suspicious sounds when using the bougie and catheter, I, on 11/15, '02, incised the left m. t. and blew out a large quantity of very thick viscid mucus, with marked improvement in hearing and feeling. On 1/7, '03, I made this note: "Upon introducing the finger into the naso-pharynx there was a sensation as of adhesion between the surfaces, which seemed to separate with a tearing sensation, and some bleeding, but was followed by a much more open feeling for breathing, etc. 1/4, re-opened left m. t.; 3/9, repeated
the introduction of the finger into naso-pharynx with the same sensations and the same good effect. 4/1, severe pain in A. S. the past twenty-four hours. (I had not seen him for six days). M. t. much inflamed. I incised it and blew out thick mucus. Inflammation quickly subsided. 6/10, again incised m. t.; 7/1, do. 10/22, severe pain last night; m. t. much inflamed; incised; pain and tenderness gone by 10/24. 11/24, re-opened m. t. with escape of thick mucus, which continued to run for three or four days. 12/30, four or five days ago had severe pain in A. D. for one day, and since then moderate pain and slight discharge. M. t. much inflamed and shows a minute perforation which I at once enlarged, with immediate relief of pain. 1/7, '04, ill with a severe cold; after a few days pleurisy developed. A. D. still discharges slightly. Extreme deafness in both. 2/10, all his symptoms have greatly improved, H. D. W. R. 12 inches, L. 4 inches. This was the last I saw of patient. It is evident that the results of treatment, as to permanency, were very unsatisfactory. Just what was the condition in the naso-pharynx, which was probably the underlying cause of his ear troubles, I do not know. A distinguished colleague, and fellow-member of this society, to whom I sent him for an opinion, agreed with me.

Case XVII. Mrs. D.; act. 44, born in United States. Was first seen 11/8, '01. As the result of a cold in the head, she has been deaf, with rather loud pulsating tinnitus, and stopped feeling in the right ear for three weeks. H. D. W. R. 1¼ inch, L. 14 inches. Right m. t. shows great retraction and opacity, except for a large cicatrix lying inferiorly in which is a small l. r. Left m. t., shows great retraction, and opacity, l. r. small. Air entered right t. c. very poorly until after incision (in posterior part of cicatrix) when it went through freely by Politzerizing and forced out considerable viscid mucus. P. T. W. R. 22 inches, L. 12 inches. After a second inflation a few days later H. D. W. R. 22 inches, L. 18 inches. Returned two months later, 1/25, '02, with evidence of fluid in right t. c. and H. D. down to R. 2 inches, L. 8 inches; after incision of right m. t. and inflation. R. 5 inches, L. 12 inches. 4/14, left m. t. incised. 5/16, right m. t. considerably inflamed. 5/22, incised it. 8/13, incised left m. t. H. D. W. R. 2 inches, L. ½ inch. 10/7, H. D. W. R. 1 inch, L. 3 inches, incised right m. t. 10/30, both dull, H. D. W. R. and L. ½ inch. Incised both, P. T. R. 4 inches, L. 2½ inches. 12/1, re-opened both.
12/8, re-opened left. 1/13, '03, re-opened right. 3/27, both ears have been comparatively free from crackling since last seen, H. D. W. R. 8 inches, L. 14 inches. 5/15, hearing down again, R. and L. 3 inches. Incised both membranes. 7/22, do, 7/31, incised left. 11/7, do. 11/12, incised right. 1/23, '04, incised left. 3/12, incised right. 4/5, incised left. 4/11, do. 4/29, both. 5/14, left. 5/20, right. 5/31, left. 9/6, both. 10/14, left. 11/4, pain twenty-four hours in left, membrane inflamed. 11/10, incised left. 11/16, right. 12/1, right. 12/20, left. 12/29, H. D. W. R. and L. c., incised both. 12/31, both still open, A. D. dry, A. S. discharging muco-pus. 1/5, '05, A. D. open and dry. A. S. closed. 1/10, A. D. still open. incised left. 1/20, incised left. 1/30, again incised left, in which there is constant rather loud pulsating tinnitus, and m. t. considerably inflamed. 2/2, A. S. still open and dry. Incised right, which is now moderately inflamed and pulsating. H. D. W. R. ½ inch, L. 1 inch.

I do not need to tell you how unsatisfactory treatment has been in this case. The patient is as badly off, perhaps worse than at any time during the past three years. There have been times when the condition was quite comfortable for a longer or shorter period. The symptoms have been in brief—deafness, at times pulsating tinnitus, expressed by the patient as “thumping in the ear,” at times autophonia, occasionally crackling, when she lies down feels as if something were moving in the ear. No dizziness, no interference with cerebration. Has a good deal of secretion from nose and naso-pharynx. Treatment has consisted of frequent repeated incisions, (right 18 times, left 23 times), and not one of them a dry tap! Inflation with catheter and with Politzer bag, bougie, AgNO₃ applied to vault, AgNO₃ injected through the Eustachian tube into t. c. and out into the external canal, and into t. c. from the external canal and forced through into the throat. Syringing with saline, etc., through catheter, Eustachian tube, t. c. and out the external canal, and from the canal through t. c. Eustachian tube and out through the nose. General tonic and climatic treatment. A case of “Help Wanted!”

Case XVIII. Mr. J., act. 55, merchant, born in United States. Apparently as the result of using the nasal douche, has had for between two and three months deafness and tinnitus (constantly, but of varying character), and great feeling of pressure in A. S. Same feeling to a very slight (almost in-
appreciable) extent in A. D. I first saw him 6/24, '01. At that time he had been under treatment by his family physician for two months. H. D. W. R. 1½ inches, L. c. Right m. t. position about normal, marked irregular opacity, l. r. lessened. Drum moves freely to Siegle. Eustachian tube opens poorly to catheter, quite well after bougie. Left m. t. great retraction, scarcely any opacity, l. r. small and central. Drum moves very little to Siegle. Eustachian tube does not open to catheter, and I failed to get bougie more than part way through, but even this permitted air to pass quite well, and without distinct sound of fluid in t. c. Some enlargement of fifth tonsil —general redness of nasal and naso-pharyngeal mucosa, only slight excess of secretion from naso-pharynx. Treated with bougie, inflation, massage, and application of AgNO₃ to vault at frequent intervals up to 9/6, with distinct gain in hearing, up to W. R. 28 inches, L. 20 inches, but there was constant tendency for the hearing to grow worse, and with it a return of the feeling of pressure. I incised left m. t. with escape of considerable viscid mucus. 9/23, again incised left m. t. 11/18, do., mucus thicker than heretofore. 11/26, do, and instilled AgNO₃ gr. 1½ to oz. 1, into t. c. 11/30, patient reports that he had pain for several hours after last treatment. Sensation of fullness seems now almost worse than before. 12/7, still has most annoying sense of fullness; incision gave vent to a considerable amount of sero-mucus (much thinner than before). 12/14, has had great relief. 12/22, A. S. again much stopped up. Incised m. t. and blew AgNO₃, 1½ gr. to oz. I through catheter into t. c. Ordered muriate of pilocarpine gr. ½, t. i. d. by mouth. 12/29, A. S. again stopped up; H. D. W. R. 2 inches, L. c. Again incised m. t. and injected silver solution through catheter into t. c. 1/19, '05, patient has still the feeling of fullness, but the intense pressure is absent; W. L. c. P. T. (incision, bougie, and catheter inflation) W. L. 6 inches. Not seen since that date, but heard by telephone that he was hearing and feeling much better. Here is another case in which I have made but little progress toward permanent cure. Treatment has consisted of repeated incision (8 times), bougie and inflation (catheter and Politzer), massage, AgNO₃ applied to vault, injected through Eustachian tube into t. c. and from external canal into t. c. and down through the Eustachian tube. Is still under treatment. More "Help Wanted!"
Thus there have been 11 unilateral cases and 7 in which both ears were involved, 18 cases and 25 affected ears.

Etiological factors have been, cold in the head, 9 times; nasal polypi, 2; vaso-motor rhinitis, 1; hypertrophied 3d and 5th tonsils, 1; hypertrophied 5th tonsil, 1; blowing nose too hard, 1; "catarrh," 1; nasal douche, 1; use of atomizer, 1; washing hair, 1; no evident cause, 3.

Symptomatology. Deafness, 25; tinnitus, 16; blocked feeling, 15; autophonia, 4; pain (usually slight), 5; numbness of auricle, 1; appearance of membrane—great retraction, 17; moderate retraction, 4; no retraction, 3; bulged, 1; great opacity, 12; moderate opacity, 8; no opacity, 5; moderate congestion of m. t., 5; l. r. absent, 11; l. r. ½ size, 9; l. r. full size, 5.

Eustachian tube narrowed, 10. Eustachian tube not narrowed 15. Appearance of fluid through m. t. 9. Hears better lying down 1. Feels something move in ear when lying down 2.

M. t. not incised, 6. Incised once, 6. Incised twice, 4. Incised three times, 3. Incised five times, 1. Incised seven times, 1. Incised eight times, 1. Incised twelve times, 1. Incised eighteen times, 1. Incised twenty-three times, 1. Much improved or cured after relatively short courses of treatment, 13.

A striking feature of this group of cases is their proneness to intercurrent acute attacks of middle ear inflammation, eight or ten such being recorded, one of these going on to extensive mastoid disease. In considering the position of such a group of cases in the general classification of non-suppurative middle ear disease, it is evident that they belong to the moist or secretory type. But in glancing through what the authorities have to say on the subject, I was impressed with the fact that virtually none of them has described such cases as some of those I have outlined to you in detail. The nearest to it is a case described at some length by Burnett in his text-book published in 1884. With your kind forebearance I should like to run over with you some of the classifications of chronic non-suppurative middle ear disease.

Bishop (last edition) describes two classes—Hypertrophic middle ear catarrh, and adhesive middle ear catarrh (commonly called sclerosis). Hovell says, chronic catarrh appears in two principals forms: in one, the process is mainly catarrhal, i. e., accompanied by more or less abundant secretion, in the
second, the process is marked by hyperplasia of the mucous membrane, adhesions between various parts (sclerotic form), and thickening and condensation of tissues. Barr—1. Exudative catarrh of the middle ear (synonyms—mucous or mucoserous catarrh of the middle ear; catarrh of the middle ear; otitis media catarrhalis; obstruction of the Eustachian tube). 2. Non-exudative, or interstitial inflammation of the middle ear, (synonyms, chronic dry catarrh, adhesive processes in the middle ear; proliferous inflammation of the middle ear; chronic catarrh of the middle ear; sclerosis of the middle ear).

Grayson—Chronic catarrhal otitis media.

Cheatle, in Posey and Wright—
(a) Hypertrophic catarrh. (1) Chronic catarrh of the Eustachian tube. (2) Chronic catarrh of the middle ear tract.
(b) Atrophic catarrh or sclerosis.
(c) Changes in the lining membrane due to variations in pressure.
(d) Changes in the lining membrane due to deficient blood supply.

Dench in DeSchweinitz and Randall. Non-suppurative inflammation of the middle ear may be either hypertrophic or hyperplastic (meaning what is ordinarily known as sclerosis of the middle ear). Bacon—Chronic catarrhal otitis media should include cases of secretive catarrh, in which there are considerable hyperemia and swelling of the mucous membrane, followed by the formation of adhesions and ankyloses of the ossicles, as well as cases of sclerotic or interstitial inflammation, which is confined to a limited portion of the tympanum, usually the region of the fenestra.

Holmes, in DeSchweinitz and Randall—Various classifications (of middle ear disease) have been attempted; the most practical is a clinical basis; where we divide the inflammations into (a) sero-mucous form of middle ear catarrh; otitis media catarrhalis acuta: secretory form of middle ear catarrh; otitis media serosa; catarrh of t. c. and Eustachian tube. (b) Proliferous inflammation of middle ear. (c) Muco-purulent inflammation of middle ear. (d) O. m. p. a. (e) O. m. p. c. Jacobson and Blau, 3d edition—Chronic middle ear catarrh; included in this term are a large number of disease processes which differ from one another pathologically and clinically. It seems practical to divide them into two large groups—moist (secretory), and dry. The latter result from the former.
Dench, text-book, last edition. Chronic catarrhal otitis media—under this head various affections of the tympanum have been described. The selection of this name is particularly unfortunate, since it conveys the impression that the disease is really a complicating lesion of some condition in the nose or naso-pharynx. Catarrhal inflammation is a term applied to a simple inflammation of any m. m. It may occur in the ear or elsewhere, constituting a primary disease entirely independent of any lesion in the upper air passages.

In passing, let me quote from Grayson: "With our present knowledge of the pathology of catarrhal affections of the mucous membranes and of the tendency of this form of disease in one region to extend by continuity of tissue to others, it may be stated with little fear of contradiction that chronic catarrh of the middle ear is invariably secondary to a similar pathological process in the nose and naso-pharynx. In view of the anatomical and physiological relations of the nose, throat, and ear a primary and independent chronic catarrh of the last-named cavity is inconceivable."

Dench divides cases into (1) A hypertrophic inflammation, with a swelling of the mucous membrane of the t. c., due to a chronic venous congestion; as a result, the glandular elements produce an excessive amount of secretion. (2) A hyperplastic inflammation—the new tissue being firm and fibrous, secretion diminished, walls of blood vessels thickened, and a true sclerosis results.

Burnett—Chronic catarrhal inflammation—two chief forms, 1 a) the secreting or moist, (1 b) the non-secreting or dry form. He says: "To these aspects of the chronic disease, different names, and in some cases vastly different natures have been assigned."

Politzer, last edition:
1. Middle ear catarrh—(Ot. med. catarrhalis).
   a The secretory form of middle ear catarrh. (Synonyms—sero-mucous middle ear catarrh; Ot. med. serosa; exudative middle ear catarrh; tubo-tympanic catarrh.
   b. Catarrhal adhesive processes in middle ear. Chronic middle ear catarrh. (Synonyms—Ot. med. cat. chronica).

Allied conditions—narrowing of Eustachian tube. Otosclerosis. Our O. m. c. a. he classes as the first of the

II. Muco-purulent inflammations of the middle ear mucous membrane.
Otitis Media Mucosa

Walb, in Schwartz's text-book:
2. Catarrh of tympanic cavity—
a. Acute catarrh (O. m. c. a.)
b. Chronic catarrh of t. c. (O. m. c. c.)
1. Simple form (O. m. c. c. simplex).

2. Hypertrophic form of chronic catarrh (O. m. c. c. hyp.)
3. Sclerosis of mucous membrane of t. c.

As intimated above I fail to find here any accurate description of the cases under consideration, and a part of the object of this paper is to call your attention afresh to the paper by Alderton on "Otitis Media Mucosa" read before this Society and published in the Medical News for September 21, 1901, and I wish to extend to him the credit, so far as my investigations go, of having first accurately described this condition.

My observations for the most part agree very closely with his, although differing in some minor points. All of my cases occurred in adults—one was only 19—the others between 33 and 62.

As opposed to Alderton, I practically never found tenderness to the touch of the parts around the auricle. I have seen throbbing (pulsating) tinnitus in only two or three cases. Again, none of my cases spoke of difficulty in concentration or of cerebration. I found autophonia in relatively few—Alderton in most of his cases.

Alderton says, "the patient is unhappy, fearful for the future, and unable to attend to business." Beyond the point of being "unhappy" my patients have not been disturbed in this way.

I have had no complaint of dizziness, as Alderton has. Again Alderton finds "the m. t. in about its usual position—sometimes bulged." In a large proportion of my cases there was "great retraction" of m. t., bulging in only one. The congestion of the m. t. spoken of by Alderton was present in only a small proportion of my cases. There was, as Alderton says, no fluid line discernible in the pure mucosa cases—it was seen in some of the sero-mucous cases. What Alderton says about the results of changing the position of the patient's head, and of the results of inflation before and after incision, as well as of the difficulty of emptying the t. c., is absolutely borne out by my observations.

The results of treatment are eminently satisfactory in a considerable proportion of cases—seemingly not in as large
a proportion of my own cases as I am led to believe has been the case with others. With Aldgerton, again, I would give easily the first place to incision and evacuation of the t. c. together with inflation and suitable treatment of the naso-pharynx.

To revert for a moment to the general classification of the subject, in view of what I have quoted to you from our leading writers on Otology, again in view of the fact that sclerosis of the middle ear is being, perhaps has been, withdrawn from the category of middle ear catarrh so called, I would venture to ask whether or not the time may not be ripe for some new classification or subdivision of the general group known as non-suppurative middle ear disease. I would further suggest that it might come within the province of such a leading society as this to give out, after a full discussion of the subject at some one of our general society meetings, some authoritative utterance upon the subject.

DISCUSSION.

Dr. W. S. Bryant: I have not had a case of this kind which required paracentesis for a number of years. I find that treatment of the naso-pharynx and careful inflation gives satisfactory results. In certain cases antisyphilitic treatment has intimated some of the etiological factors.

Dr. Lutz: I do not know whether we are particularly fortunate in Brooklyn, but most of the men who do work in Brooklyn have seen a number of these cases. In most of the cases I have seen, the only thing that would do any good was incision. In a few cases I have been able to drain by suction through the cavity. I have incised the drum in a number of cases and I must say I differ with Dr. Sheppard in that I have seen a number of cases without any inflammatory condition, but with a bulging drum. In most cases there is no inflammation apparently. In regard to antisyphilitic treatment I do not remember a case that I have seen that needed any treatment of that sort. I have tried iodin and silver locally and potassium iodid, and, in fact, almost everything internally, and the only thing I have found of value is making a fairly large opening and allowing the middle ear to dry. As long as you keep the incision open the patient is comfortable, but as soon as it closes the symptoms return, the middle ear cavity fills up with mucus and the patient has a new attack.
Dr. Halsted: I would like to ask Dr. Sheppard what form of anesthesia he uses in doing paracentesis?

Dr. Sprague: I think a great many of these cases are due to some vasomotor disturbance or disease of the nervous system, as well as occlusion of the Eustachian tube, and I have found the injection of iodin in benzoinol, gr. 1 to the ounce, through the catheter, is very useful. There is usually some constitutional condition, such as disease of the stomach, liver or kidneys, or some disturbance of the throat or lungs, together with the possibility of rheumatic or syphilitic trouble. We cannot treat these cases without some constitutional measures. In the vasomotor disturbances, bichlorid of mercury or nitrate of silver internally may be employed, or if the mucus is very thick and tenacious, pilocarpin. I think by opening the Eustachian tube and using constitutional treatment we can help these cases very much. I have not found it necessary to incise the drum membrane very often.

Dr. Richardson: I think, with Dr. Bryant and Dr. Sprague, that a little less treatment and more conservative methods in these cases would be better. I have opened the membrane thirty or more times in one of these cases, in which the serous effusion was due to a malignant growth. I think a good many of these cases are due to vasomotor disturbances and that constitutional treatment and opening of the Eustachian tube would give better results than paracentesis.

Dr. Stucky: The disease is not primarily a pathologic condition, but symptomatic. The treatment which has given the best results in my experience is by first putting the nasopharynx in as normal condition as possible. The general health, especially the gastro-intestinal canal, should be thoroughly investigated and regulated. If the symptoms and discomfort are very marked, with vertigo, deafness, fullness and vasomotor disturbances, the patient should be put to bed for a few days on restricted diet and mild sedatives if necessary. There is too much tendency to and some danger in over-treatment, whereby we prolong and increase the local irritation. I rarely find incision necessary, and am careful to use inflation of vapor of iodin, chloroform and camphor, very gently, and not oftener than once daily or every other day until disturbing and distressing symptoms disappear. When a hyperplastic condition exists, vibratory massage of one-fourth inch strokes of one or two minute duration at first daily, then every
other day, may be employed. By this I do not mean the pneumatic massage of suction kind, but fine vibration over tragus, under ear, lymphatics of neck and over cervical vertebrae.

Dr. Sheppard, closing: A few of the gentlemen spoke of the Eustachian tube being always closed. My records show ten cases in which the tube was narrow and fifteen in which the tube was normally open. I have always looked for some constitutional condition underlying the trouble, but as yet have failed to find anything that would account for the ear condition. In doing paracentesis, I have, as a rule, not found any local anesthetic necessary. In a few instances I have used cocaine and analin oil with some satisfaction.
The comparative infrequency of primary malignant disease in and around the auditory apparatus and the paucity of description found in the text-books of the day, seems to justify the report of the cases here presented.

The usual description of malignant disease of the external ear makes some portion of the external ear the primary site of involvement, the disease later comprising the entire pinna in its ravages, and in some cases extending up the auditory canal and attacking the middle ear cavity.

No specific reference has been found of primary involvement of the auditory canal, though Dench states in general terms the disease may originate either in the auditory canal or pinna, later involving both structures.

The special features of interest in the cases now reported are that the primary site was in the auditory canal, and that at no time did extension take place to the external ear.

In both cases the disease spread along the auditory canal, attacking the soft tissues in its proximity. In one case ulceration of the external soft tissues anterior, posterior and inferior to the canal was so extensive as to almost cause amputation of the pinna, though the pinna itself, hanging by a mere shred of tissue in its superior and inferior attachment, was in no way involved.

It may be that the operative measures employed in both these cases determined the direction of the spread of the disease, and had the cases been allowed to pursue the usual course, the extension would have been different.

Case I.—On the first of March, 1904, Mrs. C. came to my office with the history that for two or three weeks previously she had an irritation in the left ear, for which she had been under the care of her family physician, and without relief.

The record in my case book is that she is 42 years of age, healthy looking, and that the right auditory canal is completely
filled with granulation tissue. No view of the drum is possible. The granulation tissue was removed by the snare and curette and the auditory canal found to be so swollen, and its lumen contracted to such an extent, as to give a very imperfect and unsatisfactory view of the deeper tissues. Still sufficient space was secured to make clear that the granulation sprang from the auditory canal along its entire length, and possibly involving the drum membrane. The removal of these granulations was attended by much bleeding, requiring firm packing. The granulations were removed again and again as recurrence was very rapid.

In the latter part of June a radical operation was attempted. An incision was made back of the attachment of the pinna, as in the mastoid operation, extending from the base to the tip, and the membranous auditory canal exposed.

It was found at this stage that the diseased condition had ulcerated through the posterior portion of the auditory canal and some of the same character of growth was present in the adjacent tissues as was found in the auditory canal. The pinna was now separated superiorly and posteriorly, and the tissues dissected up around the auditory canal. The canal and adjacent tissues were thoroughly cleared of every vestige of the growth by means of the scalpel and curette.

She made a fair recovery, one or two stitch abscesses delaying it a trifle. However, by the middle of July the wound had closed, and the canal was entirely free of growth and less swollen, though even at this time no satisfactory examination of the drum could be secured.

Towards the latter part of July, an abscess formed in front of the tragus, rapidly broke down and when incised released a large quantity of pus and broken down tissue.

This was the beginning of much trouble. The wound suppurated freely, large sloughs came away and no tendency to contraction in the wound and healing was shown. On several occasions severe hemorrhage took place, once so severe as to necessitate laying the wound open freely and making search for the spurring vessels.

Dr. Biedert, who had charge of the case at this time, during my absence from the city, informs me that it was impossible to catch up any of the bleeding points because of the friability of the tissues, so that he was obliged to pack tightly and rely solely on this to control the hemorrhage. About this
time the line of incision began to show signs of breaking down, and before long it did so. Now there was a large wound in front of the tragus and one over the mastoid, both filled with masses of granulation tissue. Both these wounds continued to increase in size, the one in front of the tragus anteriorly towards the eye and inferiorly below the lobe of the ear; while the posterior wound followed the incision to the tip of the mastoid, and at last met the anterior wound under the lobe of the ear. The ulcerative process also progressed in the deeper tissues so that the pinna was almost amputated, hanging by a mere shred of tissue from its superior and inferior borders, though seemingly well nourished.

At no time has there been any disposition of the disease to attack the pinna. Within the last week facial palsy has shown itself, indicating, of course, involvement of the facial nerve, either by swelling or actual ulceration at some portion of its course. Since there has never been any evidence of bone involvement, I am inclined to regard the facial involvement as located in the tympanic cavity.

These anterior and posterior wounds were constantly filled with large masses of granulation, which would break down and disappear, accompanied by profuse suppuration.

About October 10th, the left tonsil became swollen, but fortunately did not break down. Pressure on this body always results in the expression of a considerable flow of pus. The solution used in cleaning the wounds sometimes pass into the throat, showing the existence of a sinus from the mass to the tonsil.

The general condition of the patient has steadily, and recently, rapidly declined. She has had pain, but not so much pain as is usual in these cases, but enough to necessitate the use of morphia.

As to treatment; since the attempt at radical removal the X-rays were employed for a short time—but no beneficial result noted. Other than this—the parts have been kept in as clean a condition as possible by daily irrigation with antiseptics.

The masses removed at the time of the radical operation, June 29, 1904, was submitted to the pathologist of the Polyclinic Hospital, Dr. Randolph, whose report I append:

"Tissue fixed in 10 per cent Formalin, cut with freezing apparatus, and stained with hematoxylin and eosin."
"The growth is made up of large epithelial cells resembling those of the epidermis. These cells are atypical, and infiltrate the lymph spaces of the connective tissue, presenting a more or less well defined alveolar structure. Epithelial pearls are abundant. Many karyokinetic figures are observed. The connective tissue stroma, which is scanty, shows marked round cell proliferation.

"Diagnosis. Epithelioma, with chronic inflammation.

Signed. "B. M. Randolph."

Case II.—This case did not come to my office until the disease was far advanced, and but a brief period before his death. The following are the notes recorded:

F. E., age 44, presented himself for examination July 15th, 1904. There is a large, deep, sloughing and suppurating wound over the mastoid. The edges of the wound are indurated and covered with masses of granulation tissue. The wound in the mastoid and the tympanic cavity are one. At the bottom of this cavity necrosed bone is plainly detected.

The posterior wall of the auditory canal is absent, removed either by the surgeon's knife or disease. The anterior wall, and all the tissues surrounding the wound, are deeply infiltrated with new growth. There is complete facial palsy.

For the early history of this case I am indebted to Dr. W. Wayne Babcock, who attended him, and who kindly sent me a few notes with permission to use them on this occasion. The following are Dr. Babcock's notes:

"A Mr. E. applied to me in August, 1903, for pain in the left ear and across the forehead. He had had a discharging ear for nearly forty years. The meatus was small, and about an inch from the external opening scarcely admitted a fine probe, and at this point showed small granulations that almost completely obstructed the canal. The surrounding walls seemed to be rigid or osseous. As I found it impossible to keep the canal patent, on January 11th, 1904, I did a modified Stacke. The bone was extremely dense, but very little granulation tissue or pus was found. With skin grafting the cavity left after the operation promptly healed, and he was exhibited to my class as an example of the beneficial effects of the operation. Shortly after this the pain recurred, a soft distension appeared within the cavity, and also in the situation of the external wound. Scrapings from this showed the
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typical appearance of squamous epithelioma. I reoperated, removed practically all the mastoid and bony meatus, widely excised the scar, and tried to check further development by continued application of methylene blue. The growth seemed to start again near the orifice of the Eustachian tube, and there was a rapid extension uninfluenced by the continued use of X-rays. He finally drifted into the hands of some western empiric, and at last died."

One lesson to be learned from these cases is the futility of radical operative interferences, a lesson that one might have learned by observation of this treatment in other localities where insurmountable difficulties present to prevent a complete eradication of the diseased tissue.

In my case an attempt was made to eradicate the disease because it was thought, previous to the operation, the disease was confined within the cartilaginous walls, and by separating the pinna from its attachment, more room would be obtained, and perfect eradication secured. When, at the operation, it was found the cartilaginous walls had been invaded, an effort was made to remove every vestige of suspicious tissue. With how little success, the subsequent history of the case shows.

It is not only futile, but I believe provocative of more rapid extension of the growth, to operate unless every particle of the malignant growth can be removed, and that, unless we are confident of obtaining this result, it is better surgery to stay our hand; and, therefore, it is only in the early stages of malignant disease of the auditory canal, that radical operation should be attempted.

The difficulties that present themselves in order to carry out this dictum, are mainly in the diagnosis. Early diagnosis is absolutely essential, but it is not easy and often impossible by mere inspection.

The microscope should, in these cases, enable us to reach an early diagnosis, and should be brought to our aid in all suspicious cases.

If the microscope reveals the presence of malignant disease in the auditory canal and the growth is confined within the unyielding cartilaginous walls of the canal, there is much to hope from radical removal. On the contrary, if there is a break in the cartilaginous walls, and the disease has gone beyond their confines, there is nothing to hope from operation.
A CASE OF EPITHELIOMA OF THE MIDDLE EAR.

T. Passmore Berens, M. D.

The history of this case, a man, age 45, is: A discharging ear from infancy; stricture of the esophagus manifesting itself by regurgitation of food last June; apparently successful treatment of the stricture by bougies in the hands of an otolaryngologist; development of facial paralysis in the late stages of this treatment, not relieved by the removal of a large granuloma from the right external auditory canal; symptoms of mastoiditis. A Schwartz-Stacke operation was then performed. Extensive destruction of bone and large masses of granulation tissue were found. The dura over the tegmen was covered with granulations, as also was the sigmoid sinus below the knee. The wound did badly and would not heal.

In October, when I first saw him, the wound was that usually resulting from a carefully performed Schwartz-Stacke operation, with the exception that the whole wound was foul and contained masses of unhealthy granulation tissue. In the region of the tegmen there was a small patch of necrosed dura surrounded by granulations. The region of the descending portion of the lateral sinus was covered with a large mass of granulations. The tissues at and below the lower end of the wound were much indurated, and a suppurating sinus extended two inches into the deep tissues of the neck. There was a large ulceration of the skin of the anterior wall of the external auditory canal, reaching onto the tragus. The middle ear was filled with granulations. The peritonsillar tissues were much indurated; the appearance in this region was suggestive of abscess, but the mass was very hard to the touch. No history of syphilis could be obtained; nevertheless, large doses of iodide were given while the diseased area was treated antiseptically. The result for the first two weeks' treatment was very promising in that the induration about the wound and tonsil rapidly grew less. The improvement was short, and in spite of the continuance of treatment the ulceration on the tragus extended both superficially and deeply, destroying the tragus and extending onto the face. The patch of necrosis in the dura increased in size, and a similar patch ap-
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peared on the dura just internal to the knee of the sinus. Large flakes of bone were thrown off from the labyrinth and surrounding parts. The patient lost strength rapidly, developed vertigo and vomiting, sank into coma, and died. Autopsy was not allowed.

Shortly after I first saw the case scrapings from the wound were pronounced epithelioma by Dr. Jonathan Wright—but since the iodid was apparently doing its work, and owing to the extensive involvement of the tissues, the labyrinth, the dura, the tonsil, the muscles and glands of the neck, it was deemed unwise to further operate on the patient.

The specimens examined were taken from the facial nerve at the geniculate ganglion, the labyrinth and the tonsil. They all show the epithelial invasion.

The case is of interest because of the rarity of epithelioma of the middle ear. In a recent paper by Lutz only forty cases of malignant disease were reported. It is of further interest because of the rapidity of its destructiveness and the clear statement by a competent observer that the walls of the external auditory canal were not affected when the operation for the removal of the granulations were performed.

The possibility of the growth in the middle ear being a metastasis from a possible cancer of the esophagus is recognized, as also is the possibility of its being secondary to a possible disease of the tonsil. Both of these possibilities were investigated clinically and were ruled out. The time limit placed on this paper prevents the further discussion of this phase of the question.

DISCUSSION.

Dr. Lutz: I think both Dr. Gibb and Dr. Berens made the point that these were cases of epithelioma of the middle ear. Surface or external ear cases are seen very frequently. I have seen about a dozen cases of epithelioma of the pinna, but most of them do not seem to make any progress and do not seem to give the patient any trouble, but the deep or middle ear cases do give a great deal of trouble and are most always serious. I looked this subject up quite extensively some time ago, and as near as I could find none of the middle ear cases got well at all. They are usually observed too late to do anything with them. In some of the cases, scrapings were made from the granulating mass and showed nothing but ordinary
granulation tissue. I know in one case I had, microscopical examination showed absolutely nothing. In July, 1898, the patient came to me for a troublesome polyp. I removed it and in the course of a week it was as large as before. The microscopical examination showed nothing and I removed the growth again and the second examination showed nothing. I did not see the patient again for some time, and finally in November, 1898, I heard from him and he was very much in need of an operation. I opened the mastoid and found a great, large mass extending up and in pushing the brain up and also extending down into the nasopharynx. After two operations he died in January, 1899, a little over two months after he was operated upon. Nothing did him any good and I think this is true in all of these cases.

The diagnosis between carcinoma of the middle ear or of the mastoid and advanced carious middle ear disease is rather difficult, because early microscopical examination of polypoid tissue may not show cancer cells at all. It is only the rapid recurrence after repeated removal and repeated microscopical examinations, that determine malignancy and usually the diagnosis is established too late to allow thorough operative measures. Where operation is not possible, cleanliness and relief of pain by opium are the only means of treatment.

Dr. Donnellan: As regards the question of treatment, it is quite possible that what is foremost in the minds of most of us to-day is whether better results can be obtained by the use of the X-rays or by surgery or by a combination of both. I had the pleasure of listening to a paper read by Dr. Johnston, of Pittsburgh, before the College of Physicians of Philadelphia, in which he reported, with lantern slide demonstration, a number of cases of epithelioma of the external ear and adjacent structures practically cured by X-ray treatment. While his results were not uniformly successful, his percentage of cures was far above the average results obtained in these cases before X-ray therapy was introduced. It was the opinion of a majority of those present that the treatment giving the best results in cases of epithelioma of the face and neck would probably be thorough excision of the tumor followed by X-ray therapy.

Dr. Arnold Knapp: I observed a case of carcinoma of the middle ear in a girl of twenty years. She suffered from very severe pain, which was not explained by the purulent otitis.
Examination of the scrapings showed it to be carcinoma. A "radical" operation was done and extensive destruction of the anterior walls of the tympanum and auditory canal were found exposing the maxillary joint. There was recurrence in the depth of the canal and the case was treated for months with the X-rays without any particular change. The patient then returned to Europe and has not been heard from.

Dr. Halsted: I have seen five cases of epithelioma in which the growth involved the auricle and external auditory canal, and one involving the tympanic cavity. Recently I saw a case in an old lady over 70 years. She had a growth which destroyed completely the auricle and extended into the auditory canal and involved the skin over the face and temporal bone for the space of about three inches in diameter. Under the X-rays the growth in the canal and over the face and temporal bone subsided and apparently healed completely. In a person of that age, over 70 years, it is rather interesting, although too early to know the final result.

Another case of carcinoma of the middle ear occurring in a woman of 30 years, came to me first because of epistaxis and nasal obstruction. There was ulceration of the septum nasi and a great deal of friable granulation tissue involving the anterior half of the septum of one side.

A diagnosis of carcinoma was made, although the microscopist reported the tissue removed as simple granulation tissue. The iodides were given for three weeks in large doses without effect, the growth continuing to extend rapidly. At about three weeks, after first seeing the patient, she became deaf, a purulent discharge from first one ear and then the other occurred. Both drum heads were destroyed and the tympanic cavities became filled with the same kind of growth as in the nose. The nasopharynx was examined repeatedly and satisfactorily and there was no evidence of the disease in this space.

The patient grew steadily worse and returned home about two months before she died. Her physicians reported that she died from an extension of the disease to the brain cavity. The other cases, in two of whom I removed the auricle because of epithelioma, had extension of the disease and finally died, the only case in which there has been an apparent arrest of the disease being the one first related, in which X-rays were employed.
Dr. McCaw: In this connection it might be of some interest to recall the case of primary epithelioma of the uvula and soft palate, which I reported at the annual meeting of this society at Washington, D. C., in 1902. The growth was first excised with a cautery knife and subsequently subjected to the X-ray treatment. Excision had to be resorted to a second time, but finally after four or five months X-ray treatment the parts thoroughly healed and up until the present time, now about four years, there has been no return of the growth.

Dr. John D. Richards: The trouble in these cases, when treated by X-ray, is, that while the primary growth may disappear, there is an increased danger of metastasis occurring.

Dr. Gibb, in closing: Little remains to be said. Beneficial effects are obtained by the X-ray treatment in the purely skin cancers, but little can be secured from this plan in the deeper forms. Both of the cases reported were instances of cancerous involvement of the deeper structures, the skin surfaces becoming implicated incidentally.

Dr. Berens, closing: There are, of course, the two forms of epithelioma. That of the external parts is nothing more than the ordinary epithelioma of the face. Some of these will yield in the early stages to the X-rays treatment. The deep forms, those occurring primarily in the middle ear and extending into mastoid petrosa and into contiguous bones and soft parts, will not yield to any form of treatment unless we interfere surgically, and then the treatment is more than likely unsatisfactory, thus exposing the disease to the X-rays. I had a case in point. I supposed it to be one of primary epithelioma of the middle ear when I first saw it. It proved, however, to have originated in the deep part of the external auditory canal and extended into the mastoid squama and along the Eustachian tube into the tonsil. The case did well under the application of X-rays after operation, but ultimately died from metastases.
Stricture of the Eustachian Tube.

Paper:

STRicture of the Eustachian Tube in Aural Diseases and Its Treatment.

W. Sohier Bryant, M. D.

Stricture of the Eustachian tube is a reduction of the normal lumen of the tube, causing more or less obstruction. It may be organic or purely functional. When the stricture is tight it cannot be overlooked; when the obstruction is slight, the deviation from the normal tube is not apparent without careful tests. Though the presence of tubal obstruction is of very great importance, its full significance, unfortunately, is rarely appreciated.

The slightest obstruction causes the following evil results only in a less degree than a tight stricture:

I. Imperfect ventilation of the tympanum, causing either too little or too great barometric pressure in this wonderful chamber. The many baneful consequences resulting are (1) passive congestion, (2) over extension, or over flexion of the membrane, ossicular chain, and stapedio-fenestral articulation, any one of which destroys the acoustic balance, (3) irritation of the sensory and sympathetic nerve endings, (4) changes in nutrition, and (5) indirect effects on the labyrinth.

II. Imperfect drainage of the tympanum. Septic infection and absorption of septic material result; also clogging and over distention of the sound conducting apparatus from internal exudations.

III. Reflex congestion and edema of the mucosa and contents of the tympanum.

IV. Other reflex disturbances, often elusive, but nevertheless very important. An example of such disturbances is a considerable loss of hearing released by the flow of air through the tube, where a total destruction of the drum membrane has occurred.

Strictures can be classified as acute and chronic; suppurative and non-suppurative. In this paper, I shall consider only the chronic non-suppurative group, which includes the larger majority of obstinate cases of impaired hearing and tinnitus,
particularly those found in the omnibus of chronic middle ear catarrh.

Pathology.—A series of many hundred post-mortem examinations, which I made at the Harvard Medical School during the ten years between 1887 and 1897, failed to show a single case of organic stricture of the Eustachian tube, except in those of the suppurative class. In such cases, the stricture never occurred near the isthmus, but at the extremities of the tube. I therefore conclude that organic strictures of the isthmus are very rare; that organic strictures seldom if ever occur in any part of the Eustachian tube in non-suppurative conditions, and that the large number of strictures seen in practice are purely functional.

The pathology of the variety of stricture under consideration is passive congestion or edema. This is sometimes combined with slight paresis of the tubal muscles and with adhesions. An examination of the patients shows in most cases the presence of more than one of these conditions. Occasionally tenacious mucus will be found occluding the tube. Attempts at inflation, with osculation, will locate the stricture in the most vascular part of the tube, namely, the cartilaginous portion. This part also has the largest amount of areolar tissue. The nature of the sound given as the air passes does not suggest an annular, but a tubular narrowing more or less extensive.

Etiology.—There are two varieties of these strictures, (1) circulatory, due (a) to the faulty composition of the blood, and (b) to faulty circulation; (2) mechanical, due to impaired muscular action brought about (a) from some defect in the muscles, and (b) from mechanical interference with their action. In most cases, these conditions are combined in varying proportions. The predisposing causes of functional strictures are gout, syphilis, faulty general circulation, cardiac or arterial; hypertrophy and new growth in or about the naso-pharynx, adhesions and cicatrices of naso-pharynx, usually in the fossa of Rosennueller; mouth breathing, and rhino-pharyngitis.

The Diagnosis of organic stricture is made by a series of tests of permeability, by the use of compressed air. When no air can be forced through the Eustachian tube, bougies can be used, but on account of the many normal obstructions to the passage of a bougie, for instance the folds of mucous mem-
brane of the pharyngeal part of the tube, the abnormal lateral narrowing of the osseous tube, and the occasional presence of bone spicule at the tympanic mouth of the tube.—the results must be interpreted with considerable caution. Whether a catheter with high air pressure would not show permeability in some of the cases where the finest bougie could not be passed into the tympanum is a question to be determined. I think it must be decided in the affirmative. It is well known that some cases, impermeable to the bougie, allow a flow of air without any great difficulty. Where the permeability of the tube is interfered with, the diagnosis of functional stricture should be accepted until the presence of organic stricture is demonstrated.

**Test of permeability.**—The nares must be clear enough to allow a flow of air, and the naso-pharynx must not be obstructed with thick mucus. While the patient is inflating the ear by Valsalva's method, the effect on the membrana tympani must be observed through the speculum. The readiness with which the air passes into the drum, and the ease of its reflux must also be noted. Normally, air should enter the tympanum on very slight intra-nasal pressure, and the excess of distention should disappear spontaneously when the intra-nasal pressure is exhausted. Any retardation in the inflation or reflux shows a stricture of the Eustachian tube. Its tightness is proportionate to the retardation of influx and reflux. Great care must be taken that the patient's head is not bent toward the ear under examination, for a certain amount of obstruction to the flow of air is normally caused by the compression due to flexion of the neck.

If the result of Valsalva's method of inflation is 0, then Politzer's method is tried, and if necessary, the catheter. Before air can be made to enter the tympanum, it may be necessary in some cases to increase the pressure through the catheter to 50 pounds. It is not wise to use more force. The degree of pressure required to overcome the stricture is a direct index of its firmness and narrowness. The nearness or distance of the auscultatory sounds indicates the position of the stricture. The higher pitched the sound, the tighter the stricture. The smoother the sound, the smoother and clearer the walls of the stricture.

Both before and after attempts at inflation, the membrana tympani must always be inspected: much may be learned from
its changed appearance. Only in this way can the presence of impeded reflux be known, because the resistance offered to the entrance of air is often no indication of the resistance offered to its exit. When air enters with difficulty, but escapes readily, the inference is that the stricture acts like a valve. Air sometimes passes into the tympanum in such small volume that it gives no auscultatory sound, its flow being indicated only by the evident signs of tympanic distention.

**TREATMENT.**

Since 1887 the treatment of these cases has received my special attention. Very many of them were treated successfully without the employment of any method of inflation.

In 1888, Dr. Spear called my attention to the intimate connection of the lower turbinate with the function of hearing. Since that time the examination and treatment of a large number of cases in Boston and New York has shown me that this auditory region of the nose extends backwards to the fossa of Rosenmueller and surrounds the Eustachian tube.

To emphasize a method of treatment which I have found successful in all the cases that have come under my care during the last two years, I will consider more particularly the treatment of functional stricture in which the constitutional disturbances are not great, and the naso-pharyngeal conditions are not sufficient to attract the cupidity of the rhinologist.

The treatment that I most rely upon at present is the application of adrenalin and solution of silver nitrate to the auditory regions of the nose and naso-pharynx. The cases treated in this way have shown, without exception, marked improvement in the calibre of their Eustachian tubes. Except once, in the case of an old lady, where too profuse an application of nitrate of silver solution caused a laryngeal irritation lasting a few hours, I have never had an acute inflammation excited, or any accident result from the treatment.

There are many well recognized methods of treatment which are serviceable under various conditions. *Constitutional treatment* requires attention to gout, syphilis, faulty cardiac and arterial circulation. *Nasal treatment* requires surgical removal of impediments to free nasal respiration. *Pharyngeal treatment* requires surgical removal of new growths or extensive hypertrophies, and the breaking down of adhesions. *Local treatment* may be given by bougies, electric and medicated; by
Stricture of the Eustachian Tube.

Politzer's method of inflation and the catheter, with or without vapors; by injections into the tube, and by massage, and applications of reagents to the mouth of the tube and its neighborhood. The best of these reagents is nitrate of silver.

PROGNOSIS.

I find that, in the very large class of cases under consideration, the Eustachian tube has invariably responded to a persistent course of treatment and that no evil effects have resulted in any case.

Case 1. Miss B., a school teacher, aged 42, referred by Dr. Clarence J. Blake, of Boston. She complained of a long standing gradually increasing difficulty in hearing, and occasional tinnitus, which interfered with her profession. At the time of her first visit, Sept 10th, the nasal fossae were clear, and the mucous membrane was dark red. The drum membranes were slightly retracted, of good color, with small light reflexes. No air would enter by Valsalva's method, or that of Politzer. As only a little air entered the tympanum with great difficulty by the catheter, the presence of a tight functional stricture of the tube was apparent. A solution of nitrate of silver was applied to the naso-pharynx, and an alkaline spray used at home.

Seven days later, the result of Valsalva inflation was zero, and that from Politzer's method very small. By catheter, the inflation was still very imperfect on the right side. Sept. 24th, the patient said her ears were better. A little air entered by Valsalva's method, more by the catheter; but the light reflexes were still imperfect. Before inflation, the watch was heard on the left at a distance of 45 inches; on the right, at a distance of 22 inches. Applications of adrenalin and silver nitrate solution were made to the naso-pharynx.

On Oct. 3rd, Valsalva's method of inflation was successful for both ears. The presence of supernumerary light reflexes which persisted after swallowing, showed that the reflex was still imperfect. Before inflation, the watch was heard at the left, 47 inches away; at the right, 30 inches away. After inflation, the watch was heard at a distance of 37 inches. Oct. 15th, the watch was heard at the left, 60 inches away; at the right, 40 inches away. The patient felt much better. Valsalva inflation was easy for both ears, but best in the left.

On her ninth visit, Oct. 21st, the Valsalva inflation was
good and equal. Oct. 28th, the drum membranes looked well. The light reflexes were good. The patient thought her ears were in a good enough condition to stop the treatment. On Jan. 3d she wrote: "Except for a fortnight, when I was unfortunate enough to be suffering from a heavy cold, my ears have remained in a very good condition. Now that the cold has disappeared, the ears seem normal again."

Case 2.—Mrs. L., 64 years, complained of impairment of hearing and tinnitus in both ears. In the left, where the trouble had begun three years before, she had at the time of her first visit, Dec. 12th, a constant roaring like the sound of a waterfall. This roaring was occasionally intermingled with sharper sounds. Inspection showed that the right drum membrane was drawn in, and dark-colored. The light reflex was very faint. In the left ear, the drum membrane had good color and a fair light reflex. The watch was heard on the right, 9 inches away; on the left, 22 inches away. The fact that Politzer's method of inflation could not inflate the right ear showed the presence of a functional stricture of medium grade. Applications of adrenalin and solution of silver nitrate to the pharynx were made.

Dec. 14th, the watch was heard on the right, at a distance of 12 inches; on the left, a distance of 20 inches. Inflation was easy by Politzer's method. Dec. 19th, the watch was heard on the right, 17 inches away; on the left 29 inches away. The same treatment was continued. Dec. 23d, the watch was heard at the left, 54 inches away; at the right, 48 inches away. The tinnitus was very faint.

Case 3.—Rev. J., age 26, complained of impaired hearing of late in his left ear, and slight ringing tinnitus. His first visit was made Oct. 25th. An examination showed that the bone conduction was much increased and that the air conduction was diminished. By air, the high notes were well heard, but the hearing was defective for the low notes. The tuning fork was lateralized to the left. The left tympani was marked by whitish atrophic areas on a clear background. Imperfect Valsalva inflation demonstrated the presence of a slight functional stricture. Treatment was given by applications of a solution of silver nitrate to the nasopharynx.

Nov. 11th, the watch was heard at the left, 72 inches away (normal 62 inches). Applications of adrenalin and solution
of silver nitrate were made to the naso-pharynx. On his seventh visit, Nov. 18th, the patient was well pleased with his improvement. The watch was heard at the left, 96 inches away. Valsalva inflation was easy in both ears. The hearing of the watch at the right was normal. On his ninth visit, Dec. 23d, the watch was heard at the left 360 inches away. Since that time, diminished hearing or tinnitus has not disturbed the patient.

Case 4.—Mr. B., aged 43, complained of impaired hearing and slight tinnitus in right ear, lasting several years. On his first visit, June 25th, the right drum membrane was retracted, the color good, the light reflex very faint. Air would not pass by the Valsalva method; by the Politzer method it entered with great difficulty. This showed the presence of a functional stricture of medium grade. Before inflation, the watch was heard at a distance of 1½ inches; after inflation, at a distance of 24 inches. Treatment was given by applications of a solution of nitrate of silver to the naso-pharynx.

July 1st, the watch, before inflation, was heard 24 inches away; after inflation, 3 feet away. Applications of adrenalin and solution of silver nitrate were made to the naso-pharynx. July 8th, the watch, before inflation, was heard 4½ feet away. On his fourth visit, July 22d, the patient was much improved. The watch was heard at a distance of 18 feet.

Case 5.—Mr. L., aged 24, complained of decreased hearing and tinnitus on the right side. He was referred to me with the diagnosis of commencing stapes fixation. He used to have crackling and some musical tinnitus, but now he has only buzzing and a sound like surf. His first visit was made Oct. 21st. The right drum membrane was slightly drawn in, its color and surface normal, the light reflexes broken. As inflation was imperfect by the Valsalva method, the presence of a functional stricture of at least medium grade was shown. The acoumeter was heard at a distance of 12 inches. A solution of silver nitrate was applied to the pharynx.

Oct. 28th, the nasal mucous membrane was dark red. Valsalva inflation was imperfect. Treatment was given by applications of adrenalin and solution of silver nitrate. The patient said that for three days after the last visit he heard better, but that the tinnitus was less. Oct. 31st, there was less surf sound in the ear. The acoumeter was heard 4 feet away. Dec. 12th, the acoumeter was heard at a distance of 8 feet. Valsalva
inflation went for the first time, but with great difficulty. Adrenalin and silver nitrate solution were applied to the nasopharynx. On his eleventh visit, Dec. 20th, tinnitus was hardly perceptible. Valsalva inflation was occasionally normal. The acoumeter was heard at a distance of 7 feet on the right, and the watch at a distance of 6 inches. By the left ear the watch was heard 4 feet away.

Case 6.—Mr. M., aged 41, came to me with a long history of impaired hearing and much treatment. Many years ago he had suffered from suppuration in the left ear. Since an exposure to a loud whistle blast, the hearing in the left ear had been much worse. In the right ear, buzzing tinnitus was present.

His first visit was made July 1st. The left drum appeared atrophic or scarred in several places. The right membrane was sunken, but otherwise normal in appearance. By Poutzer's method of inflation, the air passed very poorly in the left ear, but went better by the catheter. This fact suggested functional stricture of the pharyngeal end of the tube. The air entered more readily into the right ear. On the left, the acoumeter was heard 3 inches away. After inflation, it was heard at a distance of 9 inches. Treatment was given by applications of adrenalin and solution of silver nitrate to the naso-pharynx.

On his fourth visit, the watch was heard by the right ear 17 inches away; after inflation, it was heard at a distance of 27 inches. By the left ear, the acoumeter was heard 3 inches away. On Jan. 24th, his fifth visit was made. Before inflation, the watch was heard by the right ear 38 inches away. By the left ear, the acoumeter was heard 48 inches away. The permeability of the tubes was much improved, but not yet perfectly normal.

Conclusions: The foregoing cases, I believe, justify the following important conclusions:

1. The stricture of the Eustachian tube in aural diseases is not generally organic.

2. Non-organic strictures are easily treated by the methods employed.

Discussion.

Dr. E. B. Dench: I have not very much to say, probably nothing new, about the treatment of these cases. I think that Dr. Bryant made a statement to me some time ago that he had
never found an organic stricture in the Eustachian tube. I think that the cases in which we have complete stenosis are very rare. We do find a number of cases where we have narrowing of the tube. I think the older we grow the less we are inclined to use the bougie. If it is simply a catarrhal condition, we hope, by inflation, to cause absorption and prevent narrowing. In some cases there may be swelling of the mucous membrane, which the bougie will quickly restore. What sort of bougie shall we use? You may use whalebone or flexible wire of the proper size so as to cause some dilatation of the tube. By either of these methods you can get results; sometimes I use one and other times another. The use of the cotton tip bougie has the advantage that you can make an application to the walls of the tube and use astringent solution and carry the application through the tube. On the other hand, the galvanic bougie has the advantage of stimulating the walls and of restoring the tube to its normal tone. We are about equally divided as to the two advantages. I have had one case of acute involvement of the middle ear set up by the use of the simple bougie. I have also seen cases where the tip of the electrolytic bougie has been lost. I think if you are careful with your bougie you will have no trouble.

Dr. N. L. Wilson: It seems to me that a great many of us are afraid to use the bougie. It has been my habit to use the bougie almost every day. I have never seen any bad results from its use. The only thing I have seen is where the piano wire bougie was employed and in my hurry I left a little end of the wire sticking out and it caught in the mucous membrane of the Eustachian tube and caused a little bleeding, but the cotton was still on the bougie. The galvanic bougie is my favorite method because, as Dr. Dench has said, you not only get stimulation of the canal, but you can get through the stricture without using any force. I saw a case only yesterday in which I introduced it to 43 mm. into the right tube and in the left it only went up to 20 mm. and stopped; I put on 3 milliamperes of current and it immediately went in 43 mm., without any force whatever. I am thoroughly in favor of the bougie.

Dr. Randall: I have been using bougies of various forms for more than twenty years, and still use them occasionally; yet have been disappointed in obtaining anything but temporary relief. As to the electric bougie, I must confess skep-
ticism in its relief of stricture. It was pretty thoroughly tried a dozen years ago and abandoned. I know there are some of my colleagues who have had very excellent results from its use and others the same by using the simple bougie. It has been found that when one meets with obstruction and the current fails to turn on, it is passed just as easily if one waits for a moment. I think it is a method that should be very cautiously recommended to beginners, and even in the most careful hands the manipulator will meet with mishaps which may be disastrous. Therefore, when I can get without it all the good results that I can hope to obtain by the electricity, I feel that I should not use it.

Dr. Lutz: I have made it a practice to use the bougie as a part of my preliminary examination. I think if more men did it, strictures would be discovered a good deal earlier and the proper treatment instituted.

Dr. Bryant, closing: In conclusion, I wish to emphasize the importance of the early recognition of slight degrees of stricture and not to decry any other method of treatment.
REPORT OF A CASE OF BRAIN ABSCESS RESULTING FROM CHRONIC PURULENT OTITIS MEDIA.

JAMES F. MCKERNON, M. D.

The following case is reported, not because there were any new or unusual diagnostic symptoms presenting, but because the writer believes that every case of brain abscess, whether successful or fatal, should be reported, so that our records in the future, and the statistics taken from them, may be more nearly accurate, and thus enable us to correctly determine the percentage of cases of cerebral suppuration caused by disease of the middle ear.

The history in this case, which terminated fatally, is briefly as follows:

M. G., a girl eleven years of age, was first seen on December 16, 1904. Her mother said that the child had had a running ear on the right side for the past eight years, in consequence of an attack of measles when she was three years old. The mother remembered that twice during the eight years the ear had stopped discharging. Once, when the child was six years old, the discharge had ceased for several months; and again, three years later, there was no discharge for six weeks. With these two exceptions, there had been a continuous discharge of pus from the ear for eight years.

About a year before, she had spoken to her family physician about it and asked him what she should do for it. He told her to let it alone, as it would be very bad to check the discharge; and that when the diseased material had all come away, the ear would get well of itself.

For the past month the mother had noticed that the child was very dull, and often extremely irritable with the other children. At night she was very restless, would grit her teeth, and occasionally give a short, sharp cry as if in pain. If awakened at this time and questioned, she would say she had pain all over the head. Four days before I saw her, she vomited, said the daylight hurt her eyes, would not eat and con-
tinually complained of headache. During the past three days she had been lying in a stupor, moaning and groaning and tossing from one side of the bed to the other. When aroused, she would attempt to answer a question, but before she could do so, would lapse again into unconsciousness. She refused all food. The family physician had been called in to see her several times during the last few days, and had told her mother that the child must be kept quiet. He had given her a hypodermic of morphine at each call.

Physical examination showed a child apparently about eight years old, very much emaciated, moaning and moving from side to side of the bed. Her color was indicative of sepsis, the tongue was dry, glazed and heavily coated, the eyes were closed tight and her hands were clenched. The temperature by rectum was 97.3 F., the pulse was 52 and the respiration 14 per minute. Examination of the right ear disclosed a large polypoid mass completely filling the external auditory canal and meatus. This was covered with a thin but very foul-smelling discharge.

The mastoid was normal in appearance, the left ear was negative. A diagnosis of brain abscess was made, and the mother was told of the critical condition of the child. She said if there was a possible chance of saving the child's life by an operation, she wished it done. She was then told that at that late day, even with an operation, the child would in all probability die in a few hours. Notwithstanding this, she requested that an operation be performed as speedily as possible.

A hasty preparation was made, and within an hour the child was on the operating table. While preparing for the operation, one of the assistants examined the eyes, and reported double choked discs.

Operation: Chloroform in small quantity was administered. Feeling certain that we had a cerebral abscess present, I decided to expose the brain primarily, and chose as the point for entering the skull a space near the floor of the middle fossa, corresponding with a point directly above the mastoid antrum, as I believe, in children, cerebral infection occurs more frequently by an extension from the mastoid antrum through its roof than by way of the tegmen or other portions of the bone. The dura was exposed rapidly to about the size of a silver half dollar, the lower margin of the opening being as low down as the floor of the middle fossa. The exposed dura was not at all dark in color, but rather white or grayish, and devoid of lustre, and did not show any undue prominence by bulging into
the opening made by the removal of the bone. It was incised freely with a scalpel, and sutures introduced to act as retractors. Upon exposing the cerebral substance, it was found to be lustreless also, and did not bulge prominently into the openings through the dural flaps. A knife with a long slender blade was introduced just above the bony floor, and directed upward for about one inch. Before the blade could be withdrawn, pus gushed through the opening with such force that it was carried as far as the elbow of the operator, as though propelled by a pump. The opening to the cerebral cavity was enlarged by the introduction of the finger, and it was estimated that between three and four ounces of pus had been contained in the cavity. Certainly it was the largest amount of pus I have ever seen coming from the cranial cavity. The abscess wall was composed of a limiting membrane and the cavity was cleansed by wiping it out with narrow strips of gauze.

Upon inquiring of the anesthetist the patient's condition, I was told that the pulse had gradually increased in rapidity to 90 per minute, was of good force, and the respirations higher than before.

Owing to the improvement in the patient's condition, it was decided to open the mastoid. This was quickly done, and it was found to be necrotic throughout, and completely filled with a cholesteatomatous mass which was removed.

Into the brain cavity was inserted a wick of sterile gauze moistened and rolled in equal parts of boric acid and iodoform powder. The wound was dressed as rapidly as possible and the patient placed in bed. The time consumed in the operation and dressing did not exceed twenty-five minutes. A saline solution was thrown into the bowel to forstall any sudden collapse.

The patient did well, the pulse increased to 120 per minute, the respirations were only slightly above normal and the temperature rose to 102 F. She became conscious, asked for a drink, and said her head pained her, but not as badly as it did in the morning. In about an hour she became worse, the temperature rose to 106 F., pulse 180 and respiration loud and snoring in character; and within another hour she was dead, having survived the operation about eight hours.

The pus was examined bacteriologically, and found to contain a mixed infection. It had an extremely foul odor as is usual in abscess cases of long duration.

The history of this and similar cases teaches us how ex-
terribly dangerous it is to allow a chronic suppuration of the middle ear to continue unchecked. But while we, as otologists, recognize the danger, does the average general practitioner of medicine to-day so recognize it? While some may, I do not believe the vast majority do. If they do not, is there anything that we, who are practicing this especial branch of medicine, can do in the future to enlighten them?

I think we can, and the first step in the right direction is to teach the medical student of to-day, who will be the general practitioner of to-morrow, how to recognize and properly treat acute affections of the middle ear, for if so treated an acute inflammatory process need rarely become chronic. If it should become so, we should insist upon his knowing the danger that may arise from a continuance of this condition, and the appropriate surgical treatment for its relief.

DISCUSSION.

Dr. Charles W. Richardson: The paper just read by Dr. McKernon is interesting from two standpoints. First, he has reported to us a case which proved of interest not only in its history; and secondly, from the fact that he has reported a case which showed the necessity of an operation and the quick method by which he met the indications. The point which he refers to particularly, in regard to our enlightenment of the general practitioner, is well taken, and I think this is something that cannot be too much impressed upon the medical student by those teaching this branch in the colleges of this country; and also the importance of getting the general practitioner out of the idea that there are no dangers attending chronic suppuration. We all know that a certain number of these cases go on for an indefinite period without giving rise to symptoms of a definite character. We know that sometimes simple methods properly applied bring the case to a successful termination without resorting to radical methods. The radical methods, when indicated, are practically of little danger and justify us in doing the operation and relieving the patient of the present dangers, which are of grave importance. I think we should impress this upon the general practitioner, and get them out of the idea that suppuration of the middle ear is not serious, and that it will yield in the course of a couple of years to simple cleanliness. Some points in the diagnosis of this condition were brought out indirectly by Dr.
McKernon in his paper and I have found in several cases which I have seen, that probably one of the earliest and most important symptoms of the early presence of cerebral abscess is the change in the temperament of the individual, shown in his case by irritability of the child. I have noticed in all the cases I have seen this change in temperament, in the way of irritability with the members of the household, which is an early indication of the presence of an abscess in the cerebral cavity. Of course, other symptoms come on gradually and make the diagnosis more positive. That is one of the symptoms I think should be well thought of in cases of suppuration of the middle ear, pointing to the possibility of the patient having suppurative involvement of the cranial cavity.

Dr. Stout: I would like to ask Dr. McKernon as to his results and the general statistics on operating on intracranial abscesses.

In two cases upon which I operated last spring, there was no bulging of the meninges, and no other symptoms of intracranial pressure at the site of the operation. Both of these cases died, and, although both the middle and posterior cerebral fossae were entered and explored in each case, pus could not be found. In spite of this, one of the cases showed a subdural abscess as large as the palm of my hand at the post mortem. This case, a child of six years, had paralysis in all four extremities, double choked disc, and was blind, when first seen by me.

While I agree entirely with Dr. McKernon, that operation should be resorted to as soon as the diagnosis is made in these cases, it seems to me that they reach our hands so late that the number of cures following operative treatment is very small.

Dr. Dench: I am sorry to say that my statistics are something like Dr. Stout's. I have saved four out of ten cases operated on. While this is not very good, yet we know that this disease is absolutely fatal unless operated upon. I had a patient who suddenly developed symptoms of a brain abscess in the temporo-sphenoidal lobe. There was some aphasia and a little rise of temperature. There was a high leukocytosis. I was confident I was going to find a brain abscess and I found absolutely nothing. About two weeks after operation there was a little discharge of pus from the brain, about 1 1/2 to 2 drachms. The hernia cerebri is gradually disappearing and the patient is making a good recovery. We must operate at an early period if we are going to save the cases. The operation is
safe if done under strictly aseptic precautions. We make a mistake in waiting. Another thing is the element of time in the operation. I think it is an important point. We must be prepared to go into the cranial cavity and recognize what we see when we see it. The man who operates quickly will save more cases than the one who operates slowly. I think the sooner the general practitioner recognizes the danger of brain abscess as a possible complication in every case of chronic purulent otitis, the sooner we are going to diminish the number of cases of brain abscess and diminish correspondingly the death rate in those who suffer from chronic suppurrative disease of the middle ear.

Dr. Berens: I want to call to your attention the fact that all these cases of chronic suppuration of the middle ear are not necessarily operative cases. In our education of the general practitioner we should be careful not to give him the impression that a severe operation is necessary in every case of chronic suppuration of the middle ear. I believe we can cure many of these cases by other measures than the mastoid or Stecke operation. In our education of the general practitioner it might be well to teach them a little conservatism as well as the radical methods, never losing sight, however, of the point that these cases must be cured.

Dr. F. B. Sprague: Last week we had a case of brain abscess in the hospital at home, and when the incision was made through the dura the soft brain substance protruded in a manner similar to what Dr. McKernon has described. An instrument was inserted to a depth of one-half of an inch into the brain, when the pus fairly squirted from the cavity. I should think there was between one and a half and two ounces of pus in the abscess. The cavity was irrigated with normal salt solution. He was very much better when I saw him yesterday. The question has been asked, how many of these cases are successful? I had two cases, one six years ago and another eight years ago, in which the abscess was about the size of an English walnut, and these both recovered. I had two other cases which died. The first one I operated through the roof of the antrum and the man died about a week after operation. The other was done on a man who had been brought in unconscious. The abscess was opened and about a half ounce of pus removed. The next day the patient was conscious and lived for eighteen hours.
I would like to ask Dr. McKernon if any unfavorable symptoms develop any time after the evacuation of the pus. One patient on whom I operated six years ago has had severe headaches. I would like to know if there is any trouble following these cases in the way of disturbances of cerebration or aphasia.

Dr. McKernon, closing: Regarding Dr. Stout's question as to the statistics of brain abscess following chronic suppurative otitis media, I can only state my own. Several years ago I looked up the subject and collaborated several authorities. My own statistics show eleven cases of brain abscess following chronic purulent middle ear disease, with seven recoveries. Of these recoveries, the last was two and a half or two years and eight months ago. I do not consider a case of brain abscess cured until several months after operation. Two cases which died, not including this one I have just reported, died from encephalitis, one two and a half months, and one five weeks after operation. I know the percentage of successes is very much higher now than it was several years ago. Regarding the question of flushing the cavity, this is a question now under discussion, whether it is advisable to flush the brain abscess cavity or whether it is better to use strips of sterile gauze and wipe it out. In my first four cases, of which I saved three, I used flushing with a normal salt solution. In the fifth case I tried the dry method, wiping out the cavity. Another point, which I believe is of very great importance after the diagnosis is made, is to primarily enter the brain and not begin and do our mastoid operation first. We are not justified in using up the time limit for this. If the patient's condition will allow it, well and good; go on and explore the mastoid. If the condition is not so good, the mastoid operation can wait for a few days. Another point, which Dr. Sprague spoke of, was the symptoms after operation. In one case, a girl of 24, there was very marked headache after operation. I attributed that to a pachymeningitis. I think where we have persistent head pain after operation, lasting for months, we cannot attribute that to pachymeningitis at the point where the brain was explored. I believe it is in all probability due to small multiple cerebral abscesses which have been and are still present. I have seen this in one case at the time of the primary operation. I think in these cases, where post-operative pain is complained of, the cause of the pain is two-fold, first the
pachymeningitis and second the retention of the multiple abscesses in the brain. Dr. Berens brings up a point on which I want to take issue with him. In this respect I do not wish to be misunderstood as advocating operation on every case of chronic middle ear suppuration. I think when we find dead bone present in the middle ear we are negligent unless we tell the patient just what the chances are if this condition is allowed to go on unchecked, and thus warn the patient of the possibility of having future intracranial involvement. I never operate unless dead bone is present.
While aural neuralgia of dental origin is a well-known phenomenon and referred to in most text-books on diseases of the ear, at the same time the literature on the subject is meager and but little can be found. I do not at this moment recall having heard the subject discussed before this Society. I am quite sure that cases of severe aural pain, having its origin in some trouble with the teeth, are not infrequently seen by all of us. In order to bring the subject to your attention, with the hope of gaining something from the discussion, I present the following remarks.

Such patients present themselves with a history of severe earache lasting a longer or shorter time, pretty severe in character, entirely uninfluenced by the various measures which they have used for its relief or which their physician has used for its relief. The pain is of a rather constant type and does not suggest the throbbing, continually intensifying pain of an acute otitis media. On examination of the drum, there is no sign of inflammatory action. The history of a cold, some form of exposure, possibly of a carious tooth, may be given after close questioning, but as a rule the patient does not refer the condition to the tooth.

Anatomically there is a connection between the inferior dental nerve which supplies the teeth of the lower jaw, and the otic ganglion. The otic ganglion is situated immediately below the foramen oval, and it is in close relation to the structures of the middle ear, the tensor tympani muscle, the Eustachian tube, the auriculotemporal nerve, and has a direct connection with the internal pterygoid of the inferior maxillary nerve. I have not been able to find any direct connection with the nerve supply of the upper teeth which come from the posterior, middle and anterior-superior dental branches of the submaxillary nerve, unless it be by way of the Gasserian ganglion. As,
however, this entire nerve net-work has many connections, it is quite possible that the irritation of the nerves of the roots of the upper teeth may also be referred back to the ear. Although in my own experience most of the cases of aurai neuralgia have been connected with affections of the teeth of the lower jaw rather than the upper. Exactly why pain in connection with the teeth should be referred back to the ear rather than any other of the points with which the dental nerves may be connected or be in relation, I cannot say. The following cases will illustrate the relationship between the teeth and the ear:

Case I.—A woman who had suffered from severe neuralgia of the face and ear for many years, but without much relief, was finally referred to me by her family physician. Examination of the ear showed no trouble whatever. She was then referred to a dentist who extracted an upper jaw molar tooth on the root of which a wisdom tooth was growing crosswise, and pressing on the dental nerve, somewhat similar in appearance and in results to those illustrated by Dr. Cryer in figures 118, 119, 120 and 121 in his text-book on "The Internal Anatomy of the Face." The removal of the tooth cured the pain in the ear.

Case II.—A Jewish woman about 35 years of age, complained of severe neuralgic pain in the right ear. Examination of the ear showed no inflammatory action whatever, and after seeing her for a couple of times I was very sure in my mind that the cause of the pain was not in the ear. I referred her to a dentist who removed a lower molar, very much out of shape, and pressing directly on the inferior dental nerve. With the removal of this tooth all symptoms referable to the ear, immediately disappeared.

Case III.—Woman of about the same age came complaining of severe, somewhat intermittent, neuralgic pain in the ear, Examination showed no inflammatory action visible in connection with the drum, and she was referred to a dentist who removed the last two upper molars on the right side, finding the root of the next to the last molar to have a little abscess cavity at its tip. The ear pain instantly stopped and has never returned.

Case IV.—Young woman about 30, intermittent earache in the left ear several days’ duration, relieved by hot applications and the hot water bottle. Examination of the drum
showed no apparent trouble with the ear. The canine and the incisor next to it on the lower jaw, left side, have troubled her more or less, and hot things applied at this point will cause neuralgic twinges in the ear. This case was referred back to the dentist as being probably dental in origin, and after treatment of the teeth the pain in the ear disappeared.

Case I' is somewhat different and is the only one of its class that I have seen. A boy of about 12 years of age had, as the result of a cold, an acute inflammation of the middle ear, accompanied with very severe pain. Free incision of the tympanic membrane was done but no relief whatever followed, and the severe pain continued for a number of days, requiring morphia hypodermically for its relief. On giving him something in the way of a cold drink on the second or third day of the aural pain, an unusually severe paroxysm of pain in the ear followed. Noticing this I thought of the possibility of there being some trouble with the teeth which caused the severe pain, or at least intensified it. So the dentist was sent for, who found that the filling had come out of one of the lower teeth on the left side, and that there was also a delayed eruption of one of the bicuspids. He was very doubtful whether either one or the two together was sufficient to explain the intense pain, but after free incision of the gum over the expected bicuspid and the putting in of a temporary filling in the tooth, the pain entirely disappeared, and for the first time in three days, the boy ate something apparently with relish. The severe pain did not return, although the inflammatory ear symptoms as such continued and the case later showed inflammation of the mastoid, for which a mastoid operation was done.

While no part of this paper, I may mention in connection with this case, that when the mastoid operation was done, only the two terminal cells at the tip were found involved; all the rest of the mastoid area being apparently perfectly normal. This also was somewhat unusual in my experience, as usually if the tip cells are involved, some of the intervening ones will be also.

When severe pain, for which there are no objective appearances to be found in the tympanic membrane or in the throat, appears, and the usual measures for palliative relief do little or no good, I think it always advisable to have the teeth carefully examined, with the probability that a good many of
these cases of aural neuralgia will be found to be of dental origin.

As aurists I think we ought to have perhaps more knowledge in regard to the teeth than we have and more ability to locate in the teeth those pains for which we cannot or do not find sufficient cause in the ear.

DISCUSSION.

Dr. E. L. Vansant; opening: Although reflex dental otalgia has been accepted as an established fact by all recent writers on dental and aural surgery, still as Dr. Richards has so pertinently said in his interesting paper, a renewed discussion may bring to light new anatomical or clinical facts which may further enlighten our knowledge of the subject. In my own experience most of the patients suffering from dental otalgia have been children. The otalgia accompanying the eruption of the molars. In the comparatively few cases that I have observed in adults, carious teeth, or the eruption of the wisdom teeth, have been the offending cause. Otalgia in an adult, due to the cutting of the wisdom teeth, may be prolonged and produce much distress. In a young adult suffering from an otalgia, not to be explained by local conditions, we should always bear in mind the eruption of the wisdom teeth. Lancing of the gums usually gives much relief to teething children suffering from dental otalgia. In adults lancing gives but little relief and indeed may aggravate the pain in the ear. For these cases local analgesics are indicated; the injection of these into the gum is usually of much benefit. Ice pellets may be held to the gums and best applied externally. In teething children in addition to the pain there is, in some cases, more or less congestion or inflammation of the drum-head, nor is this surprising when we consider the close connection of the dental nerves, not only with the branches of the trigeminus, but also with the sympathetic.

Dr. Conrad Berens: I have had quite a number of cases of the type described by Dr. Richards in his interesting paper, the last one being the most interesting of all. A patient called on me several years ago complaining of pains in the head upon the right side, involving the ear and mastoid of the same side. Not finding any objective phenomena, I refracted his eyes and prescribed spherical lenses of about two dioptres. This relieved the young man's symptoms.
In about seven months he returned complaining of intense pain in the right ear, eye and over the mastoid. I went over his refraction again, thinking I had possibly made a mistake, but I could find no change. I examined his ear and found absolutely nothing; it was as near normal as any I have seen. I also examined the pharynx and oropharynx and found nothing. I then discovered that the second upper bicuspid on the right side had been filled and was sensitive and I had the patient consult a dentist, who extracted the tooth. This tooth had three roots, one of which was found split for about two-thirds of its length; from this split hard vulcanite projected fully two mm. from its entire length. This undoubtedly constantly pressed upon the alveolar tissue. At the time of extraction the antrum was entered by a fine probe and found to be in an absolutely healthy condition. In filling the tooth the dentist had undoubtedly split the root and then filled it with vulcanite, thus giving rise to a constant irritation over a period of nearly eight years. There has been no further complaint since the removal of the tooth and healing of the wound.

Dr. Stucky: When I read the title of Dr. Richards’ paper I looked over the history of some of the cases which I have had. As our experience has been somewhat different, I shall mention a few points. First, the wisdom tooth was the most common cause of the trouble. Second in frequency was the amalgam filling. Third, gold crown fillings which had been on for more than two years. Fourth, I have had difficulty with some dentists to get them to pull a good tooth, and in some cases I have had to assume all the responsibility to get the dentist to extract the tooth. When a patient comes to me with pain in the ear and I can find nothing wrong with the ear and the throat is in good condition, I tap the teeth and syringe with cold water and this will generally reveal the seat of the trouble.

Dr. H. L. Myers: I had quite an interesting case a few days ago. When I first examined the patient I thought it was a case for a mastoid operation. The tenderness was very great over the mastoid and extending back for an inch. The examination of the ear, however, showed nothing with the exception of a slight congestion of the drum. The patient complained of some earache. The soreness over the mastoid was so great that I was not satisfied and I got a colleague
to examine the case with me and we both agreed that it was not the mastoid that was at fault. On examining the mouth, we found the upper last molar tooth badly decayed and on removal of this the symptoms promptly disappeared.

Dr. E. B. Dench: Several of the gentlemen have spoken of mastoid tenderness from dental caries. I would like to ask Dr. Richards to say, in closing, whether he has observed any mastoid tenderness in these cases.

Dr. Richards, closing: No. I have not seen any mastoid tenderness in any of these cases. The last case, as I stated, had mastoid trouble, but I do not think the aural neuralgia had anything to do with it. I have seen no such cases as those described.
It may be recalled that in the discussion following the reading of the paper referred to, "Cholesteatoma with report of a Case," at the meeting of the Eastern Section of the American Laryngological, Rhinological and Otological Society at Fall River one year ago, the question of dealing with a large cavity left after the removal of the tumor came up, and some suggestions were offered as to the proper method of disposing of it. It may be remembered that after removing the mass of cholesteatoma there remained a cavity measuring eight centimeters antero-posteriorly, seven centimeters vertically, and two to four centimeters deep, exposing a large surface of dura which positively refused to granulate and fill up by any process resorted to, and they were not few. Fig. 1 shows the opening into the cavity which existed at that time.

It had been learned by experience that by frequent irrigation the parts might be kept clean, but if left to themselves even for two or three days, the lining membrane, which looked not unlike a dry mucous surface, began at once to be covered with a material resembling that removed at the operation, and at once underwent decomposition.

In the discussion of the paper it was suggested, among other methods, that the inner surface of this cavity might be covered with Thiersch grafts, and a radical operation performed, and the outer opening closed. Accordingly, an attempt was made to get some grafts to take hold of the outer surface of the dura. This membrane was scraped till a raw, clean surface was produced and a fair sized Thiersch graft applied in the usual manner, but it did not adhere. Feeling that perhaps something in the technique was at fault, the procedure was repeated some three or four times; each attempt was made more careful and painstaking than before, but the result was the same.

At this time, at the suggestion of Dr. Dench, who kindly
examined the case, an attempt was made to obliterate the cavity by removing all the bony covering of the cavity, and at the same time to do a radical operation, uniting the cavity with that of the middle ear. This was accordingly done, which resulted in removal of the cranial bones over an area of about forty-five square centimeters. The edges of the old opening were freshened, the scalp was dissected well from the pericranium upward for about three centimeters, for the purpose of preventing too much tension on the sutures, and the parts brought together with interrupted sutures, with the intention of irrigating and keeping the cavity clean while union was taking place, and at the same time firm pressure was made on the soft tissues behind the ear, in order to secure, if possible, adhesion of the soft tissues to the dura. A few weeks of this treatment demonstrated two things: First, that the cicatrix formed by bringing the superficial parts together was becoming very thin, and was soon followed by an opening into the cavity behind the ear. This condition continued un-

Fig. 1.
Remarks on a Case of Cholesteatoma.

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til the opening reached the size of twenty to twenty-five millimeters in diameter; and inspection now showed further that there had been no attempt at union between the dura and the tissues covering it, but on the other hand, the same kind of membrane covering the dura was also lining the proximal surface of the outer tissues. As the superficial tissue since the second operation had been kept pressed in upon the dura, or as nearly as is possible in approximation to it, the cleft remaining was very narrow, though nearly as extensive other-

Fig. 2.

wise as before. This inner surface remained clean as long as it received frequent irrigation, but if left more than three or four days would be covered with a membrane brownish in color, with a great disposition to decompose. It was now felt that union between the outer surface of the dura and the overlaying soft tissues was exceedingly improbable, and it was thought best, therefore, to close the opening and to instruct the patient to keep the cavity clean by occasional douching for whatever length of time the case might demand. Ac-
Accordingly the whole side of the head was shaved, the edges of the opening were freshened, and a piece of the scalp was dissected from the parietal region extending about seven centimeters above the opening and brought down and sutured below and in front, while it was left free above, that there might be no traction on the cicatrix. The sliding down of the whole scalp from above left a triangular space of uncovered pericranium about four centimeters wide at the base, by eight centimeters long. This was filled in with Wolf grafts taken from the thigh. No disturbance followed the operation. The patient was up in four or five days and left the hospital in about a week. The wound united everywhere by primary union, and although a part of the graft sloughed, the ultimate result was very satisfactory, and the patient able to return to work in about four weeks. The appearance at this time is represented by Fig. 2.

During the second operation in removing the rather large area of cranium, in order to uncover all of the dura affected by the cholesteatoma, it was found necessary to extend the operation forward practically to the auditory canal, removing the whole of the mastoid tip. At this time the face was watched carefully to note any signs of injury to the facial nerve, but none was observed; nevertheless, after coming out from the ether, as was expected, he had complete paralysis of that side of his face. Taking into account the amount of bone removed, it was believed that not only must the facial nerve be injured, but that in all probability a considerable portion of it removed.

Since the recovery from the last operation the patient has presented himself from time to time for observation; the paralysis has now largely disappeared, although not entirely—he says he can do everything but "whistle and spit." The douching still brings away small shreds of cholesteatomatous lining of the cavity, though it is becoming less and less, and it now seems possible, at least, that the mucous lining of the tympanum may extend backwards and by degrees displace the unhealthy lining of the cholesteatomatous cavity, which, if it should occur, will place this surface in an ideal condition. His hearing on this side is now for watch 12/70, and loud whisper 10 feet.
DISCUSSION.

Dr. E. B. Dench: I saw that case. The result which Dr. Dudley obtained is most admirable. I have never seen a plastic operation which was so satisfactory. It is surprising what results you can get with a great loss of tissue. I have been astonished what good results could be obtained in secondary operations by means of the sliding flaps. We are sometimes deterred from this by the fear that the cicatricial tissue will slough. I have found that these cases close up admirably.

Dr. Dudley, closing: It is not expected that in a case like this there will be very much discussion, as it is so very rare. There have not been more than a half dozen cases reported.
Abscess of the tongue cannot be considered a common disease. In fifteen years of experience I can recall but two cases, one in the Hospital and one in private practice. The explanation of the rarity of this disease is to be found probably in the very rich blood supply of the tongue, and perhaps also in certain resistance to infection which it acquires on account of its constant exposure to all sorts of microorganisms. It is well known that all injuries to the tongue heal quickly and the traumatic ulcerations due to bad teeth cicatrice within a wonderfully short period after the cause of the trouble has been removed.

Butlin divides acute glossitis into several varieties, taking as a basis the predominant organisms found in each form,—streptococcal, staphylococcal, hemorrhagic and mercurial. The variety to which abscess of the tongue belongs is the staphylococcal, and is distinguished from the streptococcal by the concentration of the swelling in one portion of the tongue rather than by a general affection of that organ characteristic of streptococci. In the streptococcal form, infections of the cellular tissue to the neck, Ludwig's angina, or infections in various neighboring organs by extension, as the pericardium, glottis or lungs, are liable to follow. Inflammation may start elsewhere and infect the tongue secondarily, as in the case cited by Butlin, where a puerperal fever was followed by a streptococcal glossitis. In the abscess form in which the staphylococci predominate, a hard swelling forms at some point in the tongue, which is always more or less swollen, and after a variable time the abscess bursts, or is lanced, and pus is evacuated, after which all the symptoms promptly subside.

The history of the two cases is as follows:

J. E. C.—male—age 41. Gave a history of pain on swallowing four weeks previous which greatly increased up to the present. He has been treated by several physicians for sore
throat without success. There was no marked salivation and no odor to the breath. Examination of the throat was negative, but the base of the tongue showed a swelling the size of a small marble, but deep within the tissues of the tongue. No fluctuation could be obtained. A few days later the abscess bursts from the base of the tongue at a point nearly opposite the insertion of the posterior pillar, and much foul pus was evacuated. The patient made a rapid and uninterrupted recovery.

Case II.—J. P.—25 years of age. Entered the Massachusetts General Hospital December 5, 1904, with a swelling of the tongue in the posterior third. Temperature 99.6. The duration was four days and the symptoms salivation and great pain on swallowing, with impeded motion of the tongue, the tip of which only was free. He was given iodide in considerable doses, but there being no improvement and the swelling becoming more sharply localized, the tongue was lanced deeply and a cavity containing considerable pus was found. Convalescence was rapid and in three days the signs of swelling of the tongue had almost disappeared.

The diagnosis in these cases was not difficult, as soon as localization occurred. In the first case the disease had progressed so far that the general swelling had gone down and the local condition had become evident; while in the second case it was necessary to wait a few days to determine where incision should be made.

The literature of abscess of the tongue is fairly rich. As a rule the outcome is favorable, but fatal cases have been noted. One especially may be cited, where an anesthetic was given, but so great was the swelling that the patient died of suffocation before incision could be made.

DISCUSSION.

Dr. N. L. Wilson: It has been my privilege in a practice of twenty years to see two of these cases. One was a man 59 years of age, who consulted me for what he supposed to be a malignant growth, but on feeling it I found it was elastic and I could feel the fluid and thought it was a cyst. I plunged a knife in and evacuated it, and it got well at once. The second case was a woman, and having had experience with the first case, I diagnosed it at once. These cases are rare and at the time I was unable to find much literature on the subject.
Dr. Ard: Several years ago I was called to see a case in which the patient complained of severe pain in the ear. I found no signs of inflammation in the ear and no evidence that the pain was reflex from the teeth. I succeeded, however, in finding a spot under the tongue where pressure produced the characteristic pain in the ear. I advised the patient that an abscess was forming, and would require incision. She decided to return immediately to her home in New York City. I learned later that this opinion was confirmed by her physician in New York. While taking the anesthetic (ether) edema of the larynx developed, requiring tracheotomy. She ultimately recovered.

Dr. George L. Richards: I have just seen a case of abscess of the tongue. The patient had more or less sore throat and complained of pain at the right side of the tongue, but I could not discover any source of trouble. I saw him three days in succession. The third time I saw him, in holding the tongue down, I noticed that a little pus trickled over the back part. I found a small fistula and took a knife and evacuated the pus, and in a few days he was as well as ever.

Dr. McKimmie: As Dr. Cobb says, these cases are rare. In fourteen years I have seen just one case. The patient had sore throat and was under the care of a homeopathic physician. When I saw him I could not get to see anything, as the tongue was so swollen that it filled the entire mouth. There was also enlargement of the lymphatic glands on one side. I got everything ready to do a tracheotomy, if necessary. When I saw him the next morning, he was very much better and had expelled about four drachms of pus. Later, the tongue went down in size, but there remained some permanent thickening. The cause of this abscess was infection by a sharp edge of a carious back tooth.

I would like to ask Dr. Cobb if there remains any permanent enlargement of the tongue in his cases. There was in my case. I have come across the statement that there is always some permanent enlargement of the tongue after recovery from glossitis.

Dr. T. P. Berens: I have had two cases, one in a child about nine years of age, and in that case the trouble began in the lingual tonsil, and the other, a child about twelve years of age, in which the abscess involved the deep tissues of the tongue beneath the lingual tonsil. Both of these cases did well after incision. No permanent enlargement resulted.
Dr. Cobb, closing: I should say, in a case which has lasted as long as the first one I reported, there might be some permanent enlargement. The last time I saw him he had some slight swelling. The second one was a recent case and, of course, I cannot yet tell about that, although the tongue seems nearly normal at present.

There is one thing I want to say in closing, that the only difficulty in diagnosis that would be confusing in an abscess in the sublingual gland pushing the tongue upward.
PAPER:
SKIAGRAPHY AS A MEANS OF DETERMINING THE SIZE OF FRONTAL SINUSES, WITH EXHIBITION OF PLATES.

Cornelius G. Coakley, M. D.

The employment of the X-rays as an aid in the diagnosis of diseases of the accessory sinuses has hitherto been of little value. The credit of the process about to be described is probably due to Prof. Dr. Killian, of Freiburg, a knowledge of whose work was brought to my attention last October by Dr. F. C. Ard, on his return from a visit abroad. Dr. Ard brought with him a plate showing normal frontal sinuses and one in which suppuration in one of the frontals could be readily diagnosed.

The only information that we had to guide us in the method of taking these photographs were the statements of Dr. Ard that the patient lay prone on his face, a photographic plate being placed under the forehead and the tube with a compression apparatus placed over the occiput. The time of exposure was stated to be 3 1-3 minutes. Dr. Ard was unable to bring very definite information as to the value placed upon skiagraphy by Prof. Killian.

With this meagre information, I brought the matter to the attention of Mr. E. W. Caldwell, who is the Director of the Gibbs' Memorial X-ray Laboratory at the University and Bellevue Hospital Medical College.

Having no personal experience, whatever, with the use of X-ray my part of the work has been to furnish patients, both dispensary and private, and to interpret the plates made by Mr. Caldwell.

The first photographs obtained gave a fair outline of the cavities, but were not so good as those latterly taken.

Mr. Caldwell is at present at work upon an apparatus whereby he hopes to simplify considerably the taking of these photographs, and should his expectations be realized, he will publish his method.
Up to the present time, we have taken 44 skiagraphs, one of which was of normal frontals for purposes of control.

Since November 1st, 1904. I have performed a radical operation on ten patients whose skiagraphs have been taken. The operation consisted in a complete removal of the anterior wall of the frontal sinus. We were thus able to compare the height and width of each sinus, together with the number, size and position of the septa that these structures show in the skiagraph. While this number of verifications is not sufficient to enable one to interpret all the peculiarities observed in the plates, it suffices for the following conclusions:

First—It is possible by means of a skiagraph to determine the presence or absence of a frontal sinus which extends vertically above the glabella.

As in simple photography a single sitting may not give a satisfactory negative. This may be due to a faulty manipulation of the apparatus, imperfect development of the plate or to the subject having a large and thick walled skull. We have a very fair skiagraph of medium sized frontals in a colored woman with a large head.

A frequent source of error results from the rays passing through the head in an improper direction. For example, if the rays enter at a point too far above the occiput a small sinus may not be visible; with the rays entering too low down on the neck, some of the ethmoidal cells or the sphenoidal sinuses may be projected upwards so as to appear in the plate in the situation of the frontal sinuses.

The inspection of the plate with reference to the upper outline of the orbital cavity usually shows whether the rays have passed through the skull at nearly right angles to the forehead. There is greater difficulty in getting a satisfactory plate in patients whose forehead is sloping than in those where it is vertical.

One can readily understand the importance to the surgeon of knowing that there is a frontal sinus before he begins his operation. A. Logan Turner from an examination of 240 European crania found "18 skulls or 7½% had no sinuses, while 23 or 9½% had only one sinus." On two separate occasions I have operated needlessly on women, on the right side, for frontal sinus when no trace of one could be found; in each case there was a left frontal sinus. A skiagraph of their heads would have shown the abnormal development.
Second—A frontal sinus may be small, parallel with the upper, inner margin of the orbit and not detected in the skiagraph.

We have made five plates of a man where this condition existed. The skiagraph showed no trace of a cavity in the vertical portion of the frontal bone. There were numerous small polypi in both middle meati. A frontal sinus probe was passed upwards through the naso-frontal duct slightly outwards to a distance of eight centimeters from the lower portion of the vestibule of the nose. From a clinical standpoint there could be no doubt that the tip of this probe was situated in a cell 1.5 centimeters above the inner canthus of the eye. The left frontal region was explored under ether, and no trace of any frontal sinus could be found in the vertical portion of the frontal bone. After passing through the outer table, a vascular, spongy diploe was encountered. On operating, at a depth of 1.2 centimeters, the hard posterior table was met. The diploe was scooped out below and behind the attachment of the nasal bone, when a small, narrow, slit-like cavity, about 1.5 centimeters long and 0.3 centimeters wide was entered. It was lined with a thick, polypoid mucous membrane and contained a small quantity of pus. A probe readily passed through this cavity into the nose. This was the only trace of a cell found in this region. Had the exploratory incision been made through the orbital, instead of the vertical plate of the frontal, this cavity would have been quickly entered.

Third—In all cases of unilateral diseases of the frontal sinus verified by operation, we have observed a cloudiness in part or all of the area occupied by the sinus and an indistinctness in the outline of the cavity when compared with the opposite or healthy side.

The appearance is not unlike that of "fogging" in a plate. Whether this cloudiness is due to the presence of pus in the cavity, as I suspect, or to the changes in the surrounding bony walls as a result of the disease, I have not yet been able to determine. It is possible that with an experience, resulting from examining many skiagraphs, the presence of this cloudy area, provided "fogging" may be ruled out, may be an aid to diagnosing frontal sinus suppuration. The same cloudiness has been observed in bilateral disease of the mouth.

Fourth—The skiagraph has invariably shown the frontal
Skiagraphy.

sinus to be somewhat larger in all dimensions than it proved to be when operated upon.

This is undoubtedly due to the divergence of the rays as they pass from the tube to the plate.

Fifth—A good negative may be depended upon to show the septum separating one sinus from another.

The various incomplete septa that may be present in each sinus are usually shown quite clearly.

Sixth—An oblong, narrow, much darker area, nearly parallel with the upper margin of the orbit on its nasal side, and usually just above it, whenever present, has been found to be an orbital prolongation of the frontal sinus, running anteroposteriorly above the orbit, oftentimes the full depth of the latter.

It is exceedingly valuable to know this prior to operating, as it usually means a more tedious operation in the complete removal of the diseased membrane.

Seventh—We believe that the examination of a skiagraph of the two frontal sinuses when compared with results found on trans-illumination will aid very much in determining the presence of a diseased frontal sinus.

For example: If the left frontal sinus as in our plate, is seen to be nearly as large as the right, but trans-illumination shows a much smaller area of luminosity and a much less brilliant color, we should be strongly inclined to make a diagnosis of suppuration in such a sinus.

Eighth—Skiagraphy may prove a valuable aid in determining our method of treating a chronic suppurative frontal sinusitis.

Given a small sinus with few or no septa: I would prefer to treat such a case by establishing good nasal drainage and believe that in doing so most of them will be cured. On the other hand, if the skiagraph shows us that we have a large sinus with many septa or an orbital offshoot, intranasal treatment is of little avail, and a radical operation should be promptly advised.

Ninth—The sphenoidal sinus.

In one case, two large dark areas near the median line, just above the glabella were for a time unexplainable. Since the nose in this patient has been cleared of polypi, I have been able to determine the presence of two enormously large sphenoidal sinuses. Although we have not yet operated upon
him, I feel sure that those dark areas are due to the projection forward of the sphenoidal sinuses, rather than to any peculiarity in the frontals themselves.

Tenth—A skiagraph may also be of considerable value in determining the height and width of the ethmoidal cell area.

In one of the cases of suppurative ethmoiditis associated with the formation of multiple polypi, the same cloudy appearance of the plate is noticed here as in pus in a frontal sinus. I believe this point to be of considerable value to us is indicating the necessity for thorough curettage and drainage of the ethmoidal cells, in order to effect a cure in such cases.

Eleventh—If the plate can be so arranged as to include the superior maxilla as well, we have noticed that a chronic suppurative process in an antrum presents the same filmy appearance as above noted in similar conditions of the frontal sinus and ethmoidal cells.

A healthy antrum presents an irregular, triangular area, dark in color, with a few light colored septa running through it, many of which are ridges present in the wall of this cavity.

DISCUSSION.

Dr. G. Hudson Makuen, opening: I have had no experience whatever with this sort of work, and I, therefore, have no practical knowledge of the subject, but I know enough about it to feel grateful to Dr. Coakley for giving us the benefit of his experience. Skiagraphy seems to bid fair to become an important aid in the diagnosis of sinus diseases, and Dr. Coakley's work emphasizes not only its importance, but also the necessity of acquiring skill in its technique. While I have had no experience with skiagraphy and the use of the X-rays, yet I have often thought that we may be in too great haste to decry their value before we have first mastered the methods of their application. It seems to me it takes a great deal of skill and practice to use these rays properly, and before we conclude that carcinoma of the larynx, for instance, cannot be cured by the X-rays, we must eliminate the possibility of their faulty application. Skiagraphy, it seems to me, is like the therapeutic use of the X-rays in that it requires a great deal more time and practice than the average throat, nose and ear specialist can give to it, and I predict that specialists will have to be employed to do this work.
Dr. Ard: My attention was first called to X-ray photographs of the frontal sinus by reading in the last edition of Hajek's book that he invariably had a picture taken in all his cases before operation. A little later I visited Prof. Killian's clinic, in Freiburg, and saw a number of X-ray photographs that had been taken for Prof. Killian by Prof. Goldman. I visited Prof. Goldman, who very kindly showed me a number of very excellent skiagraphs of the frontal sinus, and gave me an opportunity to interview the nurse who had charge of the X-ray laboratory. I had my own picture taken and the result was very excellent. This work had only recently been taken up in Freiburg, and at that time I do not think Prof. Killian had formulated his views on the subject. As Dr. Coakley has said, there is no question as to the value of X-ray pictures of the sinus. You have all had experience, or seen operations on the sinus when there was an actual absence of the sinus. By means of the X-ray pictures such an error would not be possible. I saw in Dr. Goldman's collection a very beautiful picture of a brain abscess, where the abscess area was very well defined. This would suggest the value of taking a picture in all cases of suspected brain abscess. It requires considerable skill to secure satisfactory radiographs. I have had two or three operators fail. Mr. Caldwell has succeeded in taking some pictures for me that are very satisfactory. I trust, however, that the knowledge of how to make them may soon become general.

Dr. George L. Richards: I would like to ask Dr. Coakley if he has had any experience in working up through the intranasal route. I understand that by the use of the fluoroscope they have been working up through the intranasal route.

Dr. Myles: This is the most remarkable advance as a diagnostic aid. Dr. Coakley has produced the best skiagraphs that I have seen. I have operated on a great many frontal sinuses, both internally and externally, and most of the trouble that was encountered was due to not knowing the size and topography of the sinus before I commenced procedures.
A CASE OF SARCOMA OF THE MAXILLARY SINUS.

Z. L. Leonard, M. D.

The case here epitomized presents some features which may be deemed worthy of consideration at this time.

C. H. T., 51 years of age, a merchant, born in New England, of exceptional healthy and long lived ancestry, applied for relief September 15th, 1903. He had recently returned from a month's trip through the West, including the Yellowstone Park. It was after a long stage ride in the Park, where he suffered much from the irritation caused by the clouds of alkaline dust, that he had his first attack of epistaxis. During the journey home he was frequently annoyed, more at night, however, than in the daytime, by the bleeding. There was no pain accompanying this bleeding nor was it so excessive that he was forced to consult a surgeon. Simple measures staunching it. The hemorrhage was entirely from the right nostril trickling also into the pharynx.

Upon examination, the right inferior turbinate was considerably enlarged but not sensitive to touch by the probe, nor was any painful spot discovered either internally or externally. No bleeding point could be found. The posterior rhinoscopic image was normal. An astringent solution was thrown into the nostril and the patient was ordered to use frequently a spray containing sulphate of zinc. This sufficed until the first of October, two weeks, when he reported again saying that the bleeding had recommenced.

The inferior turbinate had increased in size during the time and was more sensitive but not painful on pressure. Four daily treatments again checked the flow of blood and patient did not call again until the 28th of October, or for more than three weeks. At this time the turbinate had increased to such a size that it nearly touched the septum. It had a firm, healthy appearance and did not bleed. For the first time the patient spoke of a pain on the right side of the face which he thought was caused by a decayed bicuspid tooth. Antral disease was
suspected, but these were the first symptoms which could be elicited from the patient which might be a ground for such a suspicion. He had already consulted a dentist who began the treatment of the tooth with the hope of saving it. The epistaxis came on at regular intervals, usually at night. The patient continued under the care of the dentist through the month of November, but with no permanent relief.

Early in December he presented himself again with well marked tenderness of the cheek, but no bulging, neuralgic pains and conjunctivitis. The turbinate had now attached itself to the septum by a web-like membrane through which there were two openings barely admitting a probe. Except for the inability to breathe freely through the nostril he suffered no great inconvenience, but could clean away the mucus with spray and handkerchief. Transillumination gave an umbra extending over the whole maxillary sinus. He was advised to have the bicuspid, which was very tender on pressure, removed at once. This was done, with slight relief, and the dentist referred him back to me, saying there was no drainage and he had done all he could.

On December 17th the patient was etherized preparatory to the removal of the inferior turbinate and for the purpose of making a free opening into the maxillary sinus. The turbinate was extracted with forceps. Passing the finger into the nostril beyond the base of the turbinate it entered the sinus through a wide space in the bony wall and came in contact with a mass, soft and friable. With the finger and curette this mass was removed as thoroughly as possible. The orbital wall had been so destroyed that the eyeball could be readily felt. Its surface was intact, apparently normal. It was then deemed advisable to make a counter-opening through the canine fossa to secure complete drainage. The lip was retracted and the usual incision made. Cutting through the soft tissues the knife immediately penetrated the sinus through another large opening in the bony wall in this locality. Again introducing the finger through this aperture it was discovered that almost the entire wall of the sinus was eroded or missing. As the request had been made that there should be no external mutilation, further operative interference ceased at this point. The bleeding, which had not been excessive, abated when the parts were washed with hot water. The sinus was firmly packed with iodoform gauze. The patient reacted
well, no untoward symptoms arising. A bit of the gauze was withdrawn daily until all had been removed, when a rubber drainage tube was inserted. Through this the sinus was irrigated with a warm saline solution for six weeks. A portion of the mass taken from the sinus was submitted for pathologic examination educing the report that it was a round cell sarcoma, quite vascular and with small hemorrhages in different parts of the growth.

The patient complained no more of pain in the cheek after the operation until March. He ate and slept well, attending to his business every day, going first on New Year's day. The right eye became more involved, with painless loss of the sight, its appearance causing the most annoyance. About the beginning of March there was evidence that the sinus was rapidly filling up again. There was bulging of the whole right side of the face, the eyeball protruding from the orbital space. The floor of the sinus and the alveolar processes were destroyed, allowing the teeth to fall out. Large sloughs extending into the mouth had to be cut away frequently. There was no extension of the growth below the superior maxilla. The function of deglutition was never interfered with materially. Patient died on April 14th, 1904, and no autopsy was allowed.

The antecedent history of this patient was as follows: On March 15th, 1902, a small non-malignant tumor was excised from the vicinity of the left mamma. On the site of this surgery a second growth appeared which was removed on January 26th, 1903. This operation was a thorough one. not alone the growth itself, but also the axillary glands were ablated. This second growth was examined and found to be sarcomatous. On March 15th, 1903, at the first operation, there was no glandular enlargement. Almost immediately after the second operation the patient began to have treatment by the X-ray and injections of the Coley toxin, one day receiving one, the next day the other. The toxin was increased to twenty minims to a dose, producing well marked systemic disturbance. This treatment was kept up faithfully until August and resumed in September. Both were continued until December 17th. From that time on the X-ray was abandoned but the toxin was used until shortly before death.

The details of interest worthy of consideration in connection with this case are: The inexorable advance of the disease not-
Sarcoma of the Maxillary Sinus.

withstanding the adoption of surgical and therapeutical methods approved and modern to check its progress; the absence of excruciating pain or copious hemorrhage and, most remarkable of all, was the lack of any cerebral symptoms even to the very last. This is especially to be noted since movement was apparently in the direction of the important region lying at the base of the brain. The writer is indebted to Dr. D. M. Marvin, the family physician, for many valuable facts in relation to this case.

DISCUSSION.

Dr. J. Solis Cohen: The few cases I have seen have appeared as in this case with nasal hemorrhage, and I think it is quite proper in cases of continued nasal hemorrhage to consider the possibility of sarcoma. These cases are sometimes mistaken for syphilis. Under certain circumstances the microscope cannot tell the difference between syphiloma and sarcoma. The diagnosis is made by removing and examining portions of the growth, and the sooner the radical operation is performed the better. If there is no secondary involvement, there is the possibility in some cases of permanent cure, but should there be any involvement of the glands the case will only go on from bad to worse, as in the instance reported in this paper.
EXHIBITION OF SINUS SYRINGE.

E. L. Vansant, M. D.

This syringe, which I present for your inspection, has several adjustable tips made of fairly firm metal. These tips are so bent as to facilitate their introduction into the openings of the nasal accessory sinuses. I have found this syringe useful in the treatment of diseases of the nasal sinuses.
Melanotic Sarcoma.

PAPER:

MELANOTIC SARCOMA, WITH LOCAL MANIFESTATIONS IN THE UPPER AIR PASSAGES.

Wendell C. Phillips, M. D.

A brief history of this rare case will be related as follows:

F. W., age 47, in good health during childhood. At about 18 years of age he became aware of the presence of what seemed to be a mole on the right leg just above the knee. This remained practically the same size for a number of years, when it began to gradually increase until twelve years ago. After this time the increase became more rapid until it became large enough so that it was frequently struck by objects which his leg came in contact with. At the same time he became conscious of some itching. The slight injuries which it thus received, together with the efforts at relief by scratching, eventually caused it to bleed.

As the growth increased, it became softer so that the diagnosis of nevus was made. This was removed by means of strangulation, a silk ligature being employed. The resultant wound healed nicely after a few days, but in about a year another similar growth started about one inch to the left of the original. This grew rapidly and presented a flatter surface. The second growth was partially removed, but the patient says that operation was not thoroughly done. One and one-half years ago, after a reappearance covering a much larger surface in the vicinity of the original growth, a radical operation was made and the entire growth removed under ether anesthesia. The wound healed rapidly, but almost immediately he began to notice small black specks appearing upon various parts of his body. Some of these have grown considerably and are from one-half to three-quarters of an inch in diameter, while others are not larger than a pin head. A large one has appeared on the left side of the nasal septum, which still remains. Another one has made its appearance on the soft palate and involves part of the uvula. There is another one on the right arytenoid cartilage and another in the postnasal
space. There is but little induration or infiltration in these masses and those situated upon the mucous membranes are less inclined to the oval appearance and seem to spread out over the surface. At the present time he has 110 of these small dark growths. They are very dark blue. In fact almost black in color. He has considerable cough and expectoration and is gradually losing strength and vigor. The diagnosis of melanotic sarcoma has been verified by consultation.

Ten days ago the patient complained of indistinct vision in the left eye, and stated that the vision was only blurred from a portion of the field situated near the center. On examination well marked scotoma was discovered. The fundus shows no distinct pathological lesion which might account for the scotoma. A peculiar pigmentation is seen just below the disc and some old spots of choroiditis. This pigmentation is suggestive of the presence of a sarcomatous deposit in this location.

The examination of the urine is negative, but the patient had been drinking a little more freely than usual for a month or so.

Eleven years ago he developed syphilis, which has been properly and thoroughly treated. I shall make an effort to exhibit this man at the February meeting at the Section of Laryngology of the New York Academy of Medicine.

The history of melanotic sarcoma shows that but little may be hoped for in the way of treatment, as these cases are always considered to end fatally.

Dr. George H. Fox, who has carefully examined this patient, writes that there can be no doubt as to the diagnosis. Dr. Fox has been administering chaulmoodra oil for about three months. It will be remembered that this is the remedy that has proven so efficacious in leprosy. Dr. Fox has written that he cannot be positive that the remedy is having any influence in this case, although some of the spots have become less infiltrated. On the other hand, however, there has been a steady increase in the number of new spots.

The patient has a somewhat waxy appearance, but is still attending to his usual occupation and seems to endure the strain of his work with but little difficulty.
The prime etiological factor in so-called pharyngomycosis is yet to be found. The old theory, that the leptothrix buccalis is the cause, has been doubted by Siebenmann, Brown, Kelly, Goodale, Kyle, Richardson and others. I think it has been fairly conclusively proven that the condition is a keratosis, and that this keratosis seems to be caused by some local irritation; whether that irritation is the leptothrix or something else we cannot say. Pharyngomycosis is not as rare a disease as the text-books would lead one to believe. I averaged about six cases a year out of about 1,200 clinical cases, but most of them come to be relieved of conditions other than those due to mycosis. And there is no reason to interfere in this condition unless it gives rise to annoying symptoms, but when the mycosis causes uncomfortable symptoms of the throat we are generally face to face with a most obstinate disease, which is plainly shown by the long list of remedies recommended for its relief. And of this list, the galvano-cautery seems to be the best; but when employed in an extensive case, like the one I am about to describe, the treatment seems a little too heroic.

Under the supposition that the X-ray would have a beneficial effect on the abnormal condition of the surface epithelium and if the keratosis was due to the leptothrix, the germicidal properties of the ray would make it still a more potent remedy.

I regret I have only one case to report, but it was over a year after I thought of using X-rays before I found one appropriate for the trial, and I have not seen another since in which the symptoms were severe enough to justify the time and expense for treatment with the rays. I, therefore, report this case, fully realizing that one case proves nothing, but in the hope that it may lead some of my colleagues to try it in a similar case, thereby demonstrating whether or not the X-ray is of service.

J. R., age 30, male; occupation a medical student, con-
sulted me May 25th, 1903, with the following symptoms: For the past three or four months the larynx and the pharynx felt raw and stiff, and these symptoms were increased with every spell of bad weather. Pain in the left ear with some diminution in hearing. He was hoarse and his throat felt full, especially after using his voice. Repeated attacks of acute laryngitis were common. Both Eustachian tubes felt closed at times, the left one most of the time. He first noticed white tufts on his tonsils and postpharyngeal wall about three months ago. His teeth are in good condition. He does not use tobacco or alcohol. He sleeps in a dark room, and the only condition that might be an etiologic factor is a chronic gastritis, which he has had for some years, and which is better at present; but otherwise his health is good.

Examination: The tonsils are flat, fibrous and recede behind the anterior pillars. Large white tufts are numerous on the tonsils, also on the postpharyngeal wall and extend upward on the left side into the mouth of the Eustachian tube. The lingual tonsil is nearly covered with patches of larger size and a few tufts are located on the aryteno-epiglottic fold of the larynx and extend to the false cord on the left side.

Treatment: Only the X-ray was used; at first ten-minute sittings, twice a week, for six weeks. The pain and discomfort diminished after the first few exposures, and after the fourth some of the smaller tufts became soft and could easily be wiped off with a cotton pledget. The small patches began to disappear, and at the end of six weeks the patient went to the country for the summer, with instructions to lead an open-air life as much as possible.

He returned three months later, September 30th. The condition had remained stationary since he was last seen. He again went under treatment with the X-ray, ten-minute sittings, three times a week, and by the end of November nearly all the spots had disappeared. Then the time between exposures lengthened to twice a week, and by the end of December no spots could be found.

The tonsils and pharynx were directly exposed to the rays through a speculum, something like a Ferguson vaginal speculum, with a large flange to protect the face from the rays. The lingual tonsil and larynx was treated with the rays from the outside, through the tissues of the neck.

In all he received forty-one treatments, of ten minutes each,
a medium tube with a spark gap of about three inches being used. Most of the applications were made through the tissues of the neck. The X-ray was administered by Dr. Frank B. Carpenter, 616 Madison avenue, New York City.

The patient had no return of the mycosis and has been free from attacks of laryngitis, up to the present time.

This disease subsides spontaneously sooner or later, and this case may have been treated just as the subsidence was about to take place, but the fact that his throat began to feel better after each exposure to the ray, leads me to believe that X-ray was the cause of his improvement.

**DISCUSSION.**

Dr. Donnellan: Up to the time I heard Dr. Hurd's paper, what I did not know about the treatment of mycosis by the X-rays would have filled a large volume. There is a possibility that this case was not genuine leptothrix. If it was, it is interesting to note that the X-rays have given important relief in this case. I think Dr. Hurd said that the patient was not a smoker. This is an interesting point because it is generally known that mycosis of the pharynx and adjacent structures rarely occurs in people who smoke. I shall be very pleased in the first case that comes under my care to give it the treatment suggested by Dr. Hurd.
FOREIGN BODIES IN THE BRONCHI.

Chevalier Jackson, M. D.

Frequency. No adequate statistics are available, but it is certain that the frequency is greater than the reports show. Many cases doubtless inspirate a foreign body unknown to the parents and the true cause of the fatal lung lesion is never suspected. In cases of doubt the fluoroscope is called into requisition and, as in case VIII shows nothing and the case is discharged with parents and physician happy in the thought that the foreign body was not inhaled. Later the patient is suddenly taken off with pneumonia or bronchitis attributed to the more usual causes. Foreign bodies are doubtless swallowed by children unknown to the parents, and the resulting gastritis attributed to the usual causes. Undoubtedly, as pointed out by Halstead, infants often cough up and swallow foreign bodies that have entered the trachea and bronchi without the fact ever being known.

DIAGNOSIS AND LOCALIZATION.

Before the days of the X-ray much skill was displayed in exploration. The tendency to-day is to ignore everything other than X-rays. We will do well, however, to get the aid of a skilled physical diagnostician.

Roentgen rays are of use in three ways: For diagnosis of the presence of the foreign body, to locate its exact position, to enable the direction of instruments by observing the shadow of the instrument on the screen. There is practically no foreign body that will not show opaque to rays if a plate be made, and exposure be of sufficient duration. If the patient cannot, or will not, hold still sufficiently long, anesthesia must be used. A fluoroscopic negative report is dangerously unreliable. The shadow of the heart or of the vertebra may render a metallic body invisible to the eye, as in case V and VII. A negative should be made in each of two planes at right angles to each other; ordinarily one antero-posterior and the other lateral.
PROGNOSIS.

In esophageal cases it depends largely on the nature of the foreign body. Rounded smooth bodies, if not too large, proportionate to the age of the patient, may be removed even though tightly wedged, without injury to the gullet. If smaller they pass on into the stomach, and remain there without injury for a long time, or may be passed without harm. If, however, the body be sharp or pointed, to remove it may produce fatal injury. For instance, in cases such as Case IV, it is certainly better to risk gastrotomy than to rip the esophagus open.

The prognosis of esophagotomized cases is good—far better than cases where the esophagus is only lacerated in removal of pointed objects. This, of course, is largely a matter of location. Esophagotomies are always necessarily high up.

In tracheal and bronchial cases with early removal, the prognosis is good. In tracheal cases the foreign body can always be removed by tracheotomy, if not by tracheoscopy. If not seen early, or if operative permission be refused, the prognosis is bad. In bronchial cases the chance of removal, if seen at once, is good. After twelve hours, when the body becomes buried in the swollen mucosa, the chances are less. If not removed, the patient has only a fair chance of escaping fatal abscess, bronchitis, broncho-pneumonia, and traumatic infective pneumonitis.

Undoubtedly cases are not infrequent where even sharp bodies become encysted, in other cases the body will slough loose from its bed in the swollen mucosa and be coughed out or into the trachea or larger bronchi.

In prognosis this loosening must be considered as risking laryngeal spasm, which is prognostically bad in the absence of skilled aid. With a physician at hand to stab the crico-thyroid membrane, the prognosis is good, as an extension downward of the crico-thyro-laryngotomy wound will enable the removal of the foreign body.

TREATMENT.

The indications for treatment are simple. Locate and remove the foreign body at once. But numerous questions arise. Having located the foreign body by X-rays and determined its nature, the laryngologist is often confronted with the prob-
lem as to whether the patient will be safer by removal or by let-alone methods. The decision will rest on the points indicated under prognosis. A rough or sharp foreign body in any location should be removed, provided fatal traumatism be not inflicted in removal. In a class of cases indicated by Case IV where an open safety pin pointed upward and its removal would rip open the tissues, a reasonably safe method of removal must be devised, but removal by some method must be done at all hazards.

In the trachea or bronchi a foreign body of whatever nature must be removed at all hazards short of mediastinotomy or similar procedure. While many cases do become encysted or are coughed up, the risk of waiting for this is great, while the risk of exploration is practically nil. This last is a point the writer wishes particularly to emphasize. He has tracheotomized eighteen cases for foreign bodies, without a single fatality, or even a pneumonia, within three weeks, which might be fairly considered a reasonable limit of time for the development of symptoms of exploratory damage, the tracheotomy wound having always healed within two weeks. Two of the eighteen cases died, both of pulmonary abscess, developed around the unremoved foreign body. One death was six weeks, the other at two months after the exploration, to which it could not for this reason be attributed. The deeper air passages, by cough and by ciliary action are maintained in a fairly aseptic condition. With gentleness and careful aseptic technique, exploration through the tracheal wound is quite safe.

*Inversion of the patient* is a time-honored procedure, but had better not be done unless preparations have been made for immediate tracheotomy. In the writer’s opinion it should never be done until after a preliminary tracheotomy done with aseptic precautions.

For all bodies within reach of the finger, nothing is more successful than the *trained touch* for finding. If we educate our finger-touch as much as the gynecologist, we would often find it useful.

*Kirstein’s autoscopy* occasionally is useful in cases of foreign bodies in the larynx or introitus oesophagi superioris. Better still is an Escat’s epiglottis lifter as modified by Grant, held by a skilled assistant, patient being in Rosen’s position, while the operator kneels at the head of the table with a min-
ialture hand lamp between his eyes (not on his forehead).

Laryngoscopy A universal error in the literature of laryngology is the statement that indirect (ordinary mirror) laryngoscopy is difficult in children and infants. No mention is made of the case of laryngoscopy under chloroform anesthesia. Of course the ordinary head mirror is not convenient for this—it requires either a miniature forehead lamp or one of the now common self-illuminating laryngoscopes. If we examine the larynx and find it free from obstruction and we have cyanosis or dyspnea, especially if in addition the temperature be normal, and we have a history of choking on a foreign body—under these conditions the writer would make a diagnosis of foreign body, though the X-ray examination were negative. For laryngoscopy under anesthesia a silk worm gut loop through the tongue will not cause the after soreness and irritation that a tongue forcep or hemostat will, and is a trivial procedure considered in contrast to the danger by less careful procedure, of pushing downward a pharyngeally or laryngeally lodged foreign body into less accessible and more dangerous regions.

ESOPHAGOSCOPY.

Anesthesia may be local in adults, as the esophagus is not particularly sensitive, but the cocaine solution must not be less than 20 per cent, and the laryngo-pharynx will need it particularly. The patient should be in Rosen’s position, with the head very slightly to one side and the tube coming out the opposite side of the mouth. Killian and others have used the erect posture in some of their cases, the patient sitting on a low stool, but this requires the operator to stand, and is needlessly tiresome; and besides is less advantageous in the aspiration of secretions and manipulation of instruments, and the patient is not so easily steadied and controlled.

Technique. The tube, obturator in place, is warmed and oiled with sterile vaseline, passed back into the pharynx, using the index finger as a guide. The finger in the lead closes down the epiglottis and the tube passes over it, entering the introitus oesophagi. As soon as the tube has passed below the cricoid the obturator is removed and the tube passed by sight.

There is one important point in the technique of esophagscopy, and that is, not to interfere with an ample glottic respiratory aperture, especially if too large a tube be used.
In using the smaller tubes in which there is no hope of applying the forceps under ocular inspection, the length of the tube should be marked upon the forceps by a rubber band, as suggested by Ingals, so that when the forceps is inserted (with the opening in the proper direction) the depth of insertion can be seen by the rubber band arriving at the proximal end of the tube. Beyond this point the forceps must be inserted the distance required to seize the foreign body if the body is beyond the distal end of the tube. If within the distal orifice, insertion can be gauged accordingly. The writer feels certain of the utility of the permanent rod magnets instead of forceps in case of a magnetic foreign body.

Tracheoscopy and bronchoscopy by mouth may be done under cocaine if the patient be stolid. In sensitive men, and in women and children, deep, relaxing, general anesthesia will always be required, and this must usually be supplemented with cocaine locally. The cocainization is easily accomplished in the trachea and right bronchus with a brush or cotton swab, but the left bronchus can usually only be cocainized after the tube has been passed down to the bronchial entrance. If attempted with local anesthesia, the preliminary hypodermatic injection of morphine will lessen excitability, probably as much by the stimulative increase of fortitude as by analgesia. Atropin may well be given with the morphin as not only synergistic, but as an inhibitor of secretion. Atropin, as suggested by Ingals, has a value in checking secretion.

The best time, if selection be possible, is in the morning before breakfast; otherwise, as long after meals as possible.

The bronchoscopes should be warmed and oiled with sterile vaseline. The obturator, if used, must be removed by an assistant the instant the end of the tube has passed the epiglottis. To the writer, as with Ingals, the intubation habit is so strong that passing the tube with the index finger of the left hand as a guide as with an O'Dwyer tube, is easier. Killian, however, passes the tube under direct inspection, looking through it and using Kirstein's spatula. This precludes the use of an obturator.

The aspirator and swabs of cotton are used frequently to clear the tube of secretions.

Position of the patient. The writer has never used these or any other bronchoscope under local anesthesia, so that he has never tried bronchoscopy with the patient in the erect po-
sition. He can, however, see no advantage in it to justify the risks of general anesthesia in the erect position. Chloroform anesthesia, with the patient in the recumbent position, the head hanging over the end of the table in Rose's position, offers so many advantages that he does not feel inclined to try any other. The "sword swallowing" position of the head and neck is ideal. The head of the patient in the firm grasp of an assistant, is turned slightly to one side and the bronchoscope is allowed to pass out the opposite corner of the mouth.

Fig. A.

Care must be exercised that adequate respiration is going on. As Ingals points out, it may be going so quietly as to lead to the inference that it is suspended. In view of this it is necessary to have the undivided attention of one competent man to watch the respiration, and nothing else. The pulse must be in charge of another. The operator should have one primary assistant and a second to turn on and off electric currents and similar unsterile duties.
Tracheoscopy and bronchoscopy by tracheotomy wound is easier of accomplishment, affords a good chance of aseptic manipulations, if done at the same operation as the tracheotomy, and is, in the writer’s opinion, safer, because it can be aseptic. Later, if the wound has become infected, it offers no greater hope of escaping septic pneumonia than the oral route.

Penetration of secondary and even tertiary bronchi have been reported. Certainly there is no difficulty in entering both the right and the left bronchi in the smallest children, while in adults the secondary bronchi are explorable. Tertiary bronchi of infants present greater difficulties, by reason of their small size, demanding such a small tube that it is with difficulty kept free enough of secretion to afford a useful view. If secretion be not excessive, there is no great difficulty to those accustomed to ordinary otoscopy. True the tube is longer, but with these improved instruments the light is right at the distal end, nothing is illuminated but the tissues in advance of the instrument.
As between tracheoscopy or bronchoscopy per vias naturales and per vulnus tracheal, the writer prefers the latter for several reasons. If in the trachea, the foreign body is quickly and harmlessly removable without the danger of septic pneumonia, for the operator can be aseptic which the method by mouth cannot. Again, deep anesthesia is necessary by mouth, and, of course, it must be chloroform. Profound chloroform narcosis, never a safe condition, especially if long continued, becomes less so by the introduction of a fresh element of danger in the abolition of the cough reflex. For this reason the writer prefers tracheotomy under partial chloroform anesthesia, as a first procedure, followed by careful probing with the patient in the inverted position to obtain the assistance of gravity. If the foreign body be magnetizable the magnet is passed, the patient being still inverted. All this time the assistance of the cough reflex is assured by partial anesthesia. Failing in these procedures, the writer advises bronchoscopy through the wound with the least possible anesthesia consistent with safety. Of course, violent straining and coughing, with a rigid bronchoscope in a secondary or tertiary bronchus, introduces a risk of traumatism and is vastly more difficult and unsatisfactory than when this reflex is totally abolished with chloroform and cocaine. When this abolition is necessary, it is a comfort to know that the distal end of the bronchoscope deep down in the bronchi is clean—not having passed through the mouth, which is hopelessly septic.

There is another danger in bronchoscopy per os. Prolonged pressure and possibly traumatism of the glottic boundaries may result in edema that will require tracheotomy anyway, as in a case reported by Nehrkorn. And in such a case the wound would have to be kept open for several days, instead of immediate closure, as would have been the case had tracheotomy been done in the beginning.

**Tracheotomy.**

Tracheotomy is a safe procedure if:

(a) The anesthesia be partial so that cough may help to keep passages clear.

(b) The patient be kept in the Trendelenberg position during the operation and after.

(c) If it be done aseptically and intratracheal exploration be gentle.
(d) If the plan of dressing here recommended be followed.

(e) If a canula be not inserted without necessity.

(f) If ethyl chloride and ether be not used.

Do not leave in a tracheal canula because there seems to be slight dyspnea after the removal of a foreign body from the larynx and trachea. Put an aseptic dressing on the tracheotomy wound without stitching and station a nurse accustomed to tracheotomy cases, ready to dilate the tracheal wound should cyanosis appear. Generally it will not be needed.

Emphysema and sepsis both will usually be prevented by packing the wound with gauze tightly wrung out with 1:5000 bichloride solution, renewed every three hours.

*External cervical esophagotomy* is justifiable in case of a foreign body, the safe removal of which is impossible per os.

*Transthoracic esophagotomy, gastrotomy and mediastinotomy* belong to the sphere of the general surgeon.

**INSTRUMENTS.**

The *bronchoscopes* do not differ greatly from Killian’s in form, on which indeed it seems impossible to improve. The illumination is, however, a vast improvement. In the larger sizes, the small lamps at the distal end of the tube are covered and protected and enable instrumental work under direct inspection, with lamps *in situ*. In the smaller sizes the calibre is insufficient, and the light carrier is inserted in the lumen of the tube and removed and re-inserted by an assistant as required, in the manner suggested by Fletcher Ingals. The perforations in the sides for admission of air from shut-off bronchi are also the suggestion of Dr. Ingals. As warned against by Killian, if the bronchoscope should enter a large bronchus entirely occluded by a foreign body, the patient would get no air at all, unless lateral openings are provided.

The esophagoscopes and bronchoscope are made with slightly bell-mouthed extremities. The purpose of this is to facilitate the entrance of a foreign body, especially a point. If made like the ordinary urethroscope or Einhorn’s esophagoscope, there would be a strong tendency to override the point, or even the entire body, if like a needle. The esophagoscope of Einhorn is for examination of the esophageal lining and for this purpose its narrowed, coned extremity
is well adapted. Obturators are fitted to all the instruments, though they should not be used for foreign body work ordinarily. If desired, they may be used to start the instruments, in the case of a foreign body definitely located in deeper structures. If used in tracheoscopes or bronchoscopes they must be, of course, immediately withdrawn as soon as the tube has passed the glottis.

The hooks, and the secretion aspirator are Killian’s. The cotton carrier is an elongation of the common instrument with a threaded end that will insure against losing the cotton. The pump is the most satisfactory for the removal of abundant secretions, while swabbing brings everything out clearly to view. For forceps the writer uses Seiler’s, Boecker’s and von Schroetter’s tube forceps of various lengths.

The laryngo-pharyngeal speculum is simply a short esophagoscope, which, with the aid of an Escat’s or Kirstein’s
epiglottis lifter, held by an assistant, the writer has found of greater convenience than Kirstein’s autoscope. With bodies located to one side of the laryngo-pharynx or introitus esophagi superioris, the speculum is inserted from the opposite side of the mouth, the angle of which is pulled backward to the extreme limit, while the head hangs over the edge of the table in the “sword swallowing” position. This is the position in which all tracheal and esophageal instruments are inserted.

With all these self-illuminating instruments the ordinary street currents are unsafe for the patients. There is always a possibility of grounding, the one “live” side of the instrument through the patient, which, though harmless through the skin, becomes dangerous if good contact with moist mucosa of deep passages should be made. Dry batteries are the best source of electricity for the purpose.

MAGNETIC EXTRACTION.

Dr. de Roaldes in 1900 suggested the use of the Haab giant ophthalmic electro-magnet in extraction of magnetic foreign bodies from the trachea and bronchi. Independently, the next year, Dr. Garel, of Lyons, reported the removal of a nail from the trachea, its probable location being less than three inches from the tracheotomy wound. Later, Dr. de Roaldes made experiments on the cadaver, by which he demonstrated that the limitation of magnetic extraction with the Haab magnet is about five inches below its point inserted in
the tracheal wound—a point at which (in the adult at least) forceps extraction is easy. He tried extending this limitation with picture wire, but failed and suggested vertebrated probes to be energized by contact with the point of the Haab magnet. He also demonstrated the slight utility of a miniature magnet an inch and a half long lowered into the trachea. A method is suggested by Dr. de Roaldes in which the Haab magnet is used to bring the foreign body up to the chink of the glottis, through which it is drawn by a second smaller magnet introduced through the mouth, the Haab magnet being demagnetized when the second magnet is in contact. This ingenious suggestion has never been used by any one.

My own experiments have led to the development of four forms of magnets, which are herewith exhibited:

(a) Permanent magnets long enough for insertion into the trachea and bronchi.

(b) Electro magnets of small diameter but great length to be passed bodily into the air passages.

(c) A very powerful electro-magnet with a core extension. Fig. E.

(d) A ring magnet, technically a solenoid, into which the inverted patient is lowered bodily. Fig. F.

One great trouble with magnetic extraction is the necessarily small size of the foreign body. Practically the magnetic force you can apply is in inverse ratio to the size of the foreign body. In other words, the magnet can exert no more attraction on the foreign body than the foreign body does on the magnet. If a railroad spike could be inhaled, it would be easy to design a magnet to pull it out, pull it through the patient, or lift him off his feet. Further, in order to exert any attraction it must magnetize the foreign body, hence you must have either a small magnet closely approached to the foreign
body, or otherwise obtain a very large magnetic field.

One great advantage of magnetic extraction over forceps extraction is that the magnet will pull the free end of the foreign body, as a tack; while the point sticking into the tissues comes last, so no traumatism is inflicted.

Limitations. For a magnet to be of service, it must be remembered, that:
1. The body must be of iron or steel, partly or wholly.
2. The body must be free to move.
3. The attraction of the magnet for the former body is no greater than the body for the magnet, hence:
4. The probabilities of magnetic removal are inversely as the size of the foreign body, within the limits of size permitting mobility.
5. The magnetic force diminishes almost as the square of the distance, hence:

![Fig. E](image)

6. The location must be such that the core of the magnet can be brought within reasonable distance of the foreign body. Therefore:
7. The magnet is of undoubted utility for magnetic bodies located in the trachea.
8. Prolongation of the core lessens only to a small degree the loss as the square of the distance, but to a limited extent is valuable if it enables contact.
9. Beyond contact the effective distance between foreign body and the magnet increases directly, as the size of the foreign body.
10. Magnets of small diameter for insertion bodily into the air passages can be made of only very limited power because of the necessarily small area of core cross section.
11. By inversion of the patient, gravity may assist a weak magnetic action.
Magnetic extraction is not adapted to removal of bodies from the esophagus for the reason given under 2. The body is practically never free to move. The collapsing walls would wipe it off. So would the vocal cords if the attempt were made to remove magnetically a body located in the trachea. It could not be readily brought through the glottis. If, however, the esophagoscope or bronchoscope be used through which to pass the permanent rod magnets devised by the writer, this wiping off does not occur.

Even with foreign bodies reachable by forceps, magnets, especially the permanent or the solenoid forms, offer such an easy, quick and harmless means that they deserve first trial.

Projected Core Magnet. To secure the greatest possible magnetic projection with the drawback of so slender a core projected so far from the coil a large pole piece at the back is used, and the core and projections are solid. Of course the loss is great. If the core were cut off close to the coil, the magnet would suspend about 100 pounds of iron, whereas the suspension at the end of the projected core is only a few ounces.

Permanent Magnets. The advantage of the permanent magnet is its aseptability and its ease of manipulation. Its power is not great and it requires actual contact, but in a body like a tack, perfectly free to move, or at most hindered only by viscid secretions, it will certainly bring the body to the glottis or tracheal wound, as the case may be. To invert the patient just about doubles the pull by calling in the aid of gravity, while at the same time annihilating its opposition.

In using a permanent magnet, be careful to always use the same end. In these days nearly everything made from iron ore is steel—rarely iron, unless it be cast iron. With any of these, except the softest wrought iron, contact of a magnet leaves a residual magnetism in the object. If, then, the permanent magnet be reversed, the object will be repelled instead of attracted.

The same thing will occur in using an electro-magnet if the polarity of the current be reversed. This is important in case of powerful electro-magnets, as commercial electric circuits are sometimes reversed. Small iron toys, "jack-stones," and the like, which we are so apt to meet with as foreign bodies in children, are cast iron or cast steel. These become mag-
netized from contact with a magnet, either permanent or electro, and if the polarity of the magnet be reversed, the attraction is lessened until the magnet and body have been sufficiently long in contact to reverse the polarity of the foreign body.

These permanent magnets are exceedingly convenient for use through the bronchoscopes, esophagoscopes, etc., or they may be used alone. All parts of the tubes and lamps being of brass are in no way affected. A long body like a needle or tack found crosswise in the tube, will range itself so as to come out clinging to the magnet, if the latter be moved back and forth a few times. If grasped with forceps, body and tube would have to be withdrawn together, ripping the walls.

A New Magnet. The writer has devised a solenoid magnet as shown in Fig. F. It consists of an enormous coil of magnet wire, which, when energized by a suitable current, will throw any iron or steel body to its center and suspend it there. If the body be approached to one or the other side of the ring, in the plane of the ring, it will rush to that side. When such a body is approached to the magnet it is pulled directly to its central axis and drawn in, just as a floating block of wood is drawn into the vortex of a whirlpool. When the center of the magnet is reached the axial traction is at a minimum (satisfied, so to speak) and lateral traction is at its maximum.

The patient is suspended inverted over the center, and lowered head first into the coil until the plane of the foreign body (as marked on the skin at a previous X-ray examination) corresponds to the plane of the upper edge of the coil. The patient is then drawn upward while the foreign body, if of iron or steel, and free, will tend to stand still, while the patient is lifted clear of it. When the foreign body reaches the level of the tracheotomy wound, the wound is approached closely to the side of the magnet, when lateral traction will be exerted by the magnet. From experiments it would seem that as soon as the inverted patient is lowered into the magnet to the level of the tracheotomy wound (no lower) a magnetic foreign body, if in the trachea and free to move, should jump to the tracheal wound, and then out when the wound is approached to one side of the magnet. Or, if preferred, the body can be lifted out of the wound with brass forceps.
(Steel instruments of any kind must not be used near the magnet.) If preferred, extraction may be attempted without a previous tracheotomy, but the probability of spasmodic glottic closure must be borne in mind, and preparations for a stabbing tracheotomy should be made. The solenoid has no action on a sphere. A steel ball such as used in bicycle bearings is uninfluenced by it. Such a body would have to be removed by the following method: After the surgeon has become sufficiently familiar with the lines of force of the magnet, an iron probe can be passed down into the air passages, and it will become so strongly magnetized as to enable removal of any body it comes in contact with. This method, however, is not available, nor even safe, until the surgeon is so well acquainted with the lines of force of the solenoid as to prevent the jerking of the iron probe out of his hands and injuring either himself or the patient. The patient and the probe must be placed in proper position before the current is turned on. This is the most powerful way in which to use the magnet, but it requires an accurate knowledge of the force lines, while the previous method is easy, perfectly safe, and sufficiently powerful for all bodies not spheres.

In cases of elongated bodies such as tacks, nails, needles, etc., they are fortunately laid straight in the axes of the magnet, which in use corresponds to the axis of the tracheal lumen. Were they turned crosswise the magnet would be useless.

The power of this solenoid magnet is sufficient to remove any susceptible foreign body that is free to move. Of course, it may not be capable of tearing out a body fixed by being buried in the swollen mucosa. Such a body can only be removed in the event of its later sloughing or ulcerating loose and being coughed up into the trachea or larger bronchi.

The power of this magnet used on small bodies is not so enormous that we can afford to ignore the aid of coughing and of gravity. With the latter, especially, we must reckon. By inverting the patient we get double the force of gravity. Erect, we have it so many milligrams against us, according to its weight: while by inversion of the patient we have it twice that number of milligrams in favor of the magnet.

Case I.—Double-pointed pin in the introitus oesophagi superioris. Failure of Esophagoscopy. Removal by aid of touch. Mr. M. brought to Dr. Ewing W. Day by Dr. J.
Clinton Atwell, of Butler, Pa., with a history of lodgement of a duck bone in the throat while eating a piece of breast of duck two weeks previously. Laryngoscopy showed a fungous granulation on the right glosso-epiglottic fold which was edematous, but there were no signs of a foreign body. Dr. Atwell had seen a needle-like foreign body with his own fluoroscope. Dr. Day sent the patient to Dr. Russell H. Boggs and had two skiagrams made, one lateral, one antero-posterior.

Kirstein's autoscopy and laryngo-pharyngoscopy by both Dr. Day and myself failed to locate any foreign body, though the granulation before mentioned could be seen. Dr. Day nipped this off with forceps, but no foreign body was hidden in or beneath it. Touch was, however, successful in locating the object under the mucosa in the wall of the esophageal entrance, whence it was torn out by forceps. It proved to be, not a duck bone, but a double pointed stick pin. How it became imbedded in the duck's breast is unknown. Failure of the laryngo-pharyngeal speculum here was due to the fact that the sharply pointed pin had traveled from its point of entrance marked by the granulation, to a new location, where it was covered with normal mucosa. Nothing but touch could reveal its presence.

Case II.—Pin in the esophagus. Urethroscope serving as esophagoscope. J. P. sent to me by Dr. W. C. Meanor was admitted to the Western Pennsylvania Hospital, where the pin complained of was located by X-ray examination by Dr. Meanor and Dr. Ralph Duffy. It was sticking point downward high up in the esophagus. The writer tried removal with the finger as a guide to the forceps, but the finger was not long enough to reach. A self-illuminating urethroscope without obturator was inserted, and the pin appeared crosswise of the end of the tube, neither head or point in sight. No forceps being at hand sufficiently small to pass through the urethroscope, the latter was removed and an antero-posterior forcep of delicate construction introduced. The body located by sense of touch transmitted through the forceps and fortunately grasped and removed. An esophagoscope of ample size would have made removal per tubam easy, as the pin, even though only catchable by the middle, could have been pulled into the tube, doubling it up in the process.

Case III.—Double pointed tack in the esophagus removed
with the aid of the esophagoscope. John R., a stolid youth of 18 years, came to my office stating that Dr. ——, naming a well-known surgeon, had opened his windpipe in search of a wire staple (double pointed tack) that he had "choked on" while at his work as electric wireman. He had "coughed and choked and spluttered," but could not get it out. He had had a slight cough previously, but this became worse and there was considerable expectoration, at times bloody. Both

Fig. G.

of these had ceased a few days after the operation. He insisted that he felt the tack in his throat every time he swallowed, and indicated with his finger a point just above the clavicle. The mother stated that the surgeon had "nearly turned the child inside out with a brush" (bristle probang) and not finding anything had operated on his neck. The boy had a recently neatly healed tracheotomy cicatrix. The writer passed a short esophagoscope with local anesthesia. Shortly after the distal end of the tube had entered the esophagus the loop of the staple came into view with stems of the tack
upward and to the left. By means of the large and serviceable handle the tube was manipulated to the left and slightly withdrawn until the insertion of both points of the tack in the esophageal wall was located. Then a hook similar to the one exhibited was inserted and the loop of the tack caught, and drawn into the tube through which it was withdrawn. It proved to be the double pointed tack or staple exhibited and would have done serious, probably fatal, damage to the esophagus had it been forcibly withdrawn with forceps without an esophagoscope. The probang, if it had been successful (and if the tack were there at the time), would have withdrawn it harmlessly, for it would have come loop first, if at all. However, the writer feels confident from the history of urgent respiratory symptoms in the beginning of the case that the tack was originally in the bronchi beyond reach of the surgeon, and that later it had been coughed up and swallowed. The writer succeeded in convincing the patient and his mother of the correctness of this view. This double pointed tack points a double moral. Do not rely upon the bristle probang’s negative result; and do not fail to warn the patient that, though in the bronchi at the time, it may be coughed up and swallowed, and later be discovered in the alimentary canal.

Case IV.—Open safety pin in the esophagus located by esophagoscope, removed by gastrotomy. Infant L., male; 9 months of age; breast fed, good previous health, though slightly pale. On December 24th, at 5 p. m., was lying on a bed, the mother changing the diaper, when it was thought to have picked up and swallowed an open safety pin.

On December 26th, at 2 p. m., the writer was called to the Western Pennsylvania Hospital by Dr. George R. Winter and Dr. John D. Milligan to see the infant. With the assistance of Dr. Ralph Duffy, a fluoroscopic examination had already been made and the pin had been located at the level of the thyroid cartilage, point upward. By digital examination two hours previously Dr. John D. Milligan had been able to touch the “keeper” end in the esophageal entrance barely within reach of the finger. Preparations were immediately made and the child anesthetized by Dr. Reineman, when the pin was found to have disappeared beyond sight or reach. An esophagoscope was passed by the writer, and the pin discovered deep down in the esophagus, evidently quite near the cardiac
orifice. The point could not be seen, though from the visible portion it was clear that the point was directed upward and to the left, pointing directly toward the heart. The writer endeavored to draw the point into the esophagoscope, but on account of the small caliber (adapted to a 9-month infant) this proved impossible. In a larger size it would have been easy. Had this been accomplished, the pin could have been easily and harmlessly withdrawn.

The esophagoscope was withdrawn and Tieman's foreign body forceps inserted with which the pin was readily clasped, presumably by the spring end. (This presumption later was shown to be correct by the marks of the forceps corrugations.
on the pin.) The click of the Tieman forceps clasping the pin could be plainly heard, and could be felt through the chest wall by Dr. John Milligan. Traction, however, demonstrated that the point was sticking in the esophageal wall. As it was pointing, presumably, directly toward the heart (judging from the esophagoscopy and as afterward demonstrated radiography) it was clear that safe withdrawal was impossible not only on account of its size, but because the only part of the pin that could be seized was the flattened spring end, which would prevent rotation when in the grip of the forceps. The temptation to draw it out was great, after searching for a foreign body to find it, and feel it in the forceps' grasp. Yet a slight pull on the forceps gave a peculiar sensation which can best be described by a comparison with the sensation of pulling on the line close up, when a fish has swallowed the hook. The sensation was peculiarly convincing that violent removal would have resulted in fatal trauma.

![Fig. I.](image)

matism to the esophagus, pericardium, heart or other thoracic viscera.

In consultation with Dr. John Milligan and Dr. George Winter it was decided that gastrotomy would be the safer procedure. On December 27th, the child was taken to Dr. Russell H. Boggs to have a radiograph made and a half tone of this is shown in Fig. H. Allowing for the angle, the pin was about opposite the body of the tenth dorsal vertebra, in the position demonstrated by the esophagoscope.

At noon Dr. John D. Milligan, assisted by Dr. Brown, Dr. George R. Winter and Dr. Zimmerman, with Dr. Reineman an anesthetist, skillfully and rapidly gastrotomized the child. The stomach was empty but was carefully flushed out. The pin was not found in the stomach, nor as far up the esophagus as Dr. Milligan's finger would reach. The writer then
passed a Tieman's forceps down the esophagus, the jaws being partially opened as the location of the pin was reached. When the pin was felt, the jaws were spread and the pin seized and pushed down to where Dr. Milligan's skillful fingers, with the aid of a hook-bent probe, engaged and removed it. The pin is shown actual size in Fig. I.

The secretions in the esophagus gave no trouble in esophagoscopy, as is often the case. The writer worked from the head of the patient, with a separate table, instruments and nurse, so as to in no way risk any accident to the aseptic technique of Drs. Milligan and Brown.

A more devilish contrivance than an open safety pin could scarcely be devised, and all parents should be warned against the common habit of allowing infants and children to play with them. In addition to preventing safe withdrawal the spring, while favoring the seriatim action of the swallowing muscles, assists the point in acting as the pawl of a ratchet.

Case V.—Carpet tack in left bronchus. Attempted removal by forceps and magnet passed through tracheal wound. Edward J., 3 years of age, healthy and well nourished, was brought to me by Dr. Eastman, of Brownsville. Two days before the child had been noticed to put a tack in its mouth. The mother saw the tack far back in the mouth and attempted to get it out, but failed because the child naturally jerked away, and at the same instant aspirated the tack. There followed some cough and dyspnea, but these had subsided at the time the child was brought to the writer. Dr. Eastman examined the chest and reported a probable atelectasis over the middle portion of the left lung. The writer examined the larynx and found it free from a foreign body or any sign of traumatism. The child was admitted to the Western Pennsylvania Hospital, the tack was seen with the fluoroscope to be located opposite the fifth intercostal space. Allowing for the angle, and considering its axis we believed it to be in one of the left secondary bronchi. It was lying head downwards, the point probably sticking in the bronchial wall, preventing expulsion, while the head corked up the bronchus preventing the entrance of air. The child was sent to Dr. R. H. Boggs, who made a radiograph reproduced in Fig J. The child jumped after a second’s exposure and could not be controlled save by an anesthetic, which was deemed unnecessary, as a faint though certain shadow was found on the plate. The
child was anesthetized by Dr. Reineman, and with the assistance of Dr. Eastman, Dr. Zimmerman, Dr. Miller and Dr. Wagner, the writer opened the trachea and explored the trachea and bronchi in every direction, not omitting the side opposite from that on which the tack had been located, lest it should have been coughed up and fallen back into the other bronchus. During this procedure the child was held inverted, and was allowed to come almost completely out, and hiccup vigorously. The tracheal wound was then tied open with letter U sutures tied back of the neck, and put to bed in Trendelenberg posture. Next day the tack not having been coughed out the writer, with the assistance of Dr. Zimmerman and Dr.
Boyce, the child being partially anesthetized and inverted, attempted magnetic extraction without avail. It was then decided that the tack was too deeply imbedded in the swollen mucosa to permit of removal until it should have sloughed loose and should have been coughed up into the trachea. Meanwhile the tracheal wound was allowed to close. Dr. Day saw the case at this stage and concurred. Dr. Swope was consulted as to the advisability of a mediastinotomy or other external operation, but advised against it unless an abscess or some such definite focus could be localized. The child had practically no reaction, played and talked, and, except at change of dressings, seemed as well as usual, which demonstrates the harmlessness of bronchial exploration by way of an aseptic tracheal wound. A rare feature found in this case is the presence of a foreign body in the left bronchus.

Case VI.—Buckshot in trachea. Removed by inversion of patient. Laryngeal spasm. Crico-thyro-laryngotomy. A girl 4 years of age was brought by her father to the dispensary of the Eye, Ear and Throat Hospital with a history of having choked three days before while playing with several shot in her mouth. Three had been subsequently found in the stools, but parent feared some others might be "sticking somewhere." Coarse rales with absence of respiratory murmur and percussion resonance over the lower left lobe. The writer prepared for tracheotomy, then had the father hold the child up by the heels when deep cyanosis immediately set in. The writer felt certain that the cyanosis was due to the presence of the foreign body at the glottis, and that reversion of patient to the upright position was unwise, lest the foreign body drop back into the bronchi. Not succeeding in clearing the glottis with the finger, and breathing having nearly ceased, the crico-thyroid membrane was stabbed, air entered, spasm ceased, and a buckshot dropped through the mouth onto the floor.

Case VII.—Coffee berry in the trachea. Removed by tracheotomy. Infant N., brought to the writer by Dr. McConnell of Gallitzin. Four days previously she had choked while playing with an older child who said she had "swallowed" a roasted coffee berry. There had been occasional dyspnea and cyanosis since; physical examination by Dr. McConnell and Dr. D. Jackson revealed large moist rales audible all over both sides of the chest. Air was present everywhere in the
lungs. The breath was very fetid, but without coffee odor. Temperature 101, pulse 120, respirations 30. Fluoroscopic examination both in Altoona and in Pittsburg had been negative and both radiographists had most positively assured the parents that there was no foreign body in the chest.

Both tracheoscopy and tracheotomy having been prepared for, the child was anesthetized skillfully by Dr. Eyman, the tongue drawn out with a silk-worm gut loop when the writer on laryngoscopic examination found the larynx free from foreign body or any lesion. Pus was seen to well up from the trachea. When the writer saw the vocal cords spread widely at each inspiration, yet considered the intermittent dyspnea and cyanosis, he strongly urged tracheotomy. This was at first refused and had it not been for the firm backing by Dr. McConnell and Dr. D. Jackson the operation never would have been done and the child would have died.

With the kind assistance and advice of Dr. MacFarlane the writer opened the trachea, held back the tracheal lips with silk-worm gut, and allowed the child to come partially out. A probe passed down into the trachea brought on a paroxysm of coughing, during which the foreign body was coughed up to the level of the tracheal wound, where it was quickly seized and removed by the writer before it could be re-inhaled. It was followed by a gush of exceedingly foul pus, which if it had not been liberated must have resulted in death, septic symptoms already being present.

The skin incision healed per primam, but an emphysema with a large sac of air under the skin at the site of the incision required re-incision. Prompt healing followed and the child went home well in a week after admission.

The points of interest are the absence of coffee odor, the nearly fatal result of reliance upon a negative fluoroscopic examination (a coffee berry would have shown on a plate); the correctness of a diagnosis based on intermittent dyspnea with a free larynx in the face of opposition by the X-ray men, and the inadvisability of immediate suture of the entire tracheotomy wound. It would have been better to have left in a wick of gauze to drain off the air leaking out of the trachea that caused emphysema.

Case VIII.—Bay leaf in trachea. Removal through Kil from a neighboring restaurant where he had “choked” while lian’s tracheoscope. Mr. P., aged 30, was brought to my office
eating soup. He could breathe for a few minutes quite normally, then coughing would be followed by deep cyanosis with gasping inspiratory efforts. The largest and shortest Killian tracheoscope was introduced through the glottis, when the edge of a thin object presented at the orifice of the tube. It was readily caught with a Seiler forcep and withdrawn. It was found to be the portion of a leaf herewith exhibited. The presumption is that it is a bay leaf used in flavoring soup.

Case IX.—Shoe button in bronchi for two years. Removed from trachea with Killian's tracheoscope. Rosina K., aged 18, had a history of choking on a shoe button about two years before. Removal at the time by inversion had been tried, but the incident had almost been forgotten, as it never seemed to affect the health. A few days prior to bringing her to the writer there had been cough with choking efforts to expectorate, blueness of the face. The patient claimed to feel the button come up and fall back after each unsuccessful effort, which brought away blood streaked, purulent, expectoration. After thorough cocainization the writer had just introduced the distal end of a Killian tracheoscope past the vocal cords, when the button, propelled by cough, shot into and part way up the tube which was then quickly removed with the button in its lumen. As you will see, the button is covered with incrustations. No Roentgen ray examination was made.

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DISCUSSION.

Dr. Harland: I would like to ask Dr. Jackson if there is any danger in using this instrument, such as reflex inhibition of the heart.

Dr. Sprague: Two weeks ago a child was brought into the clinic with the history of having swallowed a safety pin one week before. I have a picture which shows it very beautifully in the bifurcation of the trachea and right bronchus. In the afternoon the mother came to see the child, and while she was there the child had a coughing spell and coughed up the safety pin.

Dr. Jackson, closing: It is customary to apply cocain as well as using general anesthesia. This, of course, incurs the risk of septic pneumonia on account of abolishing the cough. I very much prefer to work through a tracheal wound, because you have an aseptic wound, while in working through the mouth there is a considerable risk of septic pneumonia from the infected mouth. In a case reported by Nehrkorn there was edema from working through the larynx, and tracheotomy had to be performed for the edema.
Two Interesting Cases.

G. Hudson Makuen, M. D.

Case 1. The patient, D. A. L., is about 60 years of age and has always been in fairly good general health. Four years ago, he had a severe attack of gripe, with which he was laid up for several days and which left him with a sore throat accompanied by tickling and hoarseness. For two or three years he had a more or less continuous cough with expectoration. There is no family history of phthisis, nor is there any evidence of pulmonary lesions. He had a chancre twenty years ago, of which he claims to have been speedily cured, and he also remembers having gotten a reed-bird bone in his throat about the time of the attack of grippe, which gave him considerable pain and annoyance for a time, but he thinks it passed down with some dry crusts of bread that he swallowed.

The laryngeal lesion is an exceedingly curious one and is fairly well illustrated by the accompanying drawings. The left arytenoid cartilage, as you see, appears to be dislocated, and there is a large fistulous opening running down between it and the left wing of the thyroid and entering the larynx, probably through the ventrical between the false and true cords. A ligament is clearly seen a half or three-quarters of an inch down in this fistulous tract, which appears to be about on a level with the local cords and which I have sometimes thought may be a portion of the left cord itself.

I have studied the conditions with great care and I find that in inhalation the fistulous tract opens and the air appears to enter the larynx, partially at least, by this route, and in exhalation the arytenoid with the ary-epiglottic fold oscillates freely between the two openings, the breath, however, escaping largely if not entirely through the normal channel, but
During vocalization the arytenoid and ary-epiglottic fold are drawn over to the side and the fistulous tract is entirely closed.

This curious lesion appears to give the patient but little trouble at present and aside from a slight hoarseness he would scarcely know that there was anything unusual in the condition of the larynx.

Case II. This patient presented himself for the first time, in my clinic at the Philadelphia Polyclinic Hospital, yesterday afternoon and I bring him before you because he illustrates unusually well in his speech an important factor in the immediate causation of stammering in the great majority of cases.

The patient is 23 years old and has stammered somewhat in the manner that he does now for fifteen years. His speech was normal until he was 8 years of age, about which time he had a dream during the night. He thought that he was at a large fire, where there were numerous engines, and he got up and ran down stairs where the other members of the family were, and he was so frightened about it all that he could not talk. He has stammered in his speech continuously since that time and as you will presently see it is a very curious stammer, in that he tries to speak mainly upon the ingoing instead of the outgoing column of breath. It is what Wylie has called draw-back phonation, and it is probably the result of persistent fu-
tile attempts to speak in what may be called the *pushout phonation* or, in other words, with the natural expiratory effort.

These patients frequently find that when the speech becomes blocked by the closure of one of the various stop positions, either in the laryngeal or oral mechanisms of speech, the only recourse is in a reversal of the column of breath, which, temporarily at least, removes the blockade and makes some sort of speech possible. In this case almost all of the words are uttered upon the drawback phonation and only an occasional one is given in the normal manner, so that if you were in an adjoining room you would suppose that two persons were talking instead of one, so peculiar is the result of this defection.
AWAY WITH OBTURATORS OR DRAINAGE TUBES IN THE TREATMENT OF ANTRAL EMPYEMA.

C. Ziem, M. D.

Several times I have asserted that the use of obturators or drainage tubes introduced in artificial openings of the alveolar process was unnecessary or even pernicious*. The correctness of this statement has been proved also quite recently in the case of a lady aged about 30 years, who has been treated at Warsaw for four years for empyema of both antra, by irrigations, curetting of granulations, etc. As this treatment was not successful, and as a more severe operation, probably through the nose, was advised, she consulted me on December 27 last, at Danzig. I found both artificial openings of the alveolar process shut up by obturators of vulcanite, the right one being 27 millimeters long and 6 wide at its superior, thinner end, the left one 22 by 4.

A three-fourths per cent solution of salt water, injected by means of the force-pump, through a canula 3 millimeters in diameter, cleared out the left nostril fairly well and, according to the patient's statement, better than at any time before at Warsaw. On the right, as before, there was only a very thin and intermittent stream. Both antra having been cleansed as far as possible, I advised against reintroduction of the obturators. To her astonishment the salt water, injected by means of the canula 3 millimeters in diameter in the right antrum next day, was discharged in a broad, continuous, uniform stream, evacuating much pus, while on the left only a 2 millimeter tube could be introduced, permitting satisfactory cleansing. Daily washings and suitable diet, especially the avoidance of coffee and alcohol, resulting in such an improvement that the patient could return home on January 10; she was advised to wash out the slight suppuration still existing with a rubber syringe. I do not doubt that in a short time she will be entirely cured in accordance with my

practice to refrain from using an obturator. At all events, at
the very second washing of the antra, it was most evident that
it was not a question of "idiopathic" granulations that delayed
the cure, but only of swelling of the antral mucosa produced
by irritation of the obturators worn for four years and acting
as foreign bodies. Interesting is also the contraction of the
left artificial opening twenty-four hours after removal of the
obturator, so that the 3 millimeter canula, easily introduced on
the first day, could not be introduced the very next morning.

It is probable enough that some cases of antral em-
pyema are rebellious only or chiefly because of the continuous
use of drainage tubes or obturators. A case was described
ten years ago by Mr. Vacher of Orleans, in which the antrum
was almost completely filled with granulations after long use
of a drainage tube.
PAPER:

SOME REMARKS ON LUMBAR PUNCTURE.

C. Ziem, M. D.

One must be struck with the close, uninterrupted contiguity of the contents of the head of animals (dogs, cats, rabbits, goats, etc.) upon which sections are made after the manner recently described by me. This is shown also in the relation of the nerve substance and the blood vessels in relation to one another and to the skull. N. Piragoff, W. Braune, and others have observed the same topographic conditions in frozen sections cut by the saw. In several of the latest works on anatomy, the ventricles of the brain are not described as wide cavities, as formerly, but as fissures. His, Waldeyer, Krause and Spalteholz describe the walls of the lateral ventricles as lying, in the normal, in close contact. Zuckerkand states that the third ventricle, is not deliscent, and that the subdural cavity, if not entirely free of fluid, contains only capillary fluid (Krause) and that under normal conditions there is but a small quantity of subarachnoid fluid.

The injection of the subdural and subarachnoid cavities with colored fluid, under strong pressure, as made by Key and Retzius does not prove the normal topography of those regions.

Keeping these things in mind, it will be readily agreed that lumbar puncture is too often performed for affections of the head and of the inner and middle ear. Wherefore, general and local treatment will be used instead: (a) In accordance with an old principle warranted by anatomic facts, viz.: anastomosis of the venae intestinales, lumbales, azygos and hemazygos, with the spinal and medullar veins suitable purgation should be used; (b) by removing an eventual, and, in these cases, most prejudicial obstruction of the nose, by irrigation of the nose, and even of the sinuses; (c) administering freely some antipyretic and inoffensive remedies, such as citric, tamarind or raspberry water, too often neglected and underrated in dealing with affections of the ear and head. It is
Lumbar Puncture.

self-evident that if the swelling of the very vascular and erectile plexus of the choroid of the cerebrum and cerebellum persists in consequence of a febrile process, operative evacuation of the excess of cerebrospinal fluid by lumbar puncture can only be of palliative and very transitory efficiency.

(a) Eleven sagittal sections:

3. cat, older. Configuration of the turbinal.
4 and 5. goat. Decapitated with loss of blood. Ethmoid, frontal sinuses, inferior turbinal curved in No. 4. Tongue cut off. No breach between base of brain and skull in No. 5. Section somewhat to the right, not quite sagittal.
6. rabbit. Strangled and decapitated, without loss of blood. The nose full of blood, also region of epiphysis and choroid plexus of fourth ventricle. No breach between nervous substance and skull.

8 to 11, pigeon, hen, turkey. Pneumatic character of bones of skull and of beak. Proportion of cerebrum and cerebellum. No breach between them and the skull. Peculiar configuration of the lingual tonsil and aditus laryngis in No. 10, so that it appears to be, even in man, a non-lymphatic organ (Waldayer), but muciparous and defensive (Hyrtl).
Explanation of Specimens.
(b) Four horizontal sections on strangulated cats.

14 and 15. The same animal. Olfactory lobes, caudate nucleus, etc. Inferior horn of the lateral ventricles. Convolutions of Ammon. Osseous tent somewhat broken.
(c) Three frontal sections on cats.
16. Ethmoid labyrinth, nasal meatus; medium furrow between tongue and palate.
17. Midway between the eyes: the ethmoid, frontal sinuses, especially the left one, opened. Contiguity of tongue and palate.
18. Section, not quite symmetrical through the osseous bulla. Ossicles and tegmen tympani. Inferior horn of the lateral ventricles, copora quadrigemina, aqueduct of Sylvius.
BUSINESS MEETING.

The eleventh annual meeting of the American Laryngological, Rhinological and Otological Society convened at the Boston Medical Library, Boston, Mass., June 5th, 1905, at 10 a. m.

The Society was called to order by the President, Dr. Frederic C. Cobb, of Boston. During the sessions of the Society the following fellows and visitors registered:

Frederic C. Cobb, Boston, Mass.
W. E. Chenery, Boston, Mass.
T. H. Farrell, Utica, N. Y.
Stephen H. Lutz, Brooklyn, N. Y.
L. M. Hurd, New York.
Chas. W. Richardson, Washington, D. C.
J. A. Stucky, Lexington, Ky.
W. F. Knowles, Boston, Mass.
G. D. Murray, Scranton, Pa.
H. L. Myers, Norfolk, Va.
E. B. Dench, New York.
Frederick L. Jack, Boston, Mass.
W. Sohier Bryant, New York.
Geo. A. Webster, Boston, Mass.
G. A. Leland, Boston, Mass.
J. D. Richards, New York.
O. B. Douglas, Concord, N. H.
Lewis A. Coffin, New York.
Theo. W. Corwin, Newark, N. J.
Herbert E. Smyth, Bridgeport, Conn.
Norton L. Wilson, Elizabeth, N. J.
Frank C. Ard, Plainfield, N. J.
Oliver H. Jackson, Fall River, Mass.
Wm. L. Culbert, New York.
Wm. H. Hudley, Easton, Pa.
Thomas Hubbard, Toledo, O.
Phillip D. Kerrison, New York.
C. G. Coakley, New York.
Jas. E. Logan, Kansas City, Mo.
Wm. L. Ballenger, Chicago, Ill.
Jas. F. McKernon, New York.
Thomas H. Halsted, Syracuse, N. Y.
Jas. F. McCaw, Watertown, N. Y.
H. W. Loeb, St. Louis, Mo.
John F. Culp, Harrisburgh, Pa.
Clement F. Theisen, Albany, N. Y.
Walter A. Wells, Washington, D. C.
Geo. L. Richards, Fall River, Mass.
Jas. J. Mooney, Buffalo, N. Y.
C. F. McGahan, Aitken, S. C.
M. A. Goldstein, St. Louis, Mo.
A. Freudenthal, New York.
Chevalier Jackson, Pittsburg, Pa.
Frank B. Sprague, Providence, R. I.
S. E. Solly, Colorado Springs, Colo.
E. Fletcher Ingalls, Chicago, Ill.
J. E. Sheppard, Brooklyn, N. Y.
Geo. F. Cott, Buffalo, N. Y.
E. M. Holmes, Boston, Mass.
Irving E. Kimball, Portland, Me.
Harris P. Mosher, Boston, Mass.
Thomas J. Harris, New York.
W. H. Haskin, New York.
L. L. Mial, New York.
Wm. B. Mason, New York.
Chas. N. Cox, Brooklyn, N. Y.
J. Clarence Sharp, New York.
J. Payson Clark, Boston, Mass.
Chas. W. Haddock, Beverly, Mass.

An address of welcome was delivered by Dr. Frederick Cheever Shattuck, of the Harvard Medical School. This was followed by the reading of the President's address.

Report of the sections being next in order Dr. S. MacCuen Smith, Chairman of the Eastern Section, presented the following report:
Business Meeting.

The meeting of the Eastern Section had been held at the College building of the Jefferson Medical College, Philadelphia, Pa., on February 4, 1905.

Twenty-one papers were read during the two sessions. The meeting was attended by over sixty fellows and was a particularly enthusiastic one and extremely profitable to those who had the pleasure of attending.

Dr. Thomas Hubbard, the Chairman of the Middle Section, reported that the meeting of the Middle Section was held at Toledo, O., February 24, 1905.

There were nine papers read and discussed and also presentation of cases and instruments.

Twenty-seven were registered in attendance. After the scientific session the members were entertained at dinner as guests of the Toledo Laryngologists.

Dr. Max A. Goldstein reported that the meeting of the Western Section was held at St. Louis, Mo., February 22, 1905. He stated that an unusually interesting and scientifically strong program was carried out and the meeting generally was voted a success.

The Chairman confined himself strictly to the geographical limits of the Western Section in invitations to the Fellows to prepare and present papers. Every paper announced on the program was presented at the meeting.

Owing to the illness of Dr. Wm. Cheatham, the Chairman of the Southern Section, it was announced that no meeting of that section had been held.

At 3 p.m. the Society held an executive session. The first order of business was the election of new members. The Secretary announced that the following candidates had been recommended by the Council for election:


On motion the Secretary was instructed to cast an affirmative ballot for the list of candidates, as read.

The President then appointed as an Auditing Committee Drs. Herbert E. Smyth and Frank B. Sprague.

On motion, the President appointed a committee of five to serve as members of the Nominating Committee. The following were appointed: Drs. Charles W. Richardson, F. L. Jack, James F. McKernon, Ewing W. Day and Thomas Hubbard.

At the business meeting of the second day the following reports were read and approved:
SECRETARY'S REPORT.

The Secretary takes pleasure in presenting to the Society a copy of the transactions of the tenth annual meeting. The volumes have already been distributed to the members and also to various libraries both at home and abroad.

The Committee on Publication sincerely regrets the delay in the printing of the volume. This was largely the result of a fire which occurred in the printing establishment.

It is to be hoped that the eleventh volume will be in the hands of the members before the end of 1905.

The prizes offered by members of the Society for essays upon various topics have attracted more attention than heretofore. Four essays have been received. Two upon "The Etiology and Treatment of Mycosis Occurring in the Upper Respiratory Tract," one upon "Atrophic Rhinitis," and one upon "What Operative Treatment Offers the Best Results for the Cure of Chronic Suppurative Frontal Sinusitis." Of these the essay signed "Sic Itur Ad Astra." upon "The Etiology and Treatment of Mycosis Occurring in the Upper Respiratory Tract," was considered to be of sufficient merit to receive the prize. The name of the member proved to be John Sendziak, M.D., Warsaw, Russia. The paper appears on the present program and under the rule will be published in the Transactions of the Society.

There still remain the following prizes:

D. Braden Kyle, M.D., Topic: "Atrophic Rhinitis." Prize $100.00.

Charles W. Richardson, M.D., Topic: "What Operative Treatment Offers the Best Results for the Cure of Chronic Suppurative Frontal Sinusitis." Prize $100.00.

Norval H. Pierce, M.D., Topic: "Original Work on Rarification of the Labyrinthine Capsule." To be competed for in 1906. Prize, $100.00.

Edward B. Dench, M.D., Topic: "Chronic Non-Suppurative Inflammation of the Middle Ear." To be competed for in 1906. Prize, $100.00.

In addition, Dr. J. E. Sheppard offers a prize of $100.00 to be competed for in 1907. "The Best Classification of Chronic
Non-Suppurative Ear Diseases, based upon Pathological Research."

All except one of those elected to membership at the last annual meeting have qualified.

There have been no deaths during the year.

Three have resigned.

Including those elected at the last annual meeting we have a total membership of 265.

There have been four meetings of the Council during the year.

Four members have been dropped for non-payment of dues.

The report of the Treasurer was read, and the Auditing Committee reported that the accounts had been examined and were found correct.

The Nominating Committee then presented the following report:

President.—James E. Logan, M.D., Kansas City, Mo
Vice-Presidents and Chairmen of Sections—
   Eastern Section—Thomas H. Halsted, M.D., Syracuse, N. Y.
   Middle Section—William L. Ballenger, M.D., Chicago, Ill.
   Western Section—H. Bert Ellis, M.D., Los Angeles, Cal.
   Southern Section—Henry L. Myers, M.D., Norfolk, Va.
Secretary—Wendell C. Phillips, M.D., New York.
Library Committee—Thomas J. Harris, M.D., New York; H. Holbrook Curtis, M. D., New York; Cornelius G. Coakley, M.D., New York; David G. Yates, M.D., New York; Philip D. Kerrison, M.D., New York.
Publication Committee—Thomas J. Harris, M.D., Chairman, New York; Chevalier Jackson, M.D., Pittsburg, Pa.; Wm. H. Haskin, M.D., New York.
On motion, the Secretary was instructed to cast the ballot of the Society for the officers whose names had been duly presented, which he did, and they were declared elected.

The Secretary stated that he had received a communication from the Publication Committee, suggesting the following addition to the By-Laws:

All papers read by members at the annual meetings shall become the property of the Society, and a copy of the same shall be furnished for the exclusive use of the Publication Committee.

This addition to the By-Laws had been submitted to the Council and had received their unanimous recommendation.

On motion, duly seconded and carried, the by-law was adopted.

The Secretary read a communication from Dr. J. E. Sheppard, of Brooklyn, N.Y., offering a prize of $100.00 for the paper which proposed "The Best Classification of Chronic Non-Suppurative Ear Diseases," the said classification to be based as far as possible upon pathological research.

On motion, duly seconded and carried, the Secretary was instructed to write to Dr. Sheppard, thanking him for his contribution.

Dr. Geo. L. Richards offered the following amendment to the By-Laws:

No member who is in arrears for the current year shall receive a copy of the Transactions of the Society until such dues are paid.

Dr. Thomas L. Harris moved that the suggested amendment be referred to Council for consideration. At a subsequent meeting the above amendment, approved by the Council, was, on motion, adopted by the Society.

Dr. Harris stated that the stock of extra volumes of the Transactions of previous years had been largely depleted by a disastrous fire, and particularly the very valuable volume of the Washington meeting had almost entirely disappeared. He suggested that any member who wished to complete his files of the Transactions should do so without delay, as these volumes were becoming very valuable, and as applications for them were being received from libraries and non-members, it was only fair that members should have the priority.
On motion a vote of thanks was extended to the retiring President, Frederic C. Cobb, and to all the other Boston members for their hospitality and for the many courtesies shown during the meeting.

On motion, a vote of thanks was also extended to the retiring President and the other officers of the Society for their untiring and efficient work in the preparation of the programme.

The President, before retiring from the Chair, expressed his appreciation of the cordial co-operation of the members in the administration of the affairs of the Society during the past year.

The newly-elected President, on taking the Chair, thanked the members for the honor they had conferred upon him, and promised to make every effort to subserve the interests of the Society.

There being no further business, the Society adjourned.

Wendell C. Phillips,
Secretary.
Treasurer’s Report.

EWING W. DAY, TREASURER, IN ACCOUNT WITH THE AMERICAN LARYNGOLOGICAL, RHINOLOGICAL, AND OTOLITICAL SOCIETY.

Dr.

To balance from 1903-1904 $633.26
" 27 initiation fees, at $5. 135.00
" 125½ current dues, at $10. 1255.00
" 65 back dues, at $5. 325.00
" 4 volumes transactions, 3 at $2.50; 1 at $1.50 9.00
" Insurance paid on fire loss 187.50

Total cash for year $2,544.76

Balance on hand May 31st, 1905 $1,801.41

By voucher:

Expenses of annual meeting, 1904 $165.05

Printing ........................................... $1.00

rent of stereopticon .......................... 12.00

Stenographer .................................... 152.05

Expenses of officers for postage, cler-
ic hire, etc. ................................. 306.17

Secretary for 1903-1904 .......................... 197.63

Publication committee ...................... 58.54

Treasurer ....................................... 50.00

Printing ........................................... 185.28

Rooney, Otten Co. .............................. 168.53

Miscellaneous printing .................... 16.75

Section meetings, 1903-1904

Southern section .............................. 22.50

Western section ............................... 25.00

Eastern section, no bill received
for 1904-1905 .................................

Middle section, no bill received
for 1904-1905 .................................

Western section, no bill received
for 1904-1905 ................................. 47.50

One check returned, N. F. S. ............. 5.00

Insurance on transactions .................. 6.10

Adjusting fire loss .......................... 18.75

Labor and expressage incident to the
fire ............................................. 9.50

Printing transactions for 1904-1905,
no bill received ............................

Total expenditures for 1904-1905 $743.35

1801.41

$2,544.76

May 31st, 1905.

EWING W. DAY, Treasurer.

The above account audited and found correct.  

H. E. SMYTH, 
F. B. S. SPRAGUE, 
Auditing Committee.
Accounts owed by the society for 1904-1905, and unpaid; no bills received by the treasurer, estimated at $1,250.00

For:
- Printing of transactions for 1904-1905
- Expenses of secretary for 1904-1905
- Expenses of meeting of Eastern Section
- Expenses of meeting of Middle Section
- Expenses of meeting of Western Section
FELLOWS.

Abraham, Jos. H., 132 W. 44th St., New York.  
Abrams, Alva E., 78 High St., Hartford, Conn.  
Alderton, Henry A., 191 Joralemon St., Brooklyn, N. Y.  
Allport, Frank, 92 State St., Chicago, Ill.  
Ard, F. C., 604 Park Ave., Plainfield, N. J.  
Arnold, J. Dennis, 1296 Van Ness Ave., San Francisco, Cal.  
Arrowsmith, Hubert, 180 Clinton St., Brooklyn, N. Y.  
Atkinson, Wm. J., 111 N. Main St., Paterson, N. J.  
Ballenger, Wm. L., 100 State St., Chicago, Ill.  
Bane, Wm. C., Steel Block, Denver, Colo.  
Barnhill, John F., Indianapolis, Ind.  
Battle, S. Westray, 13 Church St., Asheville, N. C.  
Beck, Jos., 100 State St., Chicago, Ill.  
Berens, T. Passmore, 35 Park Avenue, New York.  
Birkett, Herbert S., 252 Mountain St., Montreal, Can.  
Black, Jas. A., 406 Sutter St., San Francisco, Cal.  
Booth, Burton S., 21 First St., Troy, N. Y.  
Braislin, W. C., 217 St. Jas. Place, Brooklyn, N. Y.  
Brandegee, Wm. P., 40 W. 48th St., New York.  
Brown, J. Price, 37 Carlton St., Toronto, Ont., Can.  
Bryant, Wm. S., 57 W. 53rd St., New York.  
Bulette, Wilbur W., 5th and Sante Fe Aves., Pueblo, Colo.  
Burnett, Peter V., 170 Keap St., Brooklyn, N. Y.  
Butler, Wm. K., 1207 M St., Washington, D. C.  
Calhoun, A. W., 62 Marietta St., Atlanta, Ga.  
Campbell, Wm. E., 606 Century Building, Atlanta, Ga.  
Canfield, R. Bishop, 103 W. 48th St., New York.  
Chambers, Talbot R., 490 Jersey Ave., Jersey City, N. J.  
Cheatham, Wm., 303 W. Chestnut St., Louisville, Ky.  
Chenery, Wm. E., 222 Huntington Ave., Boston, Mass.  
Church, Benjamin F., Frost Bldg., Los Angeles, Cal.
Clark, Jos. Payson, 409 Marlboro St., Boston, Mass.
Clemens, Jas. B., 19 E. 38th St., New York.
Cline, L. C., 224 N. Meridan St., Indianapolis, Ind.
Clough, Herbert L., Bangor, Me.
Coakley, C. G., 11 W. 45th St., New York.
Cobb, Frederic C., 11 Marlboro St., Boston, Mass.
Coggshall, Henry, 40 E. 58th St., New York.
Collins, Burnett C., 1163 Dean St., Brooklyn, N. Y.
Connell, J. C., 265 King St., Kingston, Ontario, Can.
Corwin, Theodore, 5 W. Park St., Newark, N. J.
Coolidge, A., 613 Beacon St., Boston, Mass.
Cott, Geo. F., 85 N. Pearl St., Buffalo, N. Y.
Cox, Chas. N., 357 Jefferson Ave., Brooklyn, N. Y.
Crockett, Eugene A., 226 Marlboro St., Boston, Mass.
Crouch, J. Frank, 412 Cathedral St., Baltimore, Md.
Culbert, Wm. Ledlie, 118 Madison Ave., New York.
Culp, John F., 211 Locust St., Harrisburg, Pa.
Dabney, Wm. R., 282 Front St., Marietta, O.
Dench, Edward B., 17 W. 46th St., New York.
Donnellan, Patrick S., 1028 Spruce St., Philadelphia, Pa.
Douglas, O. B., 26 Pleasant St., Concord, N. H.
Dudley, Wm. F., 32 Livingston St., Brooklyn, N. Y.
Dudley, Wm. H., 3 Center Square, Easton, Pa.
Dunn, John, 314 East Franklin St., Richmond, Va.
Dye, Hobart S., 1404 L St., N. W., Washington, D. C.
Eagleton, Wells P., 15 Lombardy St., Newark, N. J.
Ellis, H. Bert, 245 Bradbury Bldg., Los Angeles, Cal.
Farrell, Thomas H., 236 Genessee St., Utica, N. Y.
Fitzpatrick, T. V., 32 Garfield Place, Cincinnati, O.
Fleming, Ernest W., 214 Bradbury Block, Los Angeles, Cal.
Franklin, W. Scott, San Francisco, Cal.
Fellows.

Fryer, Blencowe E., N. W. Cor. 9th and Cherry Sts., Kansas City, Mo.
Gallagher, Thomas J., California Bldg., Denver, Colo.
Gildea, Patrick F., 2 Cascade Ave., Colorado Springs, Colo.
Goff, Waldo P., Clarksburg, W. Va.
Goldstein, Perry G., Belleville, Ont.
Gold, Max A., 3858 Westminster Place, St. Louis, Mo.
Grady, L. B., Wilcox Bldg., Nashville, Tenn.
Grant, Dundas, Cavandish Square, London, Eng.
Goff, Waldo P., Clarksburg, W. Va.
Gallagher, Thomas J., California Bldg., Denver, Colo.
Gildea, Patrick F., 2 Cascade Ave., Colorado Springs, Colo.
Goff, Waldo P., Clarksburg, W. Va.
Goldstein, Perry G., Belleville, Ont.
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Gallagher, Thomas J., California Bldg., Denver, Colo.
Gildea, Patrick F., 2 Cascade Ave., Colorado Springs, Colo.
Goff, Waldo P., Clarksburg, W. Va.
Fellows.

Miller, Lewis H., 285 Clinton Ave., Brooklyn, N. Y.
Mooney, Jas. T., 393 Seventh St., Buffalo, N. Y.
Moore, Thomas W., 1048 Third Ave., Huntington, W. Va.
Morgenthaler, Geo., 34 Washington St., Chicago, Ill.
Mosher, Harris P., 828 Beacon St., Boston, Mass.
Moss, Robert E., 133 Avenue C., San Antonio, Tex.
Moulton, W. B., Portland, Me.
Moure, E. J., Bordeaux, France.
Mullins, John B., 1516 H St., Washington, D. C.
Munger, Carl E., Waterbury, Conn.
Myers, Henry L., 51 Granby St., Norfolk, Va.
Myles, Robert C., 46 W. 38th St., New York.
McAuliffe, G. B., 57 E. 65th St., New York.
McCaw, Jas F., 35 Washington St., Watertown, N. Y.
McClelland, Lefferts A., 78 McDonough St., Brooklyn, N. Y.
McCoy, John J., 139 W. 97th St., New York.
McGahan, Chas. F., Aitken, S. C.
McKernon, Chas. F., 62 W. 52d St., New York.
McKimmie, O. A. M., 330 N St., N. W., Washington, D. C.
McLaury, Frank H., 244 W. 42d St., New York.
McReynolds, John O., Frost Bldg., Dallas, Tex.
Norton, Chas. E., 118 Lisbon St., Lewiston, Me.
Norris, C. W., Lexington, Ky.
Onodi, Adolph, Budapest, Hungary.
Oppenheimer, Seymour, 40 E. 60th St., New York.
Page, Lafayette, 234 N. Meridan St., Indianapolis, Ind.
Park, J. Walter, 32 N. 2d St., Harrisburg, Pa.
Parker, Edward F., 70 Hasell St., Charleston, S. C.
Patterson, Jas. A., 805 N. Tejon St., Colorado Springs, Colo.
Payne, Redmond W., 135 Geary St., San Francisco, Cal.
Pierce, Norval H., 31 Washington St., Chicago, Ill.
Poyet, Geo., 15 Rue Milan, Paris, France.
Politzer, A., Vienna, Austria.
Powell, Stephen C., Newport, R. I.
Quinlan, F. J., 33 W. 38th St., New York.
Rae, John B., 668 E. 157th St., New York.
Ray, J. M., 432 W. Chestnut St., Louisville, Ky.
Renner, W. Scott, 361 Pearl St., Buffalo, N. Y.
Reuling, Geo., 103 W. Monument St., Baltimore, Md.
Richards, Geo. L., 84 N. Main St., Fall River, Mass.
Richards, John D., 44 W. 49th St., New York.
Richardson, Chas. W., 1317 Connecticut Ave., Washington, D. C.
Roberts, Wm. H., Pasadena, Cal.
Roe, John O., 28 Clinton Ave. N., Rochester, N. Y.
Rogers, Frederick T., 117 Broad St., Providence, R. I.
Root, Arthur C., 218 State St., Albany, N. Y.
Ross, Geo. T., 945 Dorchester St., Montreal, Can.
Roy, Dunbar, Grand Opera House Block, Atlanta, Ga.
Schadle, J. E., 140 Lowry Arcade, St. Paul, Minn.
Scheppegrell, Wm., 124 Baronne St., New Orleans, La.
Schmiegelow, Prof. E., 15 Norregade, Copenhagen, Denmark.
Seiss, Ralph W., 213 S. 17th St., Philadelphia, Pa.
Sendziack, Dr., Warsaw, Russia.
Shattuck, Warren S., Jr., 141 Clinton St., Brooklyn, N. Y.
Sheppard, J. E., 130 Montague St., Brooklyn, N. Y.
Shorter, J. H., Macon, Ga.
Shields, Wm. B., 303 N. Grand Ave., St. Louis, Mo.
Smith, Earle P., 75 Pratt St., Hartford, Conn.
Smith, Harmon, 44 W. 49th St., New York.
Smith, S. MacCuen, 1700 Walnut St., Philadelphia, Pa.
Smith, W. Harvey, 250 Donald St., Winnipeg, Manit.
Smyth, Herbert E., 376 John St., Bridgeport, Conn.
Snow, Sargent F., 707 University Block, Syracuse, N. Y.
Solenberger, Amos R., 106 East St., Vrain Court, Colorado Springs, Colo.
Solly, S. E., Cascade Ave., Colorado Springs, Colo.
Sondern, Paul F., 52 S. Fitzhugh St., Rochester, N. Y.
Sprague, Frank B., 27 Stewart St., Providence, R. I.
Steel, Geo. E., 124 W. 119th St., New York.
Stein, Otto Jacob. 100 State St., Chicago, Ill.
Stillman, F. L., 118 E. Broad St., Columbus, O.
Stout, Geo. C., 34 S. 18th St., Philadelphia, Pa.
Straight, Howard S., 185 Euclid Ave., Cleveland, O.
Theisen, Clement F., 132 Washington Ave., Albany, N. Y.
Thigpen, C. A., 13 S. Perry St., Montgomery, Ala.
Thigpen, F. M., Pensacola, Fla.
Thompson, John A., 628 Elm St., Cincinnati, O.
Thrasher, A. B., N. E. Cor. 7th and Race Sts., Cincinnati, O.
Thrasher, B., N. E. Cor. 7th and Race Sts., Cincinnati, O.
Trowbridge, D. H., Fresno, Cal.
Turner, Logan, 27 Walker St., Edinburg, Scot.
Tyson, Henry Hawkins, 47 W. 51st St., New York.
Voislawsky, Antonie P., 128 W. 59th St., New York.
Voorhees, Sherman, 408 N. Main St., Elmira, N. Y.
Wagner, Henry L., 506 Sutter St., San Francisco, Cal.
Waterman, Jas S., 676 St. Marks Ave., Brooklyn, N. Y.
Webster, Geo. A., 419 Boylston St., Boston, Mass.
Wells, Walter A., 1133 14th St., Washington, D. C.
White, Jas. A., 300 E. Franklin St., Richmond, Va.
Wilson, Norton L., 410 Westminster Ave., Elizabeth, N. J.
Winslow, John R., 114 Franklin St., Baltimore, Md.
Wishart, D. J. Gibb, 47 Grosvenor St., Toronto, Can.
Woakes, Dr., London, W., Eng.
Woodward, John F., Norfolk, Va.
Wright, Jonathan, 44 W. 49th St., New York.
Ziem, Prof. C. H., Danzig, Germany.
LIST OF OFFICERS.

Presidents.

1897. Frank Hyatt.
1898. William H. Daly.
1899. S. E. Solly.
1901. Robert Cunningham Myles.
1902. Charles W. Richardson.
1903. J. A. Stucky.

Vice-Presidents.

1897. Frederick L. Jack.
1897. John S. Mabon.
1897. James E. Logan.
1897. William Scheppergrell.
1898. A. W. Calhoun.
1898. J. F. Schadle.
1898. J. A. Thompson.
1898. A. G. Root.
1899. Charles W. Richardson.
1899. Max Thorner.
1899. Henry L. Wagner.
1899. Charles A. Thigpen.
1900. Robert Levy.
1900. J. A. Stucky.
1900. G. Hudson MacKuen.
1900. Howard S. Straight.
1901. W. Scott Renner.
1902. H. Holbrook Curtis.
List of Officers.

1902. Chas. F. McGahan.
1902. F. W. Fleming.
1903. Frederic C. Cobb.
1903. Lewis C. Cline.
1903. Dunbar Roy.
1903. P. F. Gildea.
1904. Chevalier Jackson.
1904. Redmond W. Payne.
1905. S. MacCuen Smith.
1905. Thomas Hubbard.
1905. Max A. Goldstein.
1905. Wm. Cheatham.

Secretaries.

1895. Robert Cunningham Myles.

Treasurer.

1900. Ewing W. Day.

Librarian.

1897. H. Holbrook Curtis.

Past Members.

1895. *J. L. Noyes, Providence, R. I.
1895. *Max Thorner, Cincinnati, O.
1895. R. C. Hodges, Houston, Tex.
1895. N. McShane, New Orleans.
1896. T. C. Evans, Louisville, Ky.
1896. J. F. Fulton, St. Paul, Minn.
1896. F. D. Owsley, Chicago, Ill.
1897. G. W. Groves, Kansas City.
1897. J. A. Mullen, Houston, Tex.
1898. *Ralph J. Wenner, Cleveland, O.
1902. *Joseph Gruber, Vienna.
1903. Flavel B. Tiffany, Kansas City, Mo.
1903. *S. Hartwell Chapman, New Haven, Conn.
1903. Samuel G. Dabney, Louisville, Ky.
1903. J. Orne Green, Boston, Mass.
1903. G. P. Hall, Galveston, Tex.
1903. Sampson Trask, San Francisco, Cal.
1903. Wm. R. Hoch, Pueblo, Colo.
1904. Edwin W. Bartlett, Milwaukee, Wis.
1904. J. B. Stone, New York.
1904. J. F. Hill, Waterville, Me.
1904. Wm. R. Thompson, Fort Worth, Tex.
1905. W. A. Martin, San Francisco, Cal.
1905. B. E. Fryer, Kansas City, Mo.
1905. Willis B. Moulton, Portland, Me.

*Deceased.
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