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OPENING ADDRESS.

By VICE-PRESIDENT ROBERT LEWIS M. D., New York City, in the Absence of the President, General Birkett.

The Vice-president, Dr. Robert Lewis, of New York City, opened the twenty-fifth annual meeting of the Society with the following informal remarks:

"Fellows of the American Laryngological, Rhinological and Otological Society. We all greatly regret the circumstances which have conferred upon me the privilege and honor of presiding at the opening of the twenty-fifth annual session of the American Laryngological, Rhinological and Otological Society. Our President, General Birkett, is still 'carrying on' the good work which he began four years ago; he, as well as many another of our members, has added much to the fair name and fame of our profession. We regret that he will not be with us, and I hope that the nominating committee will see fit to give to General Birkett the privilege of presiding another year. I would further suggest that the Secretary be authorized to send a cablegram to General Birkett expressing our regret at his absence and extending to him our felicitation upon the recognition by his Government of the great work he has done, not alone for the Canadian troops, but for the ALLIED CAUSE."
RETROBULBAR NEURITIS FROM POSTERIOR ACCESSORY SINUS DISEASE, WITH REPORT OF 17 CASES.

By L. E. WHITE, M. D., Boston, Mass.

After reading Sluder's masterly book, "Headaches and Eye Disorders of Nasal Origin," one hesitates to enter this field. I believe, however, the subject well warrants further elucidation, for in spite of the brilliant writings of Onodi, Loeb, Knapp, Holmes, deSchweinitz, Posey, Hajek, Birch-Hirschfeld, Killian, deKleyn, Berger, van der Hoeve, Halsted, Stark and many others, the subject has not, I think, been sufficiently comprehended. The cases are so rare that one seldom sees enough of them to know what to expect. The usual opinion seems to be that the seat of the trouble is determinable on a casual nasal examination. Pus, polypoid tissue or caries was formerly looked for, but now we recognize the importance also of a thickened or hypertrophied membrane—hyperplasia, as it is designated. Vail defines this as a "rarefying osteitis associated with inflammatory swelling and fibrous thickening of the mucous membrane lining the accessory sinuses. It is brought about, according to Delafield and Prudden, by long continual hyperemia. Examination of the nose is negative where the hyperplasia does not involve the middle turbinate. It is especially to this type of case that I wish to call attention.

The more one studies the structures surrounding the sphenoidal sinuses, the more one is impressed with the importance of a thorough comprehension of the pathological conditions found here. These sinuses vary greatly in size and position, even in the same individual. They may extend outward and backward into the greater wings of the sphenoid to the Gasserian ganglion and have a capacity of 12 cubic centimeters or more. The pituitary body, chiasma and optic nerve are in relation to the superior wall, while externally lie the optic, abducent, oculomotor, trochlear, ophthalmic and maxillary nerves, the cavernous sinus, the internal carotid artery, and the dura of the middle fossa. "In some specimens," Killian says, "the blood circulating in the cavernous sinus bathes the whole roof as well as the lateral walls." Bearing these relationships in mind, one can readily see what effect an inflammatory process here might
have on these structures. Cases of brain abscess and cavernous sinus thrombosis from sphenoidal sinus disease do occur, but fortunately are rather rare complications, while the affections of the adjacent nerves, such as impairment of vision and intense neuralgia, are only too frequent.

As to the vulnerability of the optic nerve much research work has been done. For instance, Francis and Gibson made a study of sixty specimens, in one-third of which the optic nerve was separated from the sphenoidal sinus by a paper thickness of bone measuring less than one one-hundredth of an inch. This frailness was well demonstrated when I was removing the lining of a sphenoidal sinus in the dissecting room recently. This bone, in a comparatively fresh subject, was so fragile that it came away with the lining, thus exposing a considerable area of dura. It is difficult to conceive how an inflammatory process could go on in a sinus of this type without causing serious damage. The wonder is that so few complications arise.

DeKelyn and Gerlach made a study of the optic nerve in a case of old sphenoidal sinus disease, and found circumscribed infiltration opposite the sinus. The same capsular diplococci were found in this infiltrate as in the mucosa of the sinus.

As to the cerebral complications from sphenoidal sinusitis, I have seen but one case, but in 1905, Dr. St. Clair Thomson gave a brief history and autopsy findings in 42, all but two of which were collected from previously reported cases. Most of these ran a very rapid course (as illustrated by my case), and while the findings as to the eyes were meager, they were most interesting as showing the effect on the optic nerve of disease in the sphenoid. Case XXXVIII of the series is as follows:

'Male 78: Two and one-half years before death, eyesight became suddenly impaired and subsequently totally lost from double optic neuritis and post-neuritic atrophy.'

The autopsy showed complete destruction of the walls of the sphenoid.

In twelve of the forty cases loss of vision with or without changes in the fundi are mentioned, thus:

In Case I. Sudden blindness in right eye. Optic disc cloudy.

Case VIII. Diminution of vision on one side.

Case XV. Three weeks before admission, failing eyesight was noted.

Case XVI. Congested optic discs.

Case XVII, (reported in full, it being Dr. Thomson’s own case). Had complained that everything was misty before him. Both optic discs were slightly hazy.

Case XXI, (also Dr. Thomson’s patient). Had double optic neuritis.
Case XXIV. Complained of dim sight five days before admission to hospital.

Case XXV. Had pain in left eye with failing of sight two days later "as from a mist before the eye." Complete blindness followed. The fundus showed dilated veins and edema of papilla. Five days later the right eye was similarly affected.

Case XXVII. Gave a history of pain in the left eye and diminished vision on that side.

Case XXXIII. Had scotoma and diminished vision in both eyes.

Case XXXIV. Had diminishing vision ending in complete blindness.

Case XXXVI. Had unilateral loss of vision.

In 1900 Miller reported two fatal cases from sphenoidal sinus disease, preceded by sudden and complete loss of vision.

Dr. D. W. Greene reported a fatal case of unrecognized empyema of the right sphenoidal sinus, with loss of vision in the right eye. On autopsy "the blood vessels (veins in particular) occupying the floor of the right anterior and middle cerebral fossae were engorged with blood; the overlying dura was boggy and opaque and the anterior clinoid processes, together with the superior wall or roof of the right sphenoid, were of a grayish red color, almost black in places, and necrotic. The right ophthalmic vein and artery, the right optic nerve and other minor structures occupying this position about the right clinoid process, were agglutinated and embedded in a mass of inflammatory lymph."

Chisholm in 1882 reported two instructive cases of blindness from malignant growth in the sphenoid. In the one—a boy of seven—almost complete loss of sight came on within two weeks in the right eye and some loss of vision in the left. There was pallor of both discs. A year later the boy was totally blind in both eyes and both discs were white. In the other case—a physician—loss of vision came on in the right eye several months after the pain started in that side of his head. The disc was pale. Left eye had normal vision at first examination, but five months later it was so poor that he could only see the outlines of large objects. Both discs were white.

Dombrowski also has reported an interesting case of retrobulbar neuritis caused by carcinoma of the sphenoid. At first there was slight blanching of the disc and restriction of the visual field in one eye. Later complete loss of vision in one eye with optic atrophy and commencing loss of vision in the other.

The case of Wood and Wallis is instructive as it shows the
difficulty in differentiating cases of retrobulbar type from those where the optic neuritis is of cerebral origin. Their patient had defective sight for two years in the left eye with vision for hand movements, and the right was also somewhat affected. Vision 6-9 with marked papillo-edema. There was pus in the nose. The removal of the middle turbinates and opening of the sphenoids brought about normal vision right and nearly normal left.

The writers up to ten or twelve years ago laid great stress on the intimate relation of the optic nerve to the accessory sinuses, and seemed to feel that pressure was the all-important factor. The literature showing the growing comprehension of toxemia and hyperplasia is most interesting.

Krauss was one of the first to express the toxemic view. He said in 1909 that "retrobulbar neuritis is generally supposed to be due to an extension of the inflammation from the sinuses to the optic nerve, but the rapidity with which the retrobulbar neuritis disappears after the evacuation of the pus from the opened sinuses is often a source of surprise and would indicate that the neuritis was due rather to a local toxemia than to an inflammatory process. It is readily conceivable that, soon after the supply of toxins through the lymphatics to the nerve fibres ceases, the natural recuperative forces are set to work. Another reason for the supposition that we have toxemia to deal with is that the macular fibres are selected for specific action by the inflammation." He cites the case of a patient who had pain in the right eye, accompanied by very dim sight and a constantly present black spot. There was faint haziness of the retina and contraction of the visual fields. There was an extreme deviation of the septum to the right, and pus was found about the middle turbinate. A rapid cure was effected by resection of the septum and the opening of the ethmoid cells.

Teillais in 1908 reported a unique case where toxemia seemed to play the leading role. The extraction of a molar tooth was followed by an acute infection of the left maxillary antrum and orbital cellulitis which spread to the neighboring sinuses, causing blindness and optic atrophy of the left eye and neuroretinitis of the right.

Stevens reported the case of a woman in middle life where the toxemia was so great as to cause stupor, slow pulse, subnormal temperature and headaches in addition to the more frequent symptom of failing vision and moderate optic neuritis with
central scotoma, vision 4-20 each eye. History of nasal discharge suddenly stopping before onset of symptoms. Recovery followed the opening of the posterior ethmoid and sphenoid.

In 1910 MacWhinnie says that because of the fact that in several of his cases the probing of the sphenoid immediately increased the fundus congestion, he was led to believe that these cases were really the result of absorption of toxic products from this sinus through the lymphatics, although "I am well aware", he says, "that, so far, there has not been any established relation between the lymphatics of the eye and the sinus other than the very noticeable widening of the perivascular lymph channels in the axial strand, demonstrated first by Schieck pathologically". MacWhinnie reported five cases giving peri-metric charts before and after operation. "Personally", he writes, "I believe it is good practice to open the sphenoid in cases of optic neuritis or choked disc, showing para-central scotomata in the visual fields, no possible harm being done if there is not an involvement of the sinus, and if it is present we have eradicated one of its etiological factors".

Gradle's views as to the etiology of blindness and the blind spot from accessory sinus disease differ considerably from previous writers. After giving the anatomical relations and blood supply of the optic nerve, in accordance with the teachings of Onodi, Loeb, Vossius and Gray, he says:—

"These anatomic facts explain the course of disease from the accessory sinuses to the optic nerve. The infection, the edema, or whatever may be the disturbing factor, passes from the sinus periosteum through the diploic veins and lymph channels to the orbital periosteum, thence by continuity to the intraosseous portion of the dura of the optic nerve, or possibly through the periosteal veins or dural veins directly to the central vein of Vossius. If the dura alone is involved, thus causing a pressure upon the periphery of the optic nerve within the canal, the peripapillary bundles alone will be involved and an enlargement of the blind spot will result. If the process extends further and involves the central vein of Vossius, surrounding it by an edema, the neighboring nerve bundles will suffer. These happen to be the papillomacular bundles and there results a central scotoma. Consequently, I believe that I am justified in stating" (contrary to the teachings of Onodi and Loeb) "that the anatomic relations of the sphenoid and ethmoid cells to the optic canal are immaterial when it comes to a question of optic nerve involvement in accessory sinus disease. The trouble is transmitted by the soft tissues alone."

Sliumway reported a unique case and expressed a very interesting theory in 1915. His patient had failing sight in one eye for nine years. The fundus showed pallor of the temporal half
of the nerve and there was a horizontal oval scotoma for colors; vision 2/45. Nasal examination showed a necrosing ethmoiditis. Three years later, after a slight improvement, his condition became worse and the writer concluded the case was one of insular sclerosis and advanced the theory that it might have been produced by absorption of the toxins from the purulent focus in the ethmoid cells. Such a theory would explain the similarity in the lesions of retrobulbar neuritis due to intoxications and those found in disseminated sclerosis.

Stark in 1916 calls attention to the similarity of the eye symptoms in accessory sinus disease and multiple sclerosis. "The eye symptoms in multiple sclerosis," he says, "are amblyopia, nerve involvement, muscle involvement, including nystagmus, change in the pupil and field of vision.... As in sinus blindness, these symptoms are not all present in any one case, the diagnosis being made by the presence of one or more."

In speaking of the etiology he quotes Auerbach and Brandt, who say that "the relation of multiple sclerosis to retrobulbar neuritis is interesting in so far as the last named affection, in the great majority of cases, in acute as well as in chronic form, is etiologically referable to various intoxications and infections, arousing the suspicion that multiple sclerosis is likewise based on some organized or unorganized poison, crediting the increased frequency of influenza in the last decade with the greater frequency of multiple sclerosis". He also quotes Parsons, who says:—"The pathologic condition is suggestive of the presence of a circulating toxin as the cause of the disease." Stark concludes as follows:—"The eye symptoms of multiple sclerosis and sinus blindness which have previously been considered different diseases, are to my mind the same, one being an advanced stage of the other."

It may be of interest to give the usual findings in cases of multiple sclerosis as outlined by Dr. Kampherenstein, who describes the eye symptoms in 37 cases, in 23 of which the diagnosis was positive and in the remaining 14 very probable. Most of the cases occurred in young individuals. In 24 there were ophthalmoscopic changes, the most common being temporal pallor, bilateral in 8 cases, unilateral in 10 cases. There was incomplete optic atrophy in 3 cases; complete bilateral optic atrophy in 1; sector-shaped pallor in 2; an optic neuritis in 1; in 5 there was an absolute central scotoma; in 5 a relative central scotoma; in 3 a central scotoma with peripheral contraction of the field; and
in one case green was not recognized in the entire field. Nystagmus was present in 30 cases. Of these, 26 had nystagmus only in extreme positions of the eye, while in two there was marked nystagmus, even in the primary position.

Bradburne reported a unique case of optic neuritis associated with implication of the abducens nerve from sphenoid disease. The patient had occipital headaches and double vision for twelve months. Examination revealed a slight weakness of abduction of the left externus muscle with some loss of vision and blurring of the left disc. This deviation reached a maximum of 14 degrees some weeks later. The use of cocaine and adrenalin was followed by a profuse thick purulent discharge from the sphenoidal region and a rapid subsidence of the neuritis. There was, however, occasional blurring of the vision for nine months and at times pain, but the diplopia cleared up. The author says that "the implication of this nerve" (the left abductor) "assisted the localization of the seat of the mischief, for such could scarcely be anywhere else than at its situation on the body of the sphenoid where it traverses the cavernous sinus alongside the carotid artery". "It is possible", he says, "that in this case the sixth nerve may have had an abnormal relationship to the carotid and instead of lying external to the artery, might have laid on its mesial aspect in contact with the bone."

The uselessness of negative findings is well shown by Caldwell, who reported a case in 1892 of double optic neuritis due to unrecognized ethmoid and sphenoid disease. Loss of vision came on during a sea voyage, being preceded by violent pain first in one eye and then in the other. After being examined by many specialists and treated unsuccessfully in various hospitals for two years, his disease was at last correctly diagnosed although too late to benefit his vision. The pain which was paroxysmal was relieved by removal of the middle turbinate and draining the sphenoid sinus, and there was also a marked improvement in his general health, but both optic nerves had atrophied.

Vail in 1919 reported three cases of monocular retrobulbar neuritis from ethmoid disease, all with negative rhinoscopic findings. Two of these were due to hyperplastic ethmoiditis and one to a suppurative process. In conclusion he says that in the two cases where "there was no bacterial invasion of the nerve present, there was swelling of the orbital wall of the posterior ethmoidal or sphenoidal cell which pressed the optic nerve in its passage through the optic foramen and caused a strangula-
tion of the nerve at this point. . . . This compression no doubt produces a transverse optic neuritis which, while not due to bacterial invasion, is nevertheless destructive to vision and is followed by more or less permanent atrophy of the optic nerve. . . . The nasal disease that produces this phenomenon is a non-suppurative one, hyperplasia of the ethmoids. . . . The disease should be recognized and operation on the ethmoid performed at once in spite of its being normal in appearance.''

The result of delayed surgical intervention is well shown in the report of Schimer, who saw a case of five months' duration with vision right, fingers immediately in front of the eye; the left, with proper correction, fingers at 5 m.; the temporal halves of both discs quite white. As suppuration was found in the accessory sinuses on both sides, the middle turbinates were removed and ethmoids treated. There was slight improvement in the left, but further improvement was impossible as the nerve fibres had already undergone degeneration. An operation on the sinuses when the trouble commenced would, the writer maintained, have stopped the inflammation and saved the vision.

The seriousness of delay and the importance of thoroughness in operating is shown by Risley, who reported a case of marked pathology in a man of 58 who had atrophy of the optic nerve of long standing in one eye and a recent loss of vision to 6/60 in the other. "The nerve was gray-red, opaque and margins obscured." There was pain in the frontal region and both nares were filled with polypoid masses. On the removal of these a large quantity of pus escaped and vision rose to 6/15. Seventeen months later it dropped to 1/10 and the nose was again filled with polypi. The patient, however, refused any further operative interference and after consulting various specialists both at home and abroad, eventually became entirely blind, and when examined three years after his first visit had atrophy of both optic nerves.

For referring to me the following cases I wish to express my sincere thanks to the physicians mentioned and also to the house surgeons of the Infirmary who have assisted me in every possible way.

The first three cases have been previously published but briefly are as follows:—

Case 1. Miss R. S., 23, referred by Dr. H. B. Chandler on April 12, 1911. Diagnosis:—Chronic unilateral retrobulbar neuritis. Nasal examination:—

Case 2. Mr. C. J. M., 25, referred by Dr. William J. Daly on November 21, 1913. Diagnosis:—Double optic neuritis. Left sphenoid smaller than right. Operation:—Removal of left middle turbinate and opening of left sphenoid. Complete recovery.


Case 4. E. G., 25, a machinist, was referred by Dr. Verhoeff at the Infirmary on April 14, 1916, with diagnosis of bilateral retrobulbar neuritis and optic atrophy. History of excellent health excepting a catarrhal trouble of several years' duration. First noticed a fogginess in vision about 2 months ago. This came on suddenly and was preceded for several days by severe pain about and behind the eyes. Was treated in the Outpatient department on February 28, 1916. Vision 20/50 right and 20/70 left. Disc of right eye apparently normal; left disc, paleness of temporal half. Admitted as a house case three weeks later, during which period vision right dropped to 10/200; left 2/200. Pupils reacted normally; vessels normal; left disc pale; central scotoma for red and green. Wassermann and nasal examinations negative. Patient discharged unimproved one week later. Re-admitted the following week with vision in right eye now 2/200 left eye shadows. Right disc now also showed pallor on temporal side. Pupils of both were dilated and did not react to light. I first saw the case ten days later, that is, on April 14th and had him X-rayed; the "left sphenoid was obscured." After a consultation with Dr. Verhoeff it was decided, in spite of the white discus, to attempt to save the remaining eye sight, so both middle turbinates were removed and the posterior ethmoids opened. As no improvement followed this operation both sphenoids were opened ten days later; they were filled with pus and granulations. Four weeks after the operation "both pupils reacted fairly well; fundi unchanged." Six months later vision for fingers was 2 feet right, 3 feet left, which was an improvement over the vision before the operation.

This case well illustrates the difficulty of making an early diagnosis, and the rapidity with which optic atrophy develops. It teaches the necessity of an early operation, even when the findings are negative.

Case 5. V. C., 28, a machinist, was referred by Dr. MacKenzie of the Infirmary, on March 1, 1917. Diagnosis: Double optic neuritis. He was first seen in the Ophthalmic Outpatient on March 3, 1917, and gave a history of loss of sight in the right eye for two weeks; vision fingers, 1 foot right 20/20 left; physical, neurological and Wassermann examinations all negative; both pupils dilated, the right responding to light but little and the left fairly well. He was seen by me two days later and admitted as a house case. Vision on admission right eye fingers at 1 foot; left eye 20/200, thus showing a marked loss in the left eye in the past 48 hours. Dr. Quackenboss examined the case and reported "the disc of the right eye pushed forward about 2 dipters; considerable exudate on and about it; the edges lost, the retinal veins enlarged and tortuous. The left disc also showed marked neuritis but no swelling. Although the nasal examination was practically negative I at
once removed the right middle turbinate and opened the right sphenoid. There was swelling of the mucous membrane,—probably a case of hyperplasia. Within 24 hours the vision commenced to improve and when the patient was discharged 12 days later it was nearly normal. On May 18th, ten weeks after the operation, Dr. MacKenzie reported both visual fields and discs normal, except that the right nerve head was possibly a little paler; vision 20/20 both.

Case 6. Miss M. C., aged 21, telephone operator, came to the Ophthalmic Outpatient on September 8, 1917. Diagnosis: Unilateral retrobulbar, neuritis. She was admitted at once as a house case. History of good health, not subject to colds, but periodic attacks of severe pain over left eye at which times vision had been blurry for a few hours, but never so bad as at present. This attack came on five days ago with an unusually severe pain over and about the eye. It hurt when she tried to look sideways. The vision was entirely gone for three or four days, and the eye sensitive to pressure. Dr. Quackenboss found a slight blurring of the edges of the left disc. The pupil was enlarged but responded slightly to light. Vision, light perception only. The septum was deflected to the left and the middle turbinate greatly swollen from a subsiding coryza. The septum was resected at once, and the anterior end of the middle turbinate removed. Following this the vision improved so that within 48 hours fingers could be made out close to the eye. One week later fingers at 15 feet. The patient unfortunately contracted another severe cold and for ten days the vision was greatly diminished, but thereafter improved, although it never became quite normal. As the swelling accompanying the coryza disappeared it was found that the posterior portion of the left middle turbinate, the location of which it had previously been impossible to determine, was obstructing the opening to the sphenoid and it was removed together with the front wall of that sinus. The pressure on the nerve had, however, caused slight atrophy. Dr. Quackenboss examined the patient on November 8th, 2 months after the operation, and reported:

‘“Right eye normal; left eye vision 20/30; the optic nerve is pale and shows evidence of partial atrophy.”’ In March 1919 the patient had some pain and blurriness of the other eye but this cleared up under treatment without impairment of vision. On examination by Dr. Quackenboss on May 10, 1919, the left disc was still paler than the right and there was a certain amount of optic atrophy present although the vision had improved in the past 18 months from 20/30 to 20/20 minus, thus showing there may be improvement some months after the operation.

Case 7. Mrs. M. J., 37 years old, came to the Ophthalmic Outpatient on September 17, 1917. Diagnosis: Bilateral retrobulbar neuritis. History of severe pain in head for 24 hours, when she noticed that the right eye was blurry; in three days it was totally blind. One week later similar trouble came on in the other eye, so that she had to be led into the Infirmary. She was admitted as a house case and improved under local treatment for three or four days, then became worse,—no light perception in right eye and fingers barely in the left. Her history pointed toward specific disease, so operation was delayed until the Wassermann report was obtained. This was negative, as were also the neurological, X-ray and nasal examinations. The right middle turbinate was then removed and the right sphenoid opened. Thickened mucous membrane was found,—probably a true case of hyperplasia. The
sight in the eye on this side commenced to improve within 24 hours. A week later the left middle turbinate was removed, and the left sphenoid and posterior ethmoid opened. Improvement thereafter was rapid. The patient was examined several times by Dr. Quackenboss who was able day by day to note the changes in the fundi. Four days after the opening of the left sphenoid he reported that there was still marked neuritis. On the twelfth day he noted "marked improvement; neuritis subsiding; edges of discs made out fairly well; vessels nearly normal." Two days later he reported "right eye, neuritis subsiding; edges of disc quite distinct; nerve has slight pallor; left eye, edges of disc fairly distinct; one or two vessels a little twisted." The patient when seen three months later had practically normal vision.

Case 8. Miss H. H., 17 years old, was referred on March 15, 1918, by Dr. Fred M. Spalding of the Infirmary. Diagnosis: Bilateral retrobulbar neuritis. History of very severe pain in head some six weeks ago which was followed by marked bilateral loss of vision. Examination showed blurring of both discs and marked neuritis right. She was referred to the Massachusetts General Hospital as the trouble at first was thought to be due to pituitary disease. Neurological, X-ray and Wassermann examinations all negative. Vision left, fingers at three feet; light perception only in right. Nasal examination negative except a deflection of the septum. This was resected on March 15th and the right middle turbinate removed. Six days later the right sphenoid was opened. No pus or granulations but a hyperplastic condition found. The patient was discharged in nine days with vision 20/20 left and 20/30 right. The right fundus still showed a slight neuritis. Two weeks later the antro-nasal wall was broken down and a diseased molar extracted. There still persisted a slight blurring of the disc in the right eye, but on July 9th, some four months after the operation, both discs were clear and the vision 20/20 both.

Case 9. Miss M. C., aged 20, was referred by Dr. Verhoeff. She entered the Infirmary April 6, 1918, with exophthalmos of the left eye. For the past two weeks, following a severe cold there had been pain and swelling about the left eye. The eyeball was pushed forward and outward; vision 20/20 and fundus normal. There was tenderness over the ethmoid region and a moderate conjunctivitis. A diseased molar was extracted by Dr. Wright. On the 9th I examined her nose which was negative, but as some sinus disease was suspected she was X-rayed; the plates were negative, however, as were also the physical, neurological and Wassermann examinations. With the subsidence of the exophthalmos the patient first noticed a fogginess in her vision, and on April 21st, some two weeks after her admission, the fundus on being again examined showed a commencing choked disc. This grew rapidly worse so that within four or five days her vision dropped to 20/200 and the fundus showed marked engorgement. On April 27th, six days after the neuritis was noticed, I removed her left middle turbinate and opened the sphenoid and the posterior ethmoid. The patient improved rapidly and was discharged a week later with vision 20/50. One month later when the left fundus was normal and the vision 20/20, the other eye commenced to pain and the vision became blurry. Dr. Verhoeff found a marked papillitis, with vision 20/200, so she was re-admitted to the Infirmary and on June 12th I removed the right middle turbinate which was tightly wedged between the
septum and ethmoidal wall and opened the right sphenoid. Eight days after the operation the patient was discharged with normal vision. She went along favorably for six weeks when, following a cold, the pain returned about the left eye (the first one affected) and there was diminution of the vision. The left antrum was dark on transillumination, and there was slight blurring of the left disc with vision 20/30; so on July 24th all the posterior ethmoids on the left were enucleated, the opening in the anterior wall of the sphenoid enlarged, and a permanent opening made into the antrum, which, by the way was filled with pus. Patient discharged a week later with vision normal which remained so for four months, when, following a severe cold, there was some pain in the left eye and a blurriness for two days, but this subsided under local treatment.

This case is unique, at least in my experience, as the optic neuritis of the left eye developed while the patient was under treatment at the Infirmary for the exophthalmos of that eye. The neuritis in the right eye came on some weeks after that in the left had subsided; then there was a recurrence of the neuritis in the left eye some weeks after that in the right was cured. The first operation on the left side was the removal of the middle turbinate, an opening into the sphenoid and the posterior ethmoid cell. This is usually sufficient but was not so in this case. That the optic nerve, while not in relation to the other accessory sinuses, may yet become involved from the toxemia of the infection, is, I believe, well demonstrated by this case.

Case 10. Miss M. E., 27, a patient at the Infirmary with neuro-retinitis and choroiditis of the right eye, was referred by Dr. Verhoeff on April 16, 1918, more with the idea of seeing what effect the opening of the sinuses would have on the retina than with the expectation that the vision could be benefited. Ten years ago she had paresis of the right facial but no cause; monthly headaches since a child. About three months ago patient noticed that inner half of field of vision was gone in the right eye. This lasted for about one week, then the other half began to go, so that now she has light perception only. About two weeks ago the eye began to turn out; pupil round, regular and reacts to light; fine floating vitreous opacities; disc swollen and edges not seen; tension normal. The left eye was normal. X-ray of sinuses, Wassermann, neurological and nasal examinations all negative. On April 20th I removed her right middle turbinate and opened the sphenoid. The membrane was somewhat thickened, but no pus or granulation. Patient was discharged a week later with no improvement. Some six or seven weeks after this the pain in the right side of the face, which she had had occasionally, became constant and of such intensity that acetyl-salicylic acid in 10-grain doses was required nearly every hour. In the region of the posterior ethmoids soft polypoid tissue was found which, on account of the severity of the pain, was suspected of malignancy, but a small portion removed for examination was negative. Although the Wassermann was negative Dr. Verhoeff suspected specific disease and had given the patient inunctions and potassium iodid for some weeks. On July 10th I cleaned out her ethmoids. Granulations and pus were found. The pain which had continued up to that time was entirely relieved and had not returned when seen six months later. This was also true of her periodical headaches. The general health was also much better, but the vision was unimproved.
Case 11. R. M., aged 45, was referred on April 18, 1918, by Dr. William J. Daly, with diagnosis of axial neuritis left with large central scotoma for colors. History of fair health and ability to work. Patient has had pain across the forehead and through the eyes for past three weeks. Expectorated a little bloody muco in the morning. Eight months ago the sight of the left eye commenced to fail and he visited the Infirmary. His fundus was examined at that time by Dr. Worthen and reported as practically normal; vision 20/200. The fields were slightly contracted; no color scotoma. With the onset of pain the vision in the left eye has been much worse, everything now being blurry. In the region of the left posterior ethmoid there was considerable soft polyloid tissue, bleeding freely on touch. A most interesting phenomenon was noted: After thoroughly cocaineizing this region the slightest pressure with a cotton swab caused intense pain. Again this region was cocaineized, yet the pain was in no wise lessened. This led me to suspect some more serious trouble than merely an infection in these cells, so I sent the patient to the Infirmary for further examination. The X-ray by Dr. Liebman showed marked erosion in the sella turcica region; ethmoid processes obliterated; ethmoids and sphenoids moderately obscured. This finding, of course, meant a malignant growth, so nothing was attempted in an operative way. The Wassermann and neurological examinations were both negative. After being under observations six days he was discharged unrelieved. One week later the patient died rather suddenly and his family physician, Dr. G. W. Blaisdell of Manchester, Mass., wrote as follows:—

"I saw Mr. M.—— on May 3rd, at 2 P. M. He had had headache for the previous twenty-four hours. The headache was general all over the head. Temperature and pulse at that time normal. He was rational and answered all my questions. There was a slight protrusion of the left eyeball. The eye was painful to touch. All reflexes were normal. I saw him again at seven o'clock. He was not as bright mentally. The left pupil failed to react to light. I saw him the next morning at five o'clock. He was then passing into coma. The reflexes of his legs even then were about normal. He died suddenly about two hours from that time, dying very easily without a struggle."

Dr. P. E. Meltzer of the Infirmary, kindly made the autopsy for me; his report is as follows:

"The usual technique was observed and calvarium was removed. Hemorrhagic areas were noted in the parietal region of the cerebral hemispheres suggesting meningitis. No free pus or exudate was seen but the sulci were infiltrated. On elevating the frontal pole, the most striking condition was noticed. Projecting upward from the sella turcica was a tumor about the size of an English walnut, which as it projected upward made quite an impression on the under surface of the brain just anterior to the chiasm. It was slightly adherent to the surface of the brain, but by careful manipulation it apparently separated intact and appeared pedunculated from the body of the sphenoid, in the pituitary region. The cranial nerves, particularly the optic were removed for sections. In order to remove the tumor, it was necessary to remove practically the anterior and middle fossae of the base of the skull. This was done out the cellular condition of the nasal walls made this difficult. By carefully chiseling through the cribriform plate the roof of the orbits, the lesser and greater wings of sphenoid and posteriorly through
the basilar process a wedge shape portion of base of skull was removed, without disturbing materially the relations. The tumor and neighboring structures, posterior ethmoidal cells were practically intact. The brain and specimen were placed in 10% formalin for purposes of hardening. Dissection later proved that the body of the sphenoid was practically entirely eroded."

Dr. Verhoeff, who examined the brain and new growth, reported as follows:

"Pathological Diagnosis: Large round cell sarcoma of sphenoid bone and hypophysis. Streptococcus meningitis.

The specimens consist of the brain and the body of the sphenoid bone together with the posterior portions of the ethmoids including the optic canals.

The sphenoid bone is almost completely pervaded by a tumor growth which has either completely broken down or rendered the bony structure friable. The sphenoid sinus is filled by the growth which has also broken through into the pharynx over a small area. The growth has extended into and greatly enlarged the pituitary body, but the capsule of the latter is still intact towards the brain. The chiasm is pressed upon by the enlarged pituitary body but has not been invaded by the growth. The brain shows the typical picture of a diffuse purulent leptomenigitis.

Histological examination: The meninges show diffuse purulent infiltration containing an abundance of streptococci. Sections of a portion of the growth removed from the sphenoid sinus show it to be a large round cell sarcoma. The fixation is not sufficiently good to permit special stains being used.

Sections of the pituitary body show that it has been almost completely destroyed by the growth, only a few parenchyma cells remaining here and there.

Sections of the optic nerves and tracts prepared by the Merchi and Weigert methods, show no evidences of atrophy or degeneration."

He further says:

"As I remember the case, there was a central scotoma in one or both eyes. This is not inconsistent with the fact that I found no degeneration in the optic nerves, because there may have been simply functional blocking, capable of recovery could the pressure have been removed."

Case 12. Mr. C. T. K., aged 49, referred by Dr. F. E. Cheney on July 18, 1918, with diagnosis of unilateral retrobulbar neuritis of some months' standing. He has had considerable secretion in nose and throat for years. Four months ago, following an unusually severe cold, the vision in the left eye suddenly became very poor and there was severe pain through the head. Then something seemed to break in the back of his nose and for a few days there was an offensive bloody discharge followed by complete relief from the pain. His vision, however, never completely returned. Dr. Cheney's report is as follows:

"An ophthalmoscopic examination showed a marked swelling of the left disc, about 3.D—the borders completely obliterated, retinal veins moderately full and tortuous, and obscured at disc borders. There were a number of glistening cholesteric like spots on the disc and the appearance of the disc as a whole did not suggest a recent inflammatory process. The borders of
the right disc were completely obliterated and the disc elevation was about 1.D. The fields of vision were not contracted.

v. o. d. e. + 50 cyl. ax O=1, v. o. s. e. + .50=.50 cyl. ax. O=0.7

As I have said the appearance of the left disc especially suggested an old rather than a very recent inflammation and the trouble probably existed before his cold and nasal discharge in March.''

The Wassermann was negative as was also the neurological examination by Dr. W. E. Paul. Patient does not use alcohol or tobacco to excess. A posterior deviation of the septum crowded the left middle turbinate so as to obstruct the sphenoid and posterior ethmoids. The tissues in this region were distinctly boggy and mucopurulent secretion was seen about the middle turbinate. The X-ray plates made by Dr. Liebman showed "'Ethmoids:—left anterior and posterior obscured. Antrum:—right obscured. Sphenoidal sinuses:—both rather hazy.'" On July 22, 1918, about four months after the onset of the neuritis, I removed the left middle turbinate and opened a posterior ethmoid cell, anterior to the sphenoid, which at first was thought to be a rather small shallow sphenoid, but on further examination an opening leading into a good sized sphenoid was found. The sphenoid contained pus, was some 10 m. m. in antro-posterior diameter with a thick anterior wall and soft tissue on the floor. There has been a gradual improvement in the vision. The blurriness no longer exists. Three months after the operation, Dr. Cheney found that vision in right eye was still normal and an improvement of 1/10 in the left, but there was no appreciable change in appearance of discs and he thinks there may not be for a considerable time. Five months after the first operation the opening into the sphenoid, which had become quite small, was enlarged. This case is still under treatment as the fundi are not yet normal.

Case 13. Miss E. A. H., 49, was referred by Dr. Thompson at the Infirmary on December 16, 1918, with diagnosis of bilateral optic neuritis.

History: Four months ago vision, which had always been poor due to extreme myopia, began to be much worse. Has had severe pain in head for past fifteen years, but much worse the last six months and constant for the past four weeks, causing complete disability. Has sensation of severe pressure within the head. Six months ago commenced to expectorate a thick mucus streaked with pus, and since that time has had intervals of marked temporary loss of vision. Pupils small and dilate easily; both discs irregular in outline and white on temporal sides, probably due to extreme physiological cupping of both nerve heads. Nasal side of discs slightly accentuated. There was a marked deflection of the septum and hypertrophied middle turbinates. Physical, dental, neurological, X-ray and Wassermann examinations all negative. Vision 20/200 both. On January 3, 1919, the septum was resected, the right middle turbinate removed and the right sphenoid opened. It was very large and filled with a thick gelatinous secretion. For several weeks the patient was entirely free from headaches and there was a slight improvement in vision, i. e., from 20/200 to 20/100, and enlargement of the visual fields. Then she complained of a feeling of discomfort, with some pain on the left side, apparently above and behind the eye and extending to back of neck. On January 31st her left middle turbinate was removed as well as the anterior wall of the left sphenoid. Reddened areas were found in the sphenoid, but only a small amount of mucus. This case is still under treatment.
Case 14. A. R., aged 5, was referred by Dr. Spalding at the Infirmary on January 3, 1919, with diagnosis of bilateral neuro-retinitis. Child had influenza 4 weeks ago and for the past 2 weeks has acted as if he could not see; complained of headache and had some vomiting. The fundi showed optic neuritis with stellate exudate changes in the macular region and dilated veins. Patient apparently does not even perceive light. Neurological, physical, X-ray and Wassermann examinations all negative. There was a slight deviation of the septum high up, and both middle turbinates were greatly swollen, blocking the posterior ethmoids. For a week the turbinates were cocaineized and the nose irrigated with a hot saline solution, as I hesitated to operate on such a young child. As there was no sign of a return of the vision, both middle turbinates were removed and the posterior ethmoids cleaned out,—a difficult procedure, I assure you, in such a small nose. The following notes from the Infirmary record show the progress of the case from day to day:

January 12th: (Two days after the operation.) Lumbar puncture negative. Fundi show no change except possibly a more grayish tint to disc.


January 15th: Some improvement in vision.


January 20th: Vision improving; counts fingers at four feet.

January 27th: Less edema of retina. Still some swelling of optic nerve and white exudate in macula region, but definitely less marked. Counts fingers at 20 feet.

February 13th: Improvement in fundi. Less edema of nerve head. Exudate in macula region definitely less.

February 15th: Vessels of fundi of normal size.

February 18th: Discharged. Disc outline not distinctly made out. Some pallor of discs. White patches in macula region much smaller. Counts fingers at 30 feet and picks up pins from floor; vision apparently normal.

Case 15. J. K., 37, was referred to me from the Eye Clinic of the Infirmary on February 6, 1919, with diagnosis of bilateral papillitis. History: A month previously while at work his right eye was struck with a fragment of eyeglass or the piece of steel that broke the glass. Vision for fingers at 1 foot left, 20/40 right. Dr. Quackenboss saw the patient on February 14th, 1919, and noted a marked double optic neuritis. Both discs were indistinct in outline, the left more so than the right, but no swelling made out. Physical, neurological and Wassermann examinations negative. X-ray showed right antrum and posterior ethmoids obscured. Sella turcica unusually large in anteroposterior diameter, but probably not pathological. The left middle turbinate was removed and the sphenoid and posterior ethmoid opened. The sphenoid was filled with pus under some little pressure. The patient developed an acute frontal sinusitis ten days after the operation, but the eye conditions improved somewhat. Two weeks after the operation Dr. Quackenboss noted the left discs stood out more clearly and the edges more distinct. On March 24th the discs still showed some slight hyperemia. Vision right 20/20, left fingers at 2 feet. Question of malingering as the patient was contemplating bringing suit for damages against the company he worked for when he had his glasses shattered. A secondary operation was advised, but refused.
Case 16. S. D., 40, was referred by Dr. E. T. Easton with diagnosis of unilateral optic atrophy. History: About three years ago he noticed that there was a constantly present blue spot in front of the right eye and that everything was blurry. Under constitutional treatment this cleared up in about three weeks and for a year the vision was normal. Then there was a recurrence of the trouble, and in spite of treatment by specialists near his home and at the New York Eye and Ear Infirmary, vision has been going from bad to worse. When seen by Dr. Easton on February 12, 1918, the vision in the right eye was 20/50; pupil rather dilated, but reacted well; disc slightly pale, fundus otherwise normal; central scotoma for red, green and blue. When next seen by Dr. Easton on February 13, 1919, vision had dropped to 20/200. Patient was referred on his first visit to Dr. Easton to the Eye and Ear Infirmary and admitted as a house case on February 19, 1918. Diagnosis:—Optic atrophy right. The X-ray of sinuses, Wassermann and neurological examinations all negative. Patient was first seen by me on February 20, 1919, i. e., one year later. There was marked deviation of the septum to the right and middle turbinate was tightly wedged between it and the outer wall. Eight days later I removed his right middle turbinate, opened the sphenoid and posterior ethmoid. The mucous membrane lining these cavities was considerably thickened, quite evidently a case of hyperplasia. Two months after the operation Dr. Easton reported as follows:—"Mr. D. shows improvement in vision in right eye from 20/200 to 20/100. The disc shows no increase in pallor."

Case 17. Mrs. R. D., aged 31, was referred by Dr. Henry Hawkins on March 21, 1919, with diagnosis of bilateral retrobulbar neuritis; vision right 20/30, left 20/100 papillitis of each disc, general edema of retina. History: Frequent colds during the past winter but vision not affected until six days ago when she noticed that everything seemed foggy. This fogginess has been getting worse and she complained of a blind spot in the center of her visual field. She has had considerable pain about the eye and back of the neck extending down to the shoulder blades. Both middle turbinates were greatly hypertrophied, the left the most marked and especially obstructing the sphenoid. Immediate operation was advised. On the following morning the left middle turbinate was removed and the sphenoid and posterior ethmoid opened. The sphenoid was of enormous size extending over an inch beyond the median line to the other side. The lining was boggy and the posterior ethmoid cell large and high. The sphenoid was irrigated daily with a hot saline solution. The discomfort about the eye and pain in the head was immediately relieved. Vision returned rapidly so that on April 10th, three weeks after the operation, Dr. Hawkins reported: "Right eye with proper correction 20/20, left 20/30; fundi little change from normal conditions." Two weeks later eyes 20/20 both.

This last case illustrates how quickly results are obtained by prompt operative interference, and I believe is the method of procedure to be followed in all obscure cases. Is it not infinitely better to promptly open the posterior accessory sinuses sometimes perhaps unnecessarily, than to allow one of these cases to become permanently blind through neglect?
Summary.

Of the 17 cases here reported, 2 were not operated upon (Cases 1 and 11). In one the eye remained permanently blind, while in the other the patient died from a sarcoma.

Of the 15 operative cases, all but one improved (Case 10). In this case the eye had been practically blind some months and the operation was undertaken to determine what effect, if any, the opening of the sphenoid would have on the dilated veins of the fundus.

Normal vision was obtained in 7 (Cases 2, 3, 5, 7, 8, 9, 17).

There was marked improvement in 3 (Cases 6, 12, 14), but some optic atrophy.

Only slight improvement in 4 (Cases 4, 13, 15, 16), this being due to the chronic nature of the disease and the delay in operating.

In all these an early operation would have saved much more of the vision.

The toxemia from the pus found in 7 cases seemed the chief factor (Cases 1, 4, 9, 10, 13, 15).

In 8, hyperplasia appeared the predominating lesion. (Cases 2, 3, 5, 6, 7, 8, 16, 17.)

In 2 cases pressure apparently played the leading role (11, 14)
In 7, the nasal examination was negative (Cases 2, 4, 5, 7, 8, 9, 10).

In 6 cases the X-ray findings were positive (Cases 2, 3, 4, 11, 12, 15). Negative findings, however, by no means contraindicate an operation.

The middle turbinate was removed in all the operated cases and the sphenoid opened in all but one (Case 3). The posterior ethmoid cell is at present opened as a matter of routine. Unless suspected of infection, the other ethmoid cells are not disturbed. The complete exenteration does not in most cases seem necessary. The Sluder technic of removing the middle turbinate and opening the sphenoid is followed. In practically all cases Wassermann and neurological examinations were made and the teeth investigated.

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DISCUSSION.

Sir St. Clair Thomson, London, England, recalled two cases, reported thirteen years ago, in which he was able to verify, by postmortem examination, ophthalmic and cerebral complications due to pyogenic infection of the posterior accessory sinuses. *He had been disappointed to find that nobody, so far as he knew, had followed up these observations with reports of other cases giving this definite confirmation. As the years passed he had also been disappointed at the small number of cases in which he had been able to confirm this association. The cases which had been referred to him had shown mostly orbital infections, while infection of the optic nerve and retrobulbar complications had been rather scant. He was beginning to think it was due to too much caution and to the idea that one must see pus, because, on looking back it became evident that these cases of retrobulbar neuritis had not occurred among those which were streaming pus,—which anybody could diagnose,—but they occurred, as his two cases had occurred, in comparatively recent cases. He believed, with the essayist, that retrobulbar neuritis, with nothing else as a cause, called for exploratory opening of the sphenoidal sinus. He asked Dr. White if, in making the exploratory opening, the X-ray findings had proved of any help?

DISCUSSION.

Dr. Harris P. Mosher, Boston, Mass., was very much disappointed because Dr. White had given no report of the microscopic findings in his series of interesting cases. The crying need was for pathology. There had been a pathology of words, but not pathology backed up by the microscope. Until such cases had been studied with the microscope they would continue to be obscure.

Dr. Joseph C. Beck, Chicago, Ill., spoke, not so much in the discussion of Dr. White's cases, as in answer to Dr. Mosher's criticism with reference to the omission of histological work concerning them. He had done some of his otological work on similar cases. He had found that patients, practically blind, had recovered vision after ethmoidectomy. In one case there was no pus. He advanced the view that the process in the bone itself is one of rarefying osteitis, and this process in the ethmoid labyrinth, in the region of the optic foramen, could certainly give rise to sufficient changes to produce swelling of the nerve. By a sort of decompression process in the posterior ethmoid and the sphenoid by an operation such as recommended by Sluder, will explain why these cases get well and so rapidly at that.

Dr. Mosher added that he hoped the members had understood Dr. Beck's concise and simple explanation of the pathology! His own remarks had been reinforced by what Dr. Beck had said.

Dr. Eugene A. Crockett, Boston, Mass., had been surprised to see the relatively small amount of hemorrhage, and the ease with which it could be controlled in operations upon these cases. In a case of sarcoma, operated upon by him five years ago, there was a distinct improvement of vision for nearly a year. The patient finally died from the disease, but the year's improvement in vision was well worth the operation.

Dr. Dunbar Roy, Atlanta, Ga., asked whether Wassermann tests had been made, to which the essayist replied in the affirmative, adding that the results were always negative.

Dr. Dunbar Roy, Atlanta, Ga., thought it unfortunate that Dr. White had used the term retrobulbar neuritis. Retrobulbar neuritis was dependent upon three things: (1) pressure from some extraneous condition, such as a growth, effusion, or inflammation from the cells themselves. (2) inflammation from the surrounding membrane of the nose. (3) a toxemic condition. In retrobulbar neuritis, as generally understood, there was no inflammation upon examination of the fundus of the eye. The term, therefore, was a misnomer in Dr. White's cases. The condition was more a neuritis between the eye itself and the entrance of the nerve into the orbital cavity. Retrobulbar neuritis was not a very common condition. In twenty-five thousand cases which he had examined there had been only twenty cases of this condition. Dr. White had seen all of his cases within three years, which, in the speaker's opinion, was an enormous number of cases for the length of time. One might find all manner of inflammation around the optic nerve without involvement of the nerve itself. The term retrobulbar neuritis should be changed. It was manifested in the very beginning by central scotoma. There might be absolute blindness, but whether it would lead to optic nerve blindness was a question. It was very difficult for the optic nerve to become involved.

Nose and throat men were getting to be extreme in the idea that all these conditions were due to sinus trouble. He had had a case, with typical symptoms of retrobulbar neuritis, which gradually progressed toward recovery, yet when he examined the nose he found what seemed to be a hyperplastic condition of the middle turbinate. He did not remove it, but the patient got well. It was an error to think that all cases of retrobulbar neuritis are due to disease of the
middle turbinate and to remove this structure. A halt should be called in the indiscriminate opening up of the turbinate simply on suspicion. Many other factors might give rise to retrobulbar neuritis without involvement of the nerve itself. Noteworthy among these factors might be mentioned toxemia from the alimentary canal. In many cases it was due to pressure, and removal of this would relieve the symptoms. It was difficult to injure the optic nerve, and a large proportion of the cases of optic neuritis were traceable to disturbance of the vascular supply of the nerve itself. In many of these cases reopening the ethmoid cells merely resulted in injury. The main point was that the condition was not a retrobulbar neuritis but optic neuritis. Dr. White had referred to papillitis; in retrobulbar neuritis there was no inflammatory condition, no tortuosity of the blood vessels, no chocked disc. Chocked disc occurred with retrobulbar neuritis. A more careful consideration of the term used would be advantageous.

Dr. J. W. Jervey, Greenville, S. C.: Like the preceding speaker, was both ophthalmologist and rhinologist, and wished to endorse what Dr. Roy had said. The only symptoms of retrobulbar neuritis were blindness and central scotoma. While Dr. White's paper was an interesting and extremely valuable contribution, it must be remembered that these cases fall into the hands of the ophthalmologist first, and he should be impressed with the importance of understanding the etiology of the disease and not waiting for the appearance of accessory sinus disease to suggest the condition.

Dr. William H. Haskin, New York City: Referred to his observations, published several years ago, on the relationship of the sphenoidal nerve to the ethmoid and other sinuses. The more of these reports he had heard the more he had become convinced that disturbance of the optic nerve was not a disturbance of the nerve itself but of the sympathetic cavernous plexus. All sorts of relationships were possible there as he had shown. Inflammation of the sympathetic nerve would give the same symptoms physiologically as inflammation of various others. These are invariably vasomotor disturbances. The trouble, in these cases, was traceable to sympathetic nerve disturbances. In old chronic cases there had been a depression of its sympathetic control, but the trophic nerve, which is also sympathetic, had been so disturbed that a trophic condition arose.

Dr. White, in closing the discussion, said the X-ray had been used with benefit in seven cases. One should not depend too much upon the X-ray findings. When negative he went ahead just the same; he merely felt a little safer in making the exploration, after inspecting the plates.

Dr. Mosher was reminded that, in reading the paper, it was necessary to omit a great deal of the discussion on the pathological aspects of these cases. Jonathan Wright had done considerable work along this line for Dr. Sluder. The findings under the microscope, however, were rather meager. Not much reliance could be placed upon the pathological findings. The clinical findings made it necessary to operate.

He had felt uncertain as to the title of the paper. He knew perfectly well the typical symptoms of ordinary retrobulbar neuritis. He had talked it over with Dr. Quackenbos, who thought the term retrobulbar neuritis was used in such a way that it was about the only one word that could be employed to describe the condition. If Dr. Roy or anybody else could suggest a better name he would be very glad.

The large number of cases for the length of time was accounted for by the fact that in the clinic where most of the cases occurred, he saw a very large number of patients. In each case the patient had been examined and referred by a competent ophthalmologist. Of the seven-
teen cases seen, ten had gone on to partial atrophy before he examined them. He did not think it safe to let these cases go on without operation. They would have been benefited if they had been operated on immediately. The operation was not dangerous; it was a dreadful thing to be blind.

Dr. Haskin's remarks about the sympathetic nerve were interesting and valuable.
EXPERIMENTAL OBSERVATIONS ON THE TREATMENT OF BRAIN ABSCESS FOLLOWING MIDDLE EAR AND MASTOID INFECTIONS.

By JOHN McCoy, M. D., New York City.

The object of these experiments has been to seek a safer and more reliable method of sealing off the meningeal membranes at the point of drainage through the dural incision, so as to prevent the general infection of the meninges and consequent fatality which so often ensues in these cases. The methods employed at present for this protection of the meninges are mainly two. One the method advocated by MacEwen, which is to pack a layer of gauze all around the margins of the dural exposure between the bone and the dura. The other is that known as the cofferdam dressing wherein the dura is incised crucially at the elected point of exposure and then to pack iodoform gauze beneath the dural flaps in the hope of having adhesions formed at the site of packing.

In our experiments we have tried a number of different procedures for the purpose of forming a safety zone through which to operate and I regret to say that we have not been able to reach definite conclusions for reasons which will develop presently. The experiments have been carried out on the dog at the Laboratory for Experimental Research at the University Bellevue Medical College, through the courtesy and kindness of Dr. George D. Stewart. In this work I have received the invaluable assistance of my associate Dr. Mark J. Gottlieb, both in the operative work and in the examination of the pathological specimens. Beginning in November of last year we tried in turn the following experiments, all under ether anesthesia. A skin incision followed by the removal of a section of the bony cortex and exposure of the dura about one and one half inches in diameter. Then in sequence was tried the following procedures, each of which was followed by killing the dog at a stated interval of time. The brain was perfused with saline solution and formalin and sections made for microscopical examination of the treated dura pia and adjacent brain tissues.

1. Mildly cauterizing the dura.
2. Subdural injections of paraffin (melting point 110).
3. Subdural injections of paraffin mixed with iodin.
4. Subdural injections of bismuth paste.
5. Subdural injections of \( \frac{1}{2} \) strength tincture of iodin (diluted with water).
7. Subdural injections of paraffin and iodoform powder.
8. Subdural injections of paraffin mixed with yellow oxide of mercury.
9. Gauze packed between bone and dura at margin of exposure.
10. Subdural injections of paraffin and closure of wound.

This dog has shown no symptoms of cerebral irritation since. We propose to watch it.

We then proposed to infect the dura of an untreated dog and also to infect the dura within the safety zone made by the adhesions which were brought about by the method which gave us the best adhesions. Accordingly we tried to infect the meninges with virulent cultures of streptococcus and staphylococcus and we have been unable to produce meningitis in a series of twelve dogs, either in the treated or untreated dog after incising the dura and injecting cultures of vicious pyogenic organisms. Finally we injected 4 c.c. of broth culture of streptococcus hemolyticus into the femoral vein of a dog and were unable to obtain a blood culture in 24 hours. The dog is still alive and healthy.

A detailed list of the experiments is subjoined.

Nov. 21, 1918. Dog No. 8.
Dura exposed one inch in diameter.
Dura seared with hot iron.
Nov. 24th, killed and brain perfused with saline and formaldehyde.
Result—Hemorrhagic necrosis between dura and pia and in brain tissue beneath pia.

Nov. 30, 1918. Dog No. 17.
Dura exposed one inch in diameter.
Paraffin injected subdurally.
Killed and perfused Dec. 2nd.
Result—Hyalized fibrin adhesions first stage of organization.
Mechanical rupture of adhesions during preparation. Young fibroblasts present.

Dec. 6, 1918. Dog No. 22.
Dura exposed.
Paraffin injected.
Killed and perfused Dec. 7th. Acute inflammatory reaction present.

Dec. 6, 1918. Dog No. 23.
Dura exposed and paraffin injected.
Dec. 8th, dog killed and perfused.
Fibrin adhesions and fibroblasts.
Dec. 20, 1918, Dog No. 30.
    Dura exposed and paraffin injected.
    Dec. 26th, killed and perfused.
    Microscopic older, fibroblasts, few polymorphonuclear leucocytes healthy organization of later stage cholugen fibers present.

Dec. 20, 1918.
    Dura exposed. Paraffin mixed with iodin, injected subdurally. Paraffin 8 c.c. Lugolls solution $\frac{1}{2}$ strength 1 c.c.
    Dec. 21st, killed and perfused.
    Microscopical examination. Under surface of dura slightly roughened.
    Brain surface slightly roughened. No definite adhesions.

Jan. 3, 1919.
    Dura exposed and bismuth paste injected subdurally.
    Dog died on Jan. 8th, of pneumonia.
    Examination showed dura stripped with difficulty. Broad bands of adhesions. Large numbers of polymorphous leucocytes found not as substantial adhesions as with paraffin.

Jan. 11th, 1919. Dog No. 44.
    Dura exposed, $\frac{1}{2}$ strength tincture of iodin diluted with water, $\frac{1}{2}$ c.c. injected under dura.
    Jan. 12th, dog killed and perfused.
    Extensive hemorrhage under dura and hemorrhage in brain substance.

    Gauze packed between dura and bone.
    Feb. 27th, killed and perfused.
    Irregular bands of adhesions.

March 10th, 1919. Dog No. 77.
    Iodized paraffin injected subdurally.
    March 11th, dog killed and perfused.
    Many leucocytes. Moderate amount of hemorrhage.

March 11, 1919. Dog No. 78.
    Iodoform and paraffin injected subdurally. Paraffin, 8 c.c. Iodoform powder, $\frac{1}{2}$ gm.
    March 12th. Killed and perfused.
    Hemorrhage between the dura and pia. Severe reaction. No evidence of beginning organization.

March 14th, 1919. Dog No. 79.
    A mixture of paraffin 8 c.c. and yellow oxide of mercury $\frac{1}{2}$ gm.
    March 15th, killed and perfused.
    Large leucocytic reaction. Moderate number of fibroblasts. Hemorrhage between dura and brain.

May 17, 1919. Dog No. 80.
    Paraffin and yellow oxide of mercury same as previous dog.
    March 19th, killed and perfused.
    Tremendous leucocytic reaction and hemorrhages. No definite attempt at organization.

March 21, 1919. Dog No. 81.
    Paraffin of yellow oxide of mercury.
    Dog died of pneumonia four days later.
Great leukocytic reaction. Extensive hemorrhages. Very little attempt at organization. Necrosis.

April 9, 1919. Dog No. 86.
Dura exposed. 5% Chloretone in paraffin injected subdurally.

April 10th, dog killed and perfused.
Evidence of irritation of cerebral tissue.

April 25, 1919. Dog No. 87.
Dura incised and streptococcus hemolyticus, 18-hour old culture put under dura with platinum loop. Dog unaffected.

April 25, 1919. Dog No. 88.
Dura exposed. Paraffin injected subdurally. 24 hours later dura incised and streptococcus hemolyticus introduced under dura. Dog unaffected.

May 1, 1919. Dog No. 89.
Paraffin injected subdurally.

May 2nd, 18-hour old pneumococcus injected under dura. Dog unaffected.

May 1, 1919. Dog No. 90.
Dura exposed.

May 2nd, Pneumococcus culture in broth 18 hours old. Dog unaffected.

Paraffin injected under dura.

May 7th, dura incised and 24-hour old culture streptococcus hemolyticus was injected under dura. Dog unaffected.

May 7, 1919. Dog No. 95.
Paraffin injected subdurally and dog allowed to live to determine irritating effects of paraffin. None observed to date.

May 20, 1919. Dog No. 96.
Dura incised.
Culture of long chain streptococcus and staphylococcus aureus injected under dura. Dog unaffected.

Paraffin injected subdurally.

May 24th, culture of streptococcus pyogenes and staphylococcus aureus injected through slit in dura. Dog unaffected.

May 24, 1919. Dog No. 98.
Dura exposed and incised and culture streptococcus pyogenes and staphylococcus aureus injected subdurally. Dog unaffected.

1 c.c. of 24-hour old virulent culture streptococcus hemolyticus injected into femoral vein. Blood culture in 24 hours was sterile.

In conclusion we can only state that thus far, subdural injections of paraffin give a better type of adhesions than gauze pressure because more accurate and that such injections do not seem to produce cerebral irritation. We propose to continue our experiments, however, and also to investigate the apparently wonderful bactericidal effect of dog’s serum.
TREATMENT OF BRAIN ABSCESS.

DISCUSSION.

Dr. Edward B. Dench, New York City, commended the valuable experimental work done by Dr. McCoy. Dr. McCoy's work had brought out the advantages of the method of Ballance in the matter of adhesions. This was of great practical value.

He was sure he had lost a number of cases in the earlier days of his practice by trying to clean out every part of the cavity. In encapsulated cases one must clean out the cavity. In a good many cases seen in the early stages there was not a firm capsule, only a limiting membrane. In these cases too much manipulation was dangerous. McCawen, who had the best results, did the least manipulation. He simply opened the cavity, put in a drain, and the cases recovered. The speaker agreed that the capsule must be removed if present. In a large majority of encapsulated cases the capsule was very thick. The normal intracranial pressure crowded out the pus after the capsule had been excised and there was a tendency for the abscess cavity to collapse. Circumstances were most favorable for drainage when the opening was made at the most dependent portion of the abscess. It was not always possible to drain at the most dependent portion. The fact that the cases most apt to be cured are those which are drained through the tympanic roof, was explained in part on the basis of there being less reason for secondary meningitis. The speaker did not use an encephaloscope, but had found that two very thin retractors, passed along a director, could be employed without damage to the brain. By inserting and then separating these retractors, complete drainage of an abscess could be secured. He had found the retractors more satisfactory than the encephaloscope.

Dr. Eugene A. Crockett, Boston, Mass., held that the question of the recovery from brain abscess operations was really dependent not so much upon the surgery as upon the preliminary diagnosis. In his experience, cases recovered when there was not unnecessary mauling of the tissues. Where it was necessary to explore the brain in the search for the abscess the mortality was very high, because of the injury to the brain tissue. Dr. McCoy had said the common cause of the fatality is secondary meningitis: in the speaker's experience secondary meningitis was relatively rare. Unless one caused a great deal of injury to the brain tissue in the exploration the meninges were not likely to be infected to any great extent. He agreed with Dr. Dench that the first and most important point was to do just as little manipulation as possible, to get through as rapidly as possible, and with as little injury to brain tissue as possible, especially in cases with no limiting membrane. The making of too small an opening was deprecated. An incision a quarter or a half inch long might fail to reveal an abscess which a little larger exposure would have instantly revealed. That was the commonest source of error which he had observed in the past. The essentials to success were first, a large opening of the skull; second, a very limited amount of exploration of the brain; third, a small amount of handling of brain tissue, and no attempt at curetting out the abscess cavity by any method. Whether one walled off the dura or did not wall it off at all was a secondary matter.

Dr. John W. Murphy, Cincinnati, Ohio, added, with reference to the point about introducing a hemostat, that if there were no capsule the hemostat would go in, whereas if there were a capsule, it would not. He had treated 48 cases of abscess, largely traumatic. In traumatic abscess there was a good chance of recovery, because there was a tract which could be entered without infecting the meninges. Puncturing through the infected area means killing the patient. If one punctured
through a clean area and found nothing, very little harm was done so far as meningeal infection was concerned. Exploring the brain was not fraught with danger providing the exploration be made through a clean area.

Dr. Ferdinand Lemaitre, Paris, France, said: "I am especially interested in the question of the treatment of abscess of the brain, upon which subject I have just read a report to the French Oto-Rhino-Laryngological Congress, held in Paris the twelfth of last May.

My work is based upon 18 observations, six of which were cases of encephalic abscess of auricular origin (four of the brain resulting in cure, and two of the cerebellum, of which one was cured and the other was being cured when death resulted from a second abscess). The other twelve observations pertain to encephalic abscesses or foreign bodies, following wounds.

"The principle of my method consists in accomplishing what I call the 'exclusion of sub-arachnoid space,' by analogy with the exclusion from the large peritoneal cavity which is observed in the course of certain appendicitis cases.

"This exclusion is accomplished in the following manner: In no case and under no pretext do I cut the meninges; in no case and under no pretext do I use a bistoury. With a fine Pravez needle I work the meninges and the encephalus at the assumed location of the abscess. When the pus comes out through the outer opening in the needle, I replace the latter by a grooved probe, along the groove of which the pus flows. Then I introduce into the very small orifice of the meningeal gap (with the aid of a very small bent otologists' forceps) a tiny rubber drain, one millimeter in diameter.

"Now, around this drain adhesions form very rapidly; they transform the meninges into a fibrous ring and this accomplishes the process of exclusion.' Every day for five or six days, I change the drain, using larger ones progressively (three, five, seven and nine millimeters in diameter). I obtain in this manner a meningeal-encephalic canal by which the drainage is accomplished very easily, and by which an encephaloscope can be introduced. The encephaloscope has enabled me, in traumatic lesions of war, to remove, checked by the eye, sequestra, and twice projectiles (shell splinters).

"The exclusion of the meninges is accomplished very easily; it permits the avoidance of, first, meningitis, in creating a fibrous barrier between the sub-arachnoid spaces and the drainage canal; second, encephalic rupture, since the brain of the cerebellum find before them, instead of the opening of an incision, a barrier, and a reinforced one.

"This method of 'exclusion of sub-arachnoid spaces,' seems to me to modify considerably the prognosis of the treatment of encephalic abscess of otitic origin, and in a more general way encephalic surgery."

Dr. William Wesley Carter, New York City, had been very much interested in Dr. McCoy's use of paraffin in the experiments described. He bad had considerable experience with it as a packing and as a rigid splint to be used after intra-nasal operations. One of the chief characteristics of paraffin, which is a saturated hydrocarbon, is that it is non-susceptible to the action of all chemicals. It acts mechanically and not chemically. Pressure caused diapedesis from the blood vessels and damming off from the meninges. Dr. McCoy's selection of pure paraffin is a very happy suggestion. The excellence of this technic is commendable. Dr. Carter was glad to see that Dr. McCoy had decided that paraffin itself, without any chemical substance, was the thing to use.

Dr. Lee Wallace Dean, Iowa City, Iowa, held that the prognosis of brain abscess depended upon the extent to which nature had erected a barrier against infection, and the amount of manipulation of brain
tissue at the time of the operation. He had in mind two types of brain abscess in which with an operative procedure which is nil so far as the brain is concerned, very satisfactory results could be secured. The first type was that which followed the penetration of the dura by a spine of bone, the result of a fracture of the temporal bone. This type of case he had seen weeks or months after the accident. The only treatment he had considered advisable, was the removal of the depressed piece of bone, and the insertion of a cigarette drain through the opening in the dura, the application of hot compresses. Following the removal of the piece of bone, pus would exude from the opening, and around this would be found adhesions. A few days of drainage with the cigarette drain and hot compresses, produce very good results. The second type of cases was one where nature had produced a discharging sinus through the dura. Frequently the pus discharged through the mastoid tympanum and external canal. In this type of cases he felt that the less manipulation the better. The insertion of a soft cigarette drain, together with hot compresses, would bring about very satisfactory results.

Dr. John F. Barnhill, Indianapolis, Ind., thought it had been well said that over-manipulation kills the patient with the brain abscess. It had been reasonably well settled that these cases should not be mauled and handled until the operator was more responsible for the patient’s death than the abscess. It was necessary to secure adequate drainage in a situation where it could maintain itself, but in all cases of otitic abscess no other operation was justifiable except one which goes through the tegmen tympani or tympanic antrum. A large bone flap should be turned down, so that the abscess could be found with ease. This was better than depending upon a rather small trephine opening. He had always used through and through drainage. He was sure that cases had been seen in which the abscess wall was too thick to be collapsed and obliterated in the way which he described. In this class of cases Krause had recommended the dissection of the limiting wall. He did not agree with this.

In connection with Dr. McCoy’s paper the speaker referred to his own efforts toward infecting the dura of the dog. Some years ago he had presented a paper detailing his attempts to infect the lateral sinus of the dog. He had found it almost impossible to do so, despite the fact that he dropped the needles with which he punctured the dura on the floor, rubbed them in the filth and dirt of the dissecting room, and resorted to other measures tending to cause infection. These experiments had led him to wonder whether the dog is not more resistant to infection than other animals.

Dr. Joseph C. Beck, Chicago, Ill., thought a distinction should be made between animal experiments, and those of man. He called attention to the fact that paraffin sometimes reacts so that new growths formed the paraffinoma. It might be that paraffin injected into the dural spaces would cause a tumor instead of walled off an abscess of the brain. More work of this kind on more animals of different species, such as the guinea-pig and the monkey, would be worth while. From his own experience with brain abscess, which had not been very large, he had found it impossible always to tell the form of abscess, whether firm capsule or not in the given case, and hence it seemed inadvisable to advocate this or that form of treatment for all cases.

Dr. John W. Murphy, Cincinnati, Ohio, emphasized the importance of the point concerning the mauling of the tissues. The less handling of the brain tissues the better the prognosis. Inasmuch as in the majority of these cases which he had encountered the brain abscess had had its origin in suppurating ear disease, he had preferred to go up through
the tegmen tympani, hunting for abscess from that direction. When found, it was most easily drained through the tegmen tympani route. In searching for the abscess he had had the best results with the Graefe knife. When an encapsulated abscess was encountered one could tell it by the sense of resistance. As soon as the pus was discovered he passed in a hemostat and evacuated the cavity, never removing the hemostat, thus preventing the collapse of the cavity. He always preferred to have a neurologist present to assist in the locating of the abscess. Very frequently the patient might have all the symptoms of brain abscess, and yet no abscess be found. He cited a case in which there had been a discharging ear for six weeks. The neurologist insisted that there was a brain abscess. After removing a considerable amount of necrotic bone he was inclined to stop, in view of the fact that he had had several cases in which the symptoms disappeared after the removal of necrotic bone. The neurologist, however, insisted on proceeding with the operation. With the Graefe knife he made exploratory incisions in several directions. No pus was found. The patient recovered, without a single bad symptom. Aside from the extensive exploration, he felt sure that part of the good result was due to the use of the thin knife instead of the searcher.
NASAL SINUS DISEASE IN INFANTS AND YOUNG CHILDREN, INCLUDING A BACTERIOLOGICAL STUDY.

By L. W. DEAN, M. D., Iowa City, Ia., and MARGARET ARMSTRONG, M. D. Iowa City, Ia.

All of the bacteriological work mentioned herein was done by Dr. Armstrong, Pathologist for the Head Specialties in the University Hospital.

The importance of the work in nasal sinusitis in infants and young children is always made plain to us by reviewing some of our cases. We think the first case that was responsible for our work in this subject, was a boy eight years of age who had multiple arthritis; he was confined to bed; he could not feed himself. In January, 1917, I removed his tonsils and adenoids, and examined the nasal sinuses, and reported no pathology,—two months later he was no better. A second examination of the sinuses was made, and a negative report sent to the orthopedic surgeon. Four months after this, the boy was again seen, and he was still no better. The orthopedic surgeon told me if we did not find the focus of infection that every joint in his body, including the temporomandibular would soon be ankylosed. With such a serious problem before us, a third complete examination was made. It showed involvement of the ethmoids right, and the ethmoids and sphenoids left. This condition was eradicated. This resulted in the disappearance of all acute joint trouble. Not only did he not have any acute trouble in his joints but the condition was so quiescent that the usual orthopedic treatment for ankylosis was instituted with very satisfactory results. Recently I saw this boy attempting football on his crutches. There was evidently a family organism, as his brother who did not come under our care, died of multiple arthritis with ankylosis of every joint including those of the spinal column and jaw.

I think of a case eighteen months old, with a posterior cleft operated twice by good surgeons, with infection and bad results, where post operative healing took place perfectly after the eradication of the sinus infection.

Then a case of seven years of age that had had since one year of age a tendency to develop a temperature of 101°, with evidence of respiratory infection without apparent cause—more noticeable when he has a cold, but is present when he does not have one. The
removal of the tonsils and adenoids diminished the number of attacks only; six months after their removal he had an irregular temperature, ranging from normal to 102 degrees without the patient giving any sign of having fever. A chronic bilateral nasal sinus infection was treated eighteen months ago, with a complete disappearance of his trouble.

Then I think of a case of noma sixteen months old that died, and the postmortem revealed an unsuspected necrosis of the ethmoids; of a patient four and one-half years old relieved of cyclic vomiting by treatment of a left Highmorian empyema; of a baby twenty months old relieved of a miserable nasal discharge, by treatment of the nasal sinuses; of a child eleven years old with asthma, and left sphenoidal empyema—one year after the drainage of the sphenoid reporting no asthma.

Then there are cases of nephritis, headache, neuralgia of the fifth nerve, neurotrophic disturbances, especially in infants, chorea, pulmonary infections, laryngitis, improved if not apparently cured by the treatment of nasal sinus disease.

None of these cases have been under our care alone. Most cases were referred by the Department of Pediatrics or Orthopedic Surgery, for study. In every case, a pediatrician or orthopedic surgeon, or both was associated with us in the handling of the case. The best thing that can be said about this work is that these men have been satisfied with the results. In short, I think we may safely say that the orthopedic surgeon expects us to find the focus of infection in all of his children suffering from infectious arthritis.

In all cases of infectious arthritis in infants and young children studied by us during the last eighteen months, the source of infection has been in the upper respiratory tract. It has been in the nasal sinuses, or faucial or pharyngeal tonsils. In no case were the teeth the source of the infection, or the gall bladder, or the appendix. We get the impression from our cases at least that in children, continued search of the throat and nose should be kept up if the infection persists. We never return a case of systemic infection to the pediatrician or orthopedic surgeon without a request for the return of the patient if any acute trouble appears; we get these patients back frequently and find a sinus is not draining properly, or we have overlooked a diseased cell. The results of repeated examination and treatments have been most satisfactory.

We have found that our methods of diagnosis in this class of
cases are so unsatisfactory that it is only by exercising the greatest patience, and making one examination after another, and not giving up until the acute trouble in the joint has disappeared, that we secure our good results.

In our series in no case was the lingual tonsil found to be the source of infection. Our adult orthopedic service is not one-tenth as large as the children's, nevertheless in the adults we have found the focus in several cases to be in the lingual tonsil. With our present series of cases, we are not prepared to exclude either lingual tonsil, gall bladder, appendix, etc. as foci in children, but we do feel our results indicate the necessity of continued search in the nose and throat.

Occasionally, elevation of temperature and increased joint disease has been noted following operation on, or treatment of the sinuses. This, we have found to be due to injury of the joint during treatment or operation, and not to any added infection.

All serious cases were examined for syphilis, and where this condition was found they were excluded from our study.

Having found what sinuses are present, the diagnosis of sinus disease is still a very difficult one. It is only by repeated examinations of the nose, careful study of the case from every angle that a proper diagnosis can be made. We feel that the bacteriological investigation of the sinuses is a very important aid. Especially is this true of the Highmorian antrum which next to the ethmoids we have found most frequently diseased in the class of cases under consideration. In the diagnosis of obscure sinus disease it has given us the most satisfactory results.

The macroscopic examination of the washings from the sinuses is not reliable. An antrum puncture may be made in the ordinary way, and the fluid coming from the nose, may be perfectly clear, and still the antrum be filled with thick pus. Or the washings from the antrum may contain numerous macroscopic particles which may be on one hand, made up of pus cells with virulent organisms; or on the other hand, pure mucus without pus cells or virulent organisms. Ordinary antrum puncture and the washings of the contents of the sinus into the nose, we do not feel is satisfactory; certainly, for purposes of a bacteriological examination it is for numerous evident reasons a very unsatisfactory procedure. Our method in making the bacteriological examination of the sinuses, will be described later in this article.
The most important thing in the treatment of nasal sinus disease in infants and young children is the removal of the adenoids and diseased tonsils if present. It is necessary to remove the tonsils if they are diseased, as well as the adenoids.

In one of our cleft palate cases two years of age, hemolytic streptococci were recovered from each antrum. This youngster had a history of having had erysipelas. He had two discharging ears—each being due to a hemolytic streptococcus. A rabbit injected with a culture of streptococcus from the antrum showed marked toxemia in twenty-four hours from which it recovered and later developed an arthritis which persisted for two months. Two months after the injection, the animal was killed, and the findings were as follows: Chronic bursitis, fibrosis of the right lung, endocarditis, a hemolytic streptococcus was isolated from the joints and heart. The interesting thing about this case is that for six or eight weeks after the removal of the adenoids, and by using various kinds of treatment, we were unable to eradicate the nasal sinus disease. We did not want to remove the tonsils because of the scar tissue which would form and perhaps interfere with the successful closure of the posterior cleft. After six or eight weeks of treatment it seemed perfectly plain that it was a question of either removing the tonsils, or not eradicating the sinus disease. The tonsils were removed. After the removal of the tonsils the same nasal treatment was continued, and several weeks after, the sinuses were found sterile. One ear had become healed; the other ear was very much improved. The clinical symptoms of the sinus disease had disappeared. From the tonsils, the same hemolytic streptococcus was recovered. The only possible way to get rid of the sinus disease in this instance was to remove the tonsils.

Up to July 1, 1918, we had examined the sinuses of two hundred thirty-four children thirteen years of age or younger, suffering from adenoids. Many of them had also chronic tonsilitis. In 15 1/2% of these cases an infection of one or more sinuses was found. These sinuses infections were not treated, only the tonsils and adenoids removed, and the patients were asked to return in four or six weeks for examination. Only seven cases returned for examination; five out of the seven were found to be apparently free of sinus disease, the disappearance of the sinus disease was due to the removal of the tonsils and adenoids.

Since July 1, last, we have investigated the sinuses in one hundred forty-five cases with adenoids, or with adenoids and chronic
tonsilitis. Of this one hundred forty-five, sixty-five had some definite sinus disease. The infection in many instances being exceedingly mild and in some instances very virulent. The bacteriological findings in these cases will be discussed later. These patients had their tonsils and adenoids removed and were asked to return in four or six weeks for examination. Six returned, and of these, four were found to have no sinus disease.

We feel, the first thing in the treatment of sinus disease is the eradication of adenoids, and diseased tonsils if present. Sinus disease in children yields particularly well to treatment. The method of Haskin and Coffin we have found to be exceptionally excellent. Especially has the Haskin treatment proven successful in our posterior cleft cases. We do not hesitate with our Highmorian sinus cases to make an opening in the inferior meatus very small, so small that it will close in twenty-one days. Through this opening a canula may be introduced for the purpose of this irrigation, or for the use of the Coffin treatment.

Naturally, operative work on the turbinates, or destruction of the sinuses is to be avoided in infants and young children. Only rarely is it necessary to resort to such procedure. As I view it that would be indicated only in those very severe cases of arthritis, or systemic infections where local treatment and climatic influence seemed to be of no avail. Those children who are suffering from sinus disease, and who can be sent to a high and dry climate, are certainly very much benefited.

We had one arthritis case in a young child two years ago that in spite of our treatment did not heal until hot dry weather. Then the nasal condition disappeared with the usual marked improvement in the arthritic condition.

Our most interesting work during the past year has been a study of the bacteriology of sinus disease in this class of cases.

Before undertaking to explain our findings in diseased sinuses it seemed wise to familiarize ourselves with the bacterial findings in healthy sinuses. Skillern says that in health the sinuses are sterile and quotes the work of Körne, who in twenty-one autopsies on bodies dead not more than two hours, found them to be sterile in every instance. But we were not dealing with dead bodies and it was necessary to study the efficiency of our technique together with the bacteriology of the sinuses. Consequently, all of the children who came into the clinic for chronic tonsilitis and adenoids were carefully studied for evidence of sinus disease and
those in which the findings were negative were subjected to the same bacteriological examinations as those in which they were positive.

We found it practicable to concentrate our attention upon the antra because, with the exception of the ethmoidal cells, they are the most frequently diseased and the most uniformly developed in young children and of all the nasal sinuses the most easily accessible. While the child is asleep for the purpose of the tonsillectomy the antra can easily be examined without inconvenience or danger.

A trochar was passed into the antrum through the antro-meatal wall and through this a long blunt-pointed needle attached to a glass syringe was inserted. One to three c.c. of sterile normal salt solution was thrown into the antrum and drawn out. The solution was forced in and out of the antrum several times so as to loosen up any pus which might be clinging to the sinus wall. The presence of pus or mucus was noted and cultures were made from the washings.

An effort was made to rule out the possibility of contaminating the antra as much as possible by cleaning the mucous membrane of the nose with pledgets of sterile cotton and washing with 50% alcohol, before passing the trochar through the wall. In a number of cases the middle meatus was painted with a solution of methylene blue with the idea of ascertaining whether or not the salt solution might flow out through the ostium with positive pressure and be drawn back in again with negative pressure, thereby contaminating the washings. In no case was there the slightest tint of blue obtained in the washings.

If contamination should occur either at the point of entrance of the trochar or through the ostium during the administration of the anesthesia the bacteria found in the culture would have been such as are normally found in the nose. In this connection a knowledge of the normal flora of the nose in our native surroundings is of value. In examining the noses of one hundred and sixty nurses in our hospital for diphtheria carriers, record was made of the bacteria present. The staphylococcus was found in every case, an encapsulated diplococcus in seventy-three, diphtheroid bacilli in fifty-nine, micrococci catarrhalis in seventeen, gram negative bacilli in ninety-three, bacillus subtilis in seven and in only three instances the streptococcus pyogenes.

In infants and young children examined the washings from the antra varied from perfectly clear fluid without any trace of
cloudiness to thick white pus which could only with difficulty be
drawn through the aspirating needle. In some instances the
washings contained varying amounts of clear glairy mucus which
on microscopic examination was seen to contain no pus cells. In
still other cases the antra contained both mucus and pus. Out
of the fifty-four apparently normal sinuses examined, pus was
found in but two cases and mucus in eight.

As soon as the normal salt solution was aspirated from the
antrum the presence or absence of pus and mucus was noted and
a small amount of the contents was smeared over the surface of a
blood agar plate and the remainder transferred to beef infusion
bouillon. Care was taken to use enough media so that it would
not be diluted more than 10% by the addition of the washings
from the antrum and not more than 1% or 2% if any consider-
able amount of pus or mucus was present. For the first thirty
or forty cases, two bouillon cultures were made, one an aerobic
culture and the other a partial tension culture but the two gave
such uniform results that the partial tension culture was aban-
donked at this time.

No routine examination of sinuses other than the antra have
been made excepting in those instances where it was deemed
of especial importance to study the upper posterior sinuses.
These were the cleft palate cases, the arthritic cases, and those
cases where an upper posterior sinus was suspected of being
the etiologic factor in some constitutional disorder. Here an
attempt was made to determine the bacteriologic conditions of
these sinuses by inserting a long slender catheter into the middle
meatus and so placing the tip that by suction secretions could be
drawn into the catheter just as they flowed from the sinuses.
Whatever material was collected in this manner was immediately
transferred to the culture media. Naturally, this method was
unsatisfactory in that contamination from the lower portion of
the nose is sure to take place and that one never feels certain
that pathogenic bacteria may not be present in the sinuses and
yet not be obtained in this way. However, in the absence of a
better method we feel this procedure to be very useful.

The results of our sinus examinations are summed up in the
following table:
<table>
<thead>
<tr>
<th>Condition</th>
<th>No. of Cases</th>
<th>Antra washing clear</th>
<th>Antra washing contain mucus</th>
<th>Antra washing contain pus</th>
<th>Antra Cultures Sterile</th>
<th>Antra Cultures contain bacteria Hem. Strepto. neg.</th>
<th>Antra Cultures Hem. Strepto. pure culture</th>
<th>Antra Cultures Hem. Strepto. and other bacteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Clinically antra apparently normal...</td>
<td>55</td>
<td>44 (80%)</td>
<td>3 (5.4%)</td>
<td>8 (14.5%)</td>
<td>39 (70.9%)</td>
<td>13 (23.6%)</td>
<td>1 (1.8%)</td>
<td>2 (3.6%)</td>
</tr>
<tr>
<td>Antra would have been considered normal but for blurred X-ray picture</td>
<td>43</td>
<td>25 (58.1%)</td>
<td>8 (18.6%)</td>
<td>10 (23.2%)</td>
<td>24 (55.8%)</td>
<td>17 (39.5%)</td>
<td>2 (4.6%)</td>
<td></td>
</tr>
<tr>
<td>Positive local evidence of sinusitis. No systemic lesions</td>
<td>12</td>
<td>2 (16.6%)</td>
<td>8 (66.6%)</td>
<td>2 (16.6%)</td>
<td></td>
<td>6 (50%)</td>
<td>3 (25%)</td>
<td>3 (25%)</td>
</tr>
<tr>
<td>Arthritis cases condition persisting after removal of tonsils, etc.</td>
<td>12</td>
<td>3 (83.3%)</td>
<td>10 (83.3%)</td>
<td>2 (16.6%)</td>
<td></td>
<td>5 (83.3%)</td>
<td>6 (100%)</td>
<td>6 (100%)</td>
</tr>
<tr>
<td>Chronic ototubal cases..........................</td>
<td>8</td>
<td>3 (37.5%)</td>
<td>4 (50%)</td>
<td>1 (12.5%)</td>
<td>5 (62.5%)</td>
<td>1 (12.5%)</td>
<td>6* (100%)</td>
<td>6 (100%)</td>
</tr>
<tr>
<td>Cleft palate cases</td>
<td>7</td>
<td>4 (57.1%)</td>
<td>1 (14.2%)</td>
<td>2 (28.6%)</td>
<td>2 (57%)</td>
<td>1 (14.2%)</td>
<td>2 (28.6%)</td>
<td>1 (28.6%)</td>
</tr>
<tr>
<td>Osteomyelitis cases</td>
<td>3</td>
<td>1 (33.3%)</td>
<td>2 (66.6%)</td>
<td>1 (33.3%)</td>
<td>1 (33.3%)</td>
<td>1 (33.3%)</td>
<td>1 (33.3%)</td>
<td>1 (33.3%)</td>
</tr>
</tbody>
</table>
We had altogether fifty-five cases in which, prior to the antra puncture there was no reason, either systemic or local for suspecting nasal sinusitis. Of these, only two, or less than 4%, had pus in the antral washings; eight, or approximately 15%, had clear mucus in the washings; and forty-four, or 80%, had neither pus or mucus. In these cases there was a very close similarity between the macroscopic and cultural finding, for it may be seen by referring to the table that thirty-nine, or 70%, of fifty-five cases were sterile; that three, or 5+%, contained a hemolytic streptococcus; and 24% contained organisms other than hemolytic streptococci.

I have placed in a separate group those cases which gave no definite evidence of sinusitis before the taking of X-ray plates, when one or more sinuses were found to be blurred. Of these there were forty-three. The washing of the antra showed no evidence of pus or mucus in 58%. Mucus was present in the washings in 24% of the cases and in 18% of the cases, pus was found. Here again the cultural tests are in close accord with the macroscopic results of the antral washings: 55% of the cultures were sterile, 4.6% contained a hemolytic streptococcus, and the other 40% contained various organisms such as are often found in the nares.

Out of the ninety-eight cases comprising these two groups, cultural tests showed that bacteria were present in the antra in thirty-five cases or altogether in fifty-one antra. Out of this number the staphylococcus was found in forty-five, the pneumococcus in thirteen, unidentified gram negative bacilli in eight, diphtheroid bacilli in seven, micrococcus catarrhalis in seven, hemolytic streptococcus in five, staphylococcus viridans in one, and Friedländer's bacilli in two.

The most interesting group was a series of twelve arthritis cases. These were all cases in which the arthritis had failed to clear up after the removal of the tonsils and adenoids. The source of the trouble was sought in the sinuses. The youngest of these cases was three years old, the oldest thirteen years. The improvement in the joint condition following treatment of the sinuses, was in each instance most satisfactory. Here the findings are in marked contrast to those above. Nine of the twelve had definite pus in the antra, two had thick glairy mucus while in the other case, thick pus was found in the ethmoidal cells, but washings from antra were not obtained. In eleven of these
cases a hemolytic streptococcus was found in the accessory nasal sinuses.

The streptococci from this group of cases were tested for their action upon sugars. All fermented lactose and salicin and were without action on mannite and inulin, and were therefore classified as streptococcus pyogenes. They were also tested for their virulence by inoculating rabbits. Three to four e.c. of forty-eight hour beef infusion bouillon cultures were injected intravenously into well grown young rabbits. Three of the animals died from acute toxemia in periods varying from one to four days. At autopsy the livers, spleens and kidneys were found to be large and hyperemic and showed areas of focal degeneration. Two of the rabbits had pneumonia. The streptococcus pyogenes was isolated from the heart blood and from the spleen of all three of these rabbits. Four of the animals survived the acute symptoms and were apparently well but after periods varying from four to six weeks developed arthritis and were killed. Each one of these four rabbits had one or more knee joints involved. The pathological changes found in the involved joints were practically identical in every instance. The animal while living, held the joint stiff, and refused to move it in moving about. The tissues surrounding the joints were swollen and slightly hyperemic; the bursa and synovial sacs contained a markedly increased amount of fluid which was thick and milky, and the synovial membrane was slightly thickened. From the joint fluid of three of these rabbits a hemolytic streptococcus which fermented salicin and lactose was cultured. The cultures from the joints of the other were sterile, however, a gram positive microcococcus arranged in pairs and short chains, was found in sections prepared from the tissues surrounding the joint.

In each of these last four rabbits, the maxillary sinuses were carefully opened and studied. In two cases both sinuses appeared to be normal. Cultures made from one was sterile, and from the other contained only a sparse growth of staphylococcus. In the other two rabbits the sinuses were definitely diseased; the mucosa was reddened and thickened. Cultures revealed a hemolytic streptococcus in the antra of both.

Two of these chronic diseased rabbits had endocarditis and one of the others a small focal abscess in the wall of the left ventricle. The heart of the other seemed to be free from disease. Unfortunately, microscopic sections were made from the
viscera of only two of these rabbits—both showed degenerative parenchymatous changes in the liver, spleen and kidneys; in the case of one animal quite marked, in the other very slight.

The rabbit inoculated from one case of arthritis never developed any symptoms. The dose used was probably too small. Those inoculated from three other cases are yet living but the requisite time for the development of arthritis has not as yet elapsed.

In the beginning of this work the purpose of animal inoculation was merely to test the virulence of the organism under consideration. When the first animal developed arthritis the idea that the hemolytic streptococcus found so uniformly in the diseased sinuses of arthritis cases might have a selective affinity for joint tissue naturally suggested itself. It now seemed unfortunate that the first four rabbits had died during the acute stages of toxemia. From this time the dose was decreased, and two animals were inoculated, one with 4 and the other with 3 e.e. of twenty-four hour cultures of the streptococcus. It was hoped that by this procedure at least one of them would develop chronic symptoms. Four rabbits were also inoculated with hemolytic streptococcus from acute mastoiditis cases, and one with a hemolytic streptococcus from a diseased sinus in a cleft palate case. Two of these also developed arthritis. While our series is as yet too small to warrant the drawing of any definite conclusions it hardly seems probable that any peculiar selective action is here demonstrated.

During this period, twelve infants suffering from posterior palate clefts were bacteriologically investigated. We do not operate for the closure of posterior clefts in children until we are sure the nasal sinuses are not infected. Nasal sinus disease if present, is almost sure to cause sloughing. Haskin's method of treating sinus disease, is particularly efficient in this class of cases. In only seven were the antra sufficiently developed to justify an antra puncture's being made. Five of the seven cases had viable bacteria in one or both antra. However, in only one case was the hemolytic streptococcus found. This child had had erysipelas and later developed double mastoiditis. From the mastoid cells pure cultures of hemolytic streptococci were obtained. Of the remaining four cases three had only one diseased antrum. The staphylococcus was found in all of these, the pneumococci in two and the streptococcus viridans in one. In the remaining case a clinical examination showed a very evident
sinusitis, the nose being continually full of pus and the mucosa red and hypertrophic. Pure cultures of pneumococci were found in both of the antra.

The pneumococci from all three cases was tested for their virulence. In the case of definite sinusitis the animal died of acute toxemia in eighteen hours. A similar dose from the other cases was without apparent effect.

In the five cleft palate cases where cultures were made only from the middle meatus one gave practically a pure culture of hemolytic streptococcus. Organisms from the other four cases were such as are habitually found in the nose.

DISCUSSION.

Dr. Ross Hall Skillern, Philadelphia, Pa., ventured that thoughtful reflection, in the quiet of one’s study, at the close of the day, if among one’s patients had been an infant or young child, was apt to bring an uneasy conscience. Not that any grave errors of omission or commission had been committed, but rather that one may have taken too much for granted. One was apt to overlook the old adage that negative findings prove nothing. All were well aware, of course, of the peculiar difficulties attending the examination and treatment of very young children. He had not made the systematic examination of the sinuses under general anesthesia, before operating for the removal of tonsils and adenoids, as suggested by Dr. Dean. It was not always practicable to do so, and, indeed, the idea had not occurred to him, but it was well worth remembering. He had always put the child on the back, allowing a few drops of a weak cocain solution to trickle back, through the nostrils, then making the examination. In the endeavor to use the nasopharyngoscope the child’s determination not to be examined would often get the better of the examiner’s patience.

One could easily see how a small infection in the nose of an infant might lead to disastrous consequences, and therefore the tremendous responsibility and importance of trying to ferret out such foci, as shown in Dr. Dean’s paper.

The bacteriological work detailed by Dr. Dean represented a new departure, so that any discussion, on that portion of the speaker’s paper, would be merely academic. He had read the paper not once, but four or five times, and was sure that merely listening to a paper of this kind did not give an adequate idea of its importance. The paper represented an enormous amount of new and important work.

Dr. Harmon Smith, New York City, emphasized the frequency of infections of the sinuses of young children. He had been forcibly impressed with this, particularly during the last two years. Dr. Dean had apparently omitted from his observations chronic bronchial disturbances in children, due entirely to sinus infection. The speaker had had a number of cases referred to him by general practitioners who had been unable to clear up the bronchitis. Relief of the sinus infection had relieved the bronchial condition.

Dr. Louis K. Guggenheim, St. Louis, Mo., had observed, not infrequently, in children, the distinct appearance of pus in the middle meatus, sometimes on one side, sometimes on both. In many cases the infection was due not to sinus infection but to adenoid suppuration, and by capillary attraction the pus had been drawn forward into the nose. If distinct disease of the antrum existed removal of the
adenoids would not bring about immediate cure, as it would in many of these cases. Distinct chronic sinus infection would not clear up so rapidly after removal of adenoids and tonsils. He had proved to his own satisfaction that many of the cases diagnosed as sinus disease were adenoid infections.

Dr. William B. Chamberlin, Cleveland, O., could not share Dr. Dean’s feeling with regard to the ease of diagnosis and treatment in the class of cases under discussion. The antrum of Highmore was easy to deal with, but sinusitis, in the ethmoid or the sphenoid, presented decided difficulties, in his experience. The field was narrow, and one was confronted by an especially difficult problem; one was between Scylla and Charybdis. If one overlooked the sinusitis, one was in serious trouble; if one tried to go in and clear out the infection, he might encounter serious difficulties. He cited a case of unilateral discharge in a child, three years of age, in which he made an examination, finding a large mass in the nasopharynx. He thought the obstruction in the nose might be due to a foreign body, but it was due to a large adenoid mass whose size was markedly increased by polyloid degeneration of adenoid tissue.

He asked Dr. Dean, in closing the discussion, to elaborate the questions of diagnosis and treatment. He thought the treatment as difficult as the diagnosis.

Dr. John J. McCoy, New York City, called attention to the inter-relationship of sinusitis, defective drainage, swelling of the mucous membrane, and systemic infection. Improvement in many of these cases was due to relief of the sinus infection. During the last eight years he had seen two cases of brain abscess in children. Neumann, of Vienna, who was in Washington when the speaker read a paper on the subject, asked what about the bacteriology. When told that the pneumococcus was the infective organism, he said the pneumococcus was always present in brain abscesses in children. The speaker asked if any of those present had seen brain abscess following accessory sinus disease in children. One of his cases had died. There was a tremendous swelling on Friday, and on Sunday, in opening up the sinus on each side he found a large epidural abscess on one side. After drainage the child did well for a few weeks, then had contralateral paralysis. On opening the frontal lobe a cupful of pus came out. In the other case there was frontal sinus disease. There had been swelling in the frontal region. Symptoms of brain abscess in the frontal lobe developed. This was opened, but the patient went from bad to worse. He then made an opening in the side, with free drainage from the front to the side, and recovery followed.

Dr. Dean, in closing the discussion, said he appreciated very much Dr. Skillern’s remarks. Both he and Dr. Armstrong considered Dr. Skillern an authority along the lines of pathology and bacteriology of sinus disease. In writing the paper he had tried to avoid making definite diagnoses, but rather to state the findings and let one draw one’s own conclusion. He would want to have a good deal more investigation of the subject made before he would come to any definite conclusion as to the exact method in which these adenoids and tonsils cause sinus infection in infants and young children.
CASE OF SARCOMA OF THE NASOPHARYNX WITH SOME INTERESTING FEATURES.

By DUNBAR ROY, M. D., Atlanta, Ga.

At the annual meeting of this Society in 1909 the writer presented the history of a case of sarcoma of the sphenoid, with additional remarks concerning the literature bearing upon this particular subject. The present case, while differing somewhat from the other in its anatomical location yet showed many similar clinical symptoms and points of interest in that they were developed very gradually, and the writer had the opportunity of watching these throughout the course of the disease.

CASE REPORT.

Mrs. R. T. B. white, age 70. This patient consulted me in the summer of 1916 on account of some deafness in the left ear.

History: Mrs. B. was a frail little woman although she had never had a serious spell of illness in her life except as mentioned below.

Family history: Negative as far as any positive record of systemic dyscrasia.

Present history: The only complaint elicited from the patient was the fact that she was becoming deaf in the left ear, accompanied by a feeling of fullness. Had never had ear aches or discharging ears as a child. Was comparatively free from colds. Was also troubled with an enlarged gland just below the ramos of the lower jaw on the right side. This was about the size of the end of the thumb and slightly tender.

Nasal Cavities: Right side free and normal in appearance. Left side narrow and small nasal spur at the base of the septum.

Nasopharynx. Appeared normal with the exception of a slight swelling in the neighborhood of the mouth of the left eustachian tube. Pharynx and tonsils normal.


The catheter was passed with some difficulty and inflation only partially accomplished.

Treatment at this time consisted in the internal administration of small doses of the iodid of potash and mercury salve to the enlarged gland. The left ear was treated by inflations. At no time was there any bleeding from the passing of the catheter. The patient improved only slightly and in a few weeks left for her old home in Alabama.

Feb. 27th, 1917, seven months later, the patient again consulted me on account of the left ear. She seemed some weaker in appearance. The patient gave me the interim history as follows: Soon after returning home she had
an attack of gall stones and suffered intensely. This was treated medically
and she was relieved without any operation. At the same time the enlarges
 gland on the right side disappeared and examination showed this statement
to be correct. Apparently she was feeling much better with the exception of
the increasing tinnitus and deafness in the left ear and with considerable
difficulty in breathing through the left nasal cavity. In fact at night she
was compelled to breathe entirely through the mouth. This symptom was telling
most decidedly on the equilibrium of her nervous system.

Examination: The pharynx showed thickening and bulging of the soft
palate on the left side. No ulceration was found. The tonsils appeared normal.
The patient talked with a decided symptom of paralysis of the soft palate
as is seen sometimes after diphtheria. The right nasal cavity appeared
normal.

On the left side there can be seen a firm gelatinous looking growth far back
at its junction with the nasopharynx. Manipulation shows it to be of firm
consistency and bleeding very slightly when touched.

It was impossible to pass the Eustachian catheter on that side as the
growth involved that whole upper part of the nasopharynx. A clinical diag-
nosis of sarcoma of the nasal cavity and nasopharynx was made. On account
of previous experiences with the operative treatment in this class of cases, I
advised the use of radium immediately.

A tube containing 10 milligrams of radium was placed immediately against
the growth through the nasal cavity and allowed to remain one hour. This
was repeated every fifth day until four applications had been used. No very
marked reaction or improvement could be seen at the end of this time and
the patient desiring to visit her son in Memphis, Tenn., was advised to make
the trip and consult Dr. E. C. Ellett in that city. One month later I received
a letter from Dr. Ellett stating that a Wassermann showed a plus 2 in the case
of Mrs. B. that two salvarsan injections had been given, with great improve-
ment in the patient’s condition and they greatly hoped that she would be
cured. Three months later the patient returned to Atlanta and brought me
the following note.

Memphis, Tenn.
Oct. 2nd, 1917.

Dear Dr. Roy:—

You probably remember the case of Mrs. B. whom you saw last spring. A
reference to your notes will recall to your memory the fact that the question
of diagnosis was between specific trouble and malignancy.

She left Atlanta and came here to Dr. Ellett who referred her to me.

A Wassermann gave 2 plus positive and she was, of course, put upon anti-
specific treatment, getting three doses of salvarsan and iodid internally with
mercurial injections.

For a time there was improvement which, however might have been the
result of the radium treatment which she had in Atlanta. At any rate a
continuation of the anti-specific treatment has not resulted in continued im-
provement. I think she has had a fair test of the anti-specific treatment with-
out benefit and had, therefore, best be treated with radium in the future.

Very sincerely,

Jno. M. Maury.
Another thorough examination of our patient showed that the growth had much increased and that the ethmoid cells on the left side were being invaded.

I then advised her daughter to take Mrs. B. to Dr. Kelley’s Hospital in Baltimore where she could obtain more intensive radium treatment as I thought this was the only chance for prolonging her mother’s life.

This advice was taken. Dr. C. V. Burnham sent me the following report: “Section from nasopharynx growth small round cell sarcoma. The X-ray plates of the head give no evidence of any bony growth and while the left aurum appears cloudy, this may be due to the position of the head.”

The patient remained in the Baltimore hospital for four months receiving radium treatments as follows:

Nov. 28, 1917, 1198 mgs. 2 hrs. applied to neck.
Nov. 30, 1917, 480 mgs. 1 hr. applied to neck.
Dec. 2, 1917, 2494 mgs. 1 hr. applied to neck.
Dec. 4, 1917, 1024 mgs. 3 min. direct to throat.
Dec. 6, 1917, 844 mgs. 1 hr. applied to neck.
Dec. 8, 1917, 1238 mgs. 2 hr. applied to neck.
Dec. 10, 1917, 1015 mgs. 1 hr. applied to left cheek.
Dec. 14, 1917, 500 mgs. 1 hr. applied to neck.
Dec. 16, 1917, 917 mgs. 1 hr. applied to neck.
Dec. 12, 1917, 958 mgs. 1 hr. applied to neck.
Jan. 4, 1918, 764 mgs. 1 hr. applied to neck.
Jan. 6, 1918, 842 mgs. 1 hr. applied to neck.
Jan. 7, 1918, 971 mgs. 1 hr. applied to neck.
Jan. 9, 1918, 1857 mgs. 3½ hr. applied to neck.
Jan. 11, 1918, 531 mgs. 3 min. direct to throat.
Jan. 13, 1918, 760 mgs. 5½ min. direct to nose and throat.
Jan. 15, 1918, 1163 mgs. 1 hr. applied to head.
Jan. 17, 1918, 694 mgs. 3 min. direct to nose and throat.
Jan. 19, 1918, 873 mgs. 1 hr. applied to neck.
Jan. 21, 1918, 1200 mgs. 1 hr. applied to neck.
Jan. 23, 1918, 1011 mgs. 1 hr. applied to neck.
Jan. 25, 1918, 764 mgs. 2 min. direct to nasopharynx.
Jan. 28, 1918, 965 mgs. 1 hr. applied to neck.
Jan. 30, 1918, 1065 mgs. 1 hr. applied to neck.
Feb. 1, 1918, 1060 mgs. 1 hr. applied to neck.
Feb. 4, 1918, 999 mgs. 1 hr. applied to neck.
Feb. 6, 1918, 953 mgs. 1 hr. applied to neck.
Feb. 8, 1918, 501 mgs. 4 min. direct to throat.
Feb. 11, 1918, 1159 mgs. 1 hr. applied to neck.
Feb. 13, 1918, 883 mgs. 3 min. direct to throat.
Feb. 15, 1918, 495 mgs. 1½ min. direct to throat.
Feb. 16, 1918, 594 mgs. 3 min. direct to throat.
Feb. 18, 1918, 1009 mgs. 1 hr. applied to left side head.
Feb. 20, 1918, 1058 mgs. 1 hr. applied to left side head.
Feb. 23, 1918, 1150 mgs. 1 hr. applied to neck.
Feb. 25, 1918, 1096 mgs. 1 hr. applied to neck.
Feb. 27, 1918, 1078 mgs. 1 hr. applied to neck.
Feb. 28, 1918, 505 mgs. 1½ hr. applied to head.
Mar. 4, 1918, 1137 mgs. 1 hr. applied to neck.
Mar. 6, 1918, 615 mgs. 1 hr. applied to neck.
Mar. 8, 1918, 628 mgs. 6 min. direct to nasopharynx.
Mar. 11, 1918, 1031 mgs. 1 hr. applied to neck.
Mar. 13, 1918, 1118 mgs. 1 hr. applied to neck.
Mar. 15, 1918, 1097 mgs. 1 hr. applied to neck.
Mar. 19, 1918, 959 mgs. 6 min. direct to throat.

On her history chart the following note was made at the time of the last visit. "The right Eustachian tube easily seen. Left one not seen very well. Left nostril quite difficult to enter. The patient cannot breathe through the left nostril but blows through it better than she used to. Growth is much reduced. There is a defect in soft palate on left. Swelling on the left side is quite small compared to what it was, but there is just as much discharge as ever."

An office examination made by me on her return showed the following condition: Patient certainly seems stronger and in better spirits. The growth in the nasopharynx had been reduced at least two thirds. The left nasal cavity posteriorly is completely filled with the growth accompanied by a profuse purulent discharge which is quite offensive. The nasal cavity was kept as clean as possible. The hearing in the left ear was practically negative. The patient returned to her old home in Alabama expecting later to again have the radium treatment in Baltimore. However the patient's condition gradually became worse and in two months she died evidently from a general sarcomatous toxemia.

Remarks: The fact that this case showed a plus 2 Wassermann reaction is by no means unusual. Pathologists tell us that it is not uncommon to have a positive Wassermann in cases of malignant growths, tuberculosis, malaria, and other similar conditions.

It is for this reason the writer believes that too much confidence is placed in this test for the determination of syphilis. In a paper before this Society last year he called attention especially to this one fact. The partial disappearance of the nasopharyngeal portion of the growth under the influence of radium was indeed remarkable. The writer would not have believed that such was possible had not the case been under his own personal observation. Had not the growth penetrated into the vascular region of the ethmoid cells the patient might have gotten far better results. Early recognition of malignant growths in the nasopharynx and the early application of large doses of radium offers the best chance for its cure and, to the mind of the writer, is the rational method of handling these cases. The use of radium has passed the experimental stage.

To the writer the chapter on sarcoma of the nasal cavities and nasopharynx is one of the darkest pages in rhinological literature. It has been my misfortune to have charge of eight cases of sarcoma of the nasopharynx, and although every known method of treatment was used, operative, electro-puncture, Coley's fluid, radium,
ligation of the carotids, etc., they all died, so that I have come to
the point of being in full accord with Dr. Shambaugh, who said
"most of the cases of sarcoma of the nose reported as cured by
operation may have really been mistakes in diagnosis in which
inflammatory tissue was mistaken for sarcoma."

Only two of these eight cases have ever been reported by me,
and I am sure that this experience of mine coincides with that of
many other rhinologists who have treated such cases and have
never published the same, consequently the bibliographical statistics
in reference to nasal sarcoma must be absolutely misleading. In
fact, you will find by reading the summary of cases appended to
this article that it is remarkable how frequently the immediate re-
sults are given in a case following a successful operation, and on
the other hand how few of the end results are reported on these
very same cases.

It is certainly unfortunate to be so pessimistic, but the manage-
ment of these malignant growths and a study of the final results
honestly reported does not add one ray of optimism. The writer
has long viewed with a suspicious eye the presence of any growth
in the nasal cavities of the young adult situated in the region of
the ethmoid and which is accompanied by periodic epistaxis, and
which occurs freely with the slightest manipulation.

CASE REPORTS.

Eighteen years ago a young man 17 years of age consulted me on account
of periodic epistaxis. Examination showed small red warty gelatinous growth
on the middle turbinate of the right side. Concluding without microscopic ex-
amination that the same was probably an angioma, I removed it without
difficulty and with very little hemorrhage. In two days the surface looked
normal and the young man returned home. One month later he again appeared
with difficulty in breathing on that side. An examination showed a hard vascu-
lar diffused growth in the whole apex of the nose. Sarcoma was immediately
suspected which was confirmed by the microscope. Active treatment was im-
mediately instituted. Evidently the whole ethmoid body was infiltrated and
an operation by extirpation was out of the question. Ligation of the common
carotid was immediately performed. Coley's fluid which at that time was
being greatly extolled was most consistently used. Radium had not as yet
been tried. In spite of all that was done the growth gradually invaded the
whole ethmoid body on both sides and in two months time he presented the
most horrible picture I have ever seen. The bridge of the nose was almost
on the same line with the side of the face. The frontal bone at the root of
the nose stuck out like a small size orange. Both eyes were protruded and
immobile. He died shortly from exhaustion and sarcomatous infiltration of
the brain substance.
The literature on the subject of sarcoma of the nasal cavities and nasopharynx is quite extensive, but it throws very little light on any curative measures which can be used for its management. Numerous cases have been reported as cured, but the writer is firmly convinced that there must be different degrees of malignancy or that there has been a mistaken diagnosis.

It is not the intention of the writer to discuss the bibliography of this subject nor subject you to any statistics. This has been done in numerous articles, all of which has added very little to the one important phase, which is what is the best line of treatment in this class of cases both as to the final result and as to the future comfort of your patient. However, in order to make this subject more complete, the writer has compiled in statistical form the various reports which have been published, dealing with sarcoma of the nose and nasopharynx, embracing the subject of the different methods of treatment which were used in each case and the results obtained. This is quite extensive and will be found appended to this article.

In 1910 there appeared in the Transactions of this Society a paper by our lamented member Dr. J. Price Brown. It was a plea for the more conservative surgery of nasal sarcoma by the use of the electro-cautery operation. The arguments adduced by Dr. Brown were most logically reinforced by a study of the results obtained by others in the use of the more radical operation with the knife. The following quotation from this article is worthy of more than ordinary consideration: "The site of formation of the sarcoma is at the back end of a bony box situated in the middle of the face and below the floor of the skull. Although this box is fragile and split in two by a bony wall, yet each half is abundantly provided with spongy tissues, which are filled to repletion with capillaries and blood vessels, glands and lymphatic channels. More abundantly probably in proportion to its size than any other region of the body. In this tissue whatever may be the cause the sarcoma has its origin and taking on the attributes incident to its position, it grows rapidly, fills itself with blood spaces and bleeds easily. When the surgeon becoming alarmed by its size proceeds to operate, he not only removes the neoplasm but the bony tissues that surround it in order to take away every vestige of the disease. At the same time the lymphatic channels and blood spaces so freely opened by the operation are ready to carry any germs that may remain to a deeper habitation,
and the early recurrence of the disease in so many cases proves the correctness of this conclusion."

There is a world of truth in this statement. When the antrum is involved the force of these remarks is not so applicable, for we all realize that anything short of a complete resection of the superior maxilla is inadvisable, although even this will probably be futile. There have been numerous reports of the most excellent results obtained in the treatment of sarcoma in different parts of the body by the use of radium therapy. The writer is convinced in his own mind that should he personally ever be afflicted with sarcoma of the nasal passages he would much prefer the final results probably to be obtained by this latter method of treatment than any such surgical procedure.

A very interesting article has lately been published by Eiken, reviewing the experiences at Rovsing's private clinic with roentgen treatment of sarcoma. The results reported in a number of cases were certainly most encouraging. One case in particular was a sarcoma of the orbit where both surgical and roentgen treatment were used in conjunction with a successful result.

The writer has now under his observation a young girl sixteen years of age who developed at the age of ten a sarcoma of the upper lid, extending partly in the orbit. The tumor has been removed five times and at the last two operations 50 mg. of radium was left deep in the wound for four hours after operation and then the wound closed. At present radium is being used externally at varying intervals with apparent success. This case has been under observation for six years. The rapid disappearance in the size of the growth accomplished by the use of the radium in this case is certainly most gratifying, and there is no doubt but that the use of this remedy is aiding our patient both in comfort and prolongation of life.

If one will study the literature of this subject especially in reference to the treatment he will be surprised to find that the real good results from treatment have been obtained by the use of the X-ray and radium, and especially the latter. The writer believes that the possibilities from radium treatment are still in its infancy and that the next few years will show the reports of many cases where malignant growths in the nose and nasopharynx have yielded to this mysterious remedy in a manner far superior to all other known methods of treatment, especially the so-called operative procedures,
SARCOMA OF THE NASOPHARYNX.

REVIEW OF LITERATURE.

General Discussions and Collection of Cases.

Arranged by Date.

Clark, J. P.—Sarcoma of the Nasal Septum. Amer. Laryngol. Assoc. Trans. 20; 183; 1898.

Nosworth in 1889 collected 41 cases of nasal sarcoma, about half of which were sarcoma of the septum; in 1891 the author added 7 cases to this list; in 1896, Boylan added 14 more. Since 1896 the author has found 14 cases and consulted reports of 10 of these. Boylan says of the 21 cases which he analyzes (seven of which were noted by the author in 1891) that in 2 cases no operation was attempted, in 2 cases it was admittedly incomplete, leaving 17 in which extirpation was attempted. Of these 2 are reported as having died of recurrence, in 5 no later history is given, in 7 the length of time the case was observed after operation is not given; in only 3 is it distinctly stated that there was no recurrence a year or more after operation. In Boylan's case the growth was removed by a snare, and the site thoroughly curetted. No sign of recurrence for over a year after operation.

In the 10 cases since 1896 reviewed by the author 7 died of the disease, in 1 the growth was so extensive that operation was considered inadvisable; another case was lost sight of. The one which recovered (no recurrence over 2 years later) was operated with snare and curet. In one of the 7 fatal cases no operation was attempted. The author reports one new case; radical operation; operation June 1, 1897; no recurrence March 28, 1898.


Reports 5 cases of his own, to which he adds 57 cases in addition to Bosworth's report. This makes a total of 103 cases. An analysis of these 103 cases shows that the termination was not stated in 48 cases; that in the 55 cases remaining, 25 (or 46%) are reported as dead. There is one case reported as recovered after operation, nature of operation not stated; 11 cases without recurrence 6 to 12 months after intranasal operation, 4 cases without recurrence at end of 2 years after intranasal operation. A year is not sufficient length of time to prove a cure. So the mortality is probably higher than indicated by the above statistics. In regard to treatment, Dr. Harris says: "Operation is indicated at the earliest possible moment. In many cases a radical operation is the proper method, but in cases in which the entire tumor is thoroughly exposed to view, and in reach, an intranasal operation only is justified."

Gibb, J. S.—Malignant Disease of the Nose and Accessory Sinuses. New York State Journ. Med. 2; 24; 56; 1902.

Gibb gives a tabulation and summary of 111 cases of sarcoma of the nasal chambers, 3 cases of sarcoma of the antrum and sinuses, 12 cases of sarcoma of the nasopharynx.

In the first and largest group, sarcoma of the nasal chambers, subsequent history is given in 31 cases after the complete eradication, in 4 cases 1
month elapsed, 13 cases from 2 to 12 months, 9 cases from 1 to 3 years, 3 cases from 2 to 3 years, 1 case from 3 to 4 years, and 1 case in 7 years without recurrence.

In regard to methods of treatment in these cases, the author says: "The earlier the case is seen before encroachment upon surrounding tissues has taken place the more is to be expected from operative interference. Small growths with moderate attachments may be removed by intranasal methods; e. g., the snare, cautery and curet, with very fair prospect of ultimate success. When the growth has extended beyond the confines of the nasal chambers and involved the sinuses, little can be accomplished through intranasal methods. * * * In these more advanced cases only the most thorough and complete radical measures offer the least prospect of success."

In the twelve cases of sarcoma of the nasopharynx, there were but two in which no recurrence had taken place at the time of the report, and in these the interval was too brief to base conclusions (four months and one year, respectively). In the case in which there was no recurrence for a year, the growth was removed by galvano-cautery snare; in the other case by radical operation (third operation). In the three cases of sarcoma of the aurum and sinuses, one case had no recurrence after eight years, following a radical operation (Lamphear. Amer. Journ. Surg. and Gynee. 13; 107:1900).

Cobb, F. C.—Malignant Growths of Nose and Naso-Pharynx. Amer. Laryngol., Rhinol., and Otol. Soc. Trans. 10, 147, 1904; also in Laryngoscope 14, 577, 1904.

Reports from records of the hospital eleven cases of sarcoma of the nose:
"The operations done varied from removal by resection in the early cases to excision of the upper jaw in the later cases. In only the early cases do we find the report cured, and these were by excision and before careful examination by the rhinologist. Even the cases most radically operated showed signs of recurrence almost before leaving the hospital." Author also reports three cases from private practice, all resulting unfavorably, "although operated by the best surgeons and by the most radical methods."

This author says: "Removal by intranasal method as a palliative measure may be advised where some indications prevent operation by a more radical method. Where such method is resorted to the galvano-cautery loop is probably the safest instrument, although the cold wire snare, if carefully and slowly used, may be recommended. The success attending the major operations, such as excision of the jaw, is very far from encouraging, yet operation may be resorted to as a forlorn hope, or to relieve the urgency of some of the symptoms. There always remains a faint possibility of success, although the prognosis, even with the most radical operations, is extremely doubtful."


Says in regard to treatment, that the medical treatment can only be palliative and applied to inoperable cases. Arsenic may be used in these cases. The intranasal operation is to be preferred, especially where the diagnosis has been made promptly and the entire growth can probably be
removed. The possible methods are tearing out with forceps, excision, curetting, cauterizing and electrolysis. "Probably the safest operation is the removal of the growth or as much of it as possible by the hot snare. * * * This procedure can be followed by the curet and cautery if necessary. * * * The cautery should be applied not only to the base of the growth, but to the surrounding tissue." Sometimes the tumor can best be removed at several successive operations. The author adds a list of 71 cases of sarcoma of the nasal septum, 31 of which are recorded as having recovered after operation, while in 14 there was recurrence in a short time, or in a few years. In the others the result is not given. The nature of the treatment is not included in his tabulation.


Reviews 150 cases, including those reported by Bosworth and Gibb; the ultimate history of 45 cases does not appear in the records; of the remaining 105 cases, 62 patients are stated to have recovered; in only 28 of these 62 does the history subsequent to treatment extend over a period longer than six months—which renders the statement of recovery in the remaining 34 cases almost useless.

In regard to the method of treatment, 48 cases were submitted to radical operation, of which subsequent history was not reported in 13, recurrence or death in 16, recovery and freedom from recurrence for a variable period in 19; percentage of cure in radical operation 39.58. In 64 cases, treated by intranasal operation, result not stated in 8, recovery in 35; recurrence or death in 21; percentage of recoveries 54.88. Apart from surgical measures the only treatment worthy of consideration is that by toxins, "either of streptococcus erysipelatos or Coley's fluid. In none of the cases of the present series in which this treatment was tried was there any noticeable improvement."

Author Reports Four Cases.

No. 1. Removed by cold wire snare, no curettage. No recurrence "in almost two years."

No. 2. Tumor removed in several operations, using snare, forceps and curet. No recurrence in a year and a half.

No. 3. Part of tumor removed by intranasal operation, with relief of symptoms; radical operation refused; disease stationary at time of report (over two years after operation); several attacks of erysipelas, which may have retarded growth.

No. 4. Tumor removed by cold snare. No recurrence in several months.


Treatment must be surgical; medical treatment is indicated only when the tumor is inoperable. If the tumor is limited to the nasal fossa, the endo-nasal route may be employed; the tumor removed at a single or several operations; and the site thoroughly cauterized. If the tumor is located too far up, or has spread too widely to be reached by the intranasal route, an external operation is indicated. The author prefers the Meure operation, or for a tumor extending to the maxillary sinuses, a combination of the Meure and Caldwell-Lue operation.
The author has collected 27 cases, including three of his own. Of these 10 are reported as having died; 2 were without recurrence, six and nine months after radical operation; 1 without recurrence six months after intranasal operation; in the remainder, there was either early recurrence or no definite statement of results.


Brown gathered reports by personal communication from fifty laryngologists in the United States and Canada.

Of the cases reported, 20 were inoperable; there were 19 intranasal operations with 6 recoveries (19 per cent.); 33 extranasal operations with 8 recoveries (24 per cent.). Total permanent recoveries after operation, 13 out of 51, or 27 per cent.

Reports in detail his fourth case treated by electro-cautery; death from sepsis. This case is included in his later reports.


Reports one case of melanosarcoma of the nose, of which portions were removed by the knife, and by the cold wire snare, at three different operations. Curettage and galvano-cautery were recommended by the author in the case, but refused by the patient. A powder containing powdered suprarenal gland and antipyrin was given to aid in controlling hemorrhage. Final results not reported.

The author adds case reports of 16 other cases of melanosarcoma of the nose, making a total of 17 cases. Of these 17 cases, seven are reported as having died, and of these seven, five were submitted to extensive operations. Of the remainder, two patients (cases 3 and 5) "probably did not live very long, judging from the reported condition." Case 7 had no recurrence after 15 years; case 5 none after 1 ½ years; case 6 recurred slightly after three years, and was re-operated. Case 9 recurred in two months, was operated on and "some months" later was free from return. Case 10, no recurrence after 1 ½ years; case 12 slight recurrence after three months, re-operated, and no recurrence after a year and a half. The author says:

"All of these cases reported as non-recurring were treated by curettage, galvano-cautery snare, thermo-cautery, or some combination of these therapeutic measures. This has so impressed me that should my patient consent to allow me to attempt a cure, I will adopt them in preference to more radical surgical procedures."


Reports 6 cases of sarcoma of nose; 2 inoperable on account of extent of tumor.

One case operated by Wolkmann spoon and electro-cautery; small recurrences were removed at different times later, but patient did not remain under observation.
One case operated by Rouge's method; general health good and no recurrence three years later.

One case tumor partially removed; cribriform plate involved; death from extension to meninges.

One case, several growths removed; later recurrences removed, and surfaces cauterized very freely. Some of earlier growths partially myxomatous in character partially sarcomatous; some later growths definitely sarcomatous. No recurrence in four months after last cauterization.

The author says in regard to treatment:

Where the growth is wholly intranasal, "it should be removed through the nares by punch forceps, curets, etc., followed by the free use of the electric cauter. The repetition of such operative procedures may be necessary time and again until the affected structures are extirpated. * * * When the disease is recognized early and treated in this fashion, the prognosis, I think, will be more than favorable. When the septum is involved, and where the area from which the new growth springs is widespread, its eradication may be made more easy and more satisfactory by having recourse to Rouge's operation."


Report deals mostly with carcinoma. Includes 6 cases of sarcoma, no late report obtained for one case operated endonasally; in another operated endonasally, no recurrence in a year. The four other cases had radical external operations; one of these had recurrence and died; the others had no symptoms of recurrence in one year to fifteen months after operation.

These authors in their general discussion mention Roentgen ray and radium as methods of treatment, but in relation to nasal carcinoma only.


Reports one case sarcoma of nose, radical operation, removal of left superior maxilla; recurrence in nasal fossae curetted several times and finally left external carotid artery ligated. Treated with arsenic. Later recurrence in nasopharynx—operated, with good operative result. But general health became bad and patient died.

Eighteen cases of nasal sarcoma collected by author in addition to the one reported above and to those reported by Watson (1904). "In the large majority of these cases surgical treatment was the one relied on, though benefit is claimed from X-rays in one, injections of adrenalin solution in another, and yellow oxide of mercury ointment with an alkaline spray in still another. * * * The percentage of cures by external operation has been unusually large, viz., three out of five. In nine cases submitted to internal operations, recovery occurred four times, recurrence or death four times, and the result was unknown in one. The external experience I had with the one case would prejudice me in favor of intranasal operations. A radical antrum operation would have accomplished quite as much as the excision of the maxilla."

The authors, in discussion of treatment, mention one case reported of malignant tumor of the nasopharynx (not stated whether sarcoma or not) "where the tumor disappeared after using radium, but the patient died six months later of meningitis, leading us to believe that the tumor, though apparently gone from the nasopharynx, was really progressing and had finally invaded the brain."

In regard to medical treatment, "the injection of alcohol, formalin, adrenalin and Coley's fluid has been tried with little success, only two cases being reported cured, one from the use of alcohol, and one by the use of formalin. Ligation of carotid artery is credited with one cured case."

"Many palliative and radical operations have been done by various methods, but the final results have proven very inadequate—Rhinologists, generally speaking, have stood against radical operations and favor conservative procedures, such as curetage, because it has been found that a large percentage of patients radically operated have not survived the operation."

The authors report one case of sarcoma of the nasopharynx removed by snare and curet through the nose. Recurrence in a few weeks and death.


Author reports 11 cases of sarcoma of the nasopharynx, of which 3 were treated with arsenic alone; 6 with Roentgen ray and arsenic internally, 1 with the Roentgen ray and morphin, and one was operated—four times in all, on account of recurrences, each operation followed by prolonged arsenic treatment. In two of the cases treated by Roentgen ray and arsenic, the tumor diminished in size and symptoms improved at first, but the improvement was not lasting, and both cases died. The one case operated was examined and reported free from symptoms and tumor four years after the last operation. This was a lympho-sarcoma. The author believes that these malignant tumors can be cured only occasionally by operation, even if combined with arsenic treatment. The Roentgen ray may relieve symptoms and reduce the size of the tumor temporarily, but does not effect a cure. Also fulguration, radium, thorium, etc., result in cure only very seldom, according to present reports. (1913.)


The author advocated operation of the most radical nature that can be undertaken with consideration of the condition of the patient. He believes Roentgen therapy, radium, and also arsenic are to be used chiefly as post-operative measures, and also in cases so far advanced as to be inoperable. He reports two cases of nasal sarcoma operated. Final results not stated.
SARCOMA OF THE NASOPHARYNX.


The treatment of malignant tumors of the lateral sinus of the nose and of the nasopharynx is primarily surgical. All attempts to use "pseudo-specific" serums (Coley's, erysipelas, etc.) as well as arsenic do not give favorable results. It is only in inoperable cases or after surgical intervention that arsenic is indicated. Also electrolysis, the Roentgen ray, radium and the galvano-cautery may also be employed in such cases. In some cases operation by the external route is indicated.


Reports a series of 65 cases of malignant tumor of the nasal fossae and hypopharynx; of these 44 were sarcoma. Of these 27 (57.35%) were reported as cured by operation.


In a brief summary of the subject the author says in regard to sarcoma of the nose: "All treatments both operative and otherwise have been tried with no very marked success. Posworth says: The only treatment is the thorough and complete eradication of the growth, and this at the earliest period possible without regard to the character of the tissue; and this seems to be the recognized treatment today. Various operations have been described......Price-Brown recommends the electric cautery, but this treatment is open to the objection that many sarcomas seem to take on renewed life after its use. In sarcoma of the nasopharynx as in sarcoma of the nose, all methods have been tried and multitudinous operations invented with but little if no success."

The author reports a case of nasopharyngeal sarcoma. Radical operation. No report on later history.

CASE REPORTS.

1904-date.


Arranged by date.

(In addition to those Cited by Farrell 1911).


First article reports first three cases of sarcoma of the nose treated by the electro-cautery (repeated operations) combined with snare and scissors removal of parts of the tumor when necessary. The first case, no recurrence after 8½ years; the second case, no recurrence in 9 months; the third case, still under observation and treatment, much improved.

In second report (1905), first case 10½ years without recurrence; second case 2 years and nine months without recurrence. The third case still had recurrences, but general health was good, and new growths were promptly treated by electro-cautery.

(See also case reports by Brown; 1909 and 1919).

Reports one case operated, but without any attempt to remove the entire tumor which was large and very vascular. Recurrence and death.


Reports one case in addition to those noted in his 1904 article. Growth filled lower part of nasal fossa anteriorly; removed entirely by cold wire snare. No recurrence in 18 months. "This case substantiates the opinion expressed by the writer that......intranasal operation is justifiable in many, if not in most, cases of sarcoma of the nasal passages."

Connal, J. G.—Patient from whose left nostril a large sarcomatous tumor was removed—no recurrence. Glasgow Med. Journ. 67, 58, 1907.

Reports one case of sarcoma of the nose removed at several sittings with scissors and cold snare; followed by thorough cauterization of the parts by electro-cautery. No recurrence in 3½ years. Also mentioned a similar case treated in the same way; no recurrence in 3 years.


Reports two cases of sarcoma of the nasopharynx operated radically by osteoplastic resection of the upper jaw. One of these died from shock three hours after the operation. In the other operative results were good; operation in September, no recurrence the following January.

Also reports a case operated by Nelaton's technic for sarcoma of the upper part of the nasopharynx. Operation June 1905; no recurrence at last examination, in March 1907.


Angio-sarcoma of the nasal septum; removed by intranasal operation. Arsenic given after operation. Slight recurrence, which author believes can be arrested and removed.


Includes three cases of sarcoma of the nose, all of extensive growth, all operated, but without cure. One case was greatly improved for a few months after operation, but this improvement was followed by recurrence and death. The other two died soon after being operated.


One case, sarcoma of the nasopharynx, operated splitting soft palate, and removing as much of growth as possible; daily injections of adrenalin, chloride given later; finally ligation of the carotid artery which led to temporary improvement. Recurrence with no hope of recovery.

Reports his 3rd case as without recurrence for 2 1/2 years. The other two cases also well and without recurrence. (See his Case Reports 1905).

Reports one new case (No. 4) operative results good after several electro-cautery treatments, but septic symptoms developed, and death ensued.

Case 5, treated by electro-cautery; growth removed, breathing normal. General health good, no recurrence for more than a month.

Case 6, treated with repeated electro-cauterizations; nose free and tumor practically destroyed; case under observation.

Case 7, electro-cautery, and cutting forceps also used. Improvement marked, under observation.


No recurrence in four months after Moure operation. Author states this is not sufficient time to judge of final results.

Brown, J. Price.—Two cases of Sarcoma of the Nose. Laryngoscope 20, 512, 1910. See also article in Amer. Laryngol., Rhinol. and Otol. Soc. Trans. 1919, 255.

Two cases of nasal sarcoma, removed by electro-cautery, with repeated operations for recurrences. Both cases at time of report had no signs of recurrence for several weeks. Were under observation, and any new growths that might appear would be treated by electro-cautery. The condition in the second case was not as good as in the first, but was being controlled at the time of the report.


Intranasal operation with forceps, scissors and electro-cautery, repeated four times for recurrences. Last operation Nov. 30, 1908. On May 1st, 1909, child entirely well, no sign of recurrence.


Reports a case lasting 11 1/2 years in which the sarcoma or parts of it were repeatedly removed with galvano-cautery, snares, etc., but no radical operation. Patient still living at time of report with growth in nose, enlarged glands, evidence of metastases.

Reviews literature briefly without giving statistics of treatment but states as his conclusion that operation is the treatment of choice.


Large growth in left nostril projecting into orbit and antrum and into nasopharynx. Temporary ligature of both external carotid and laryngotomy
to prevent hemorrhage; radical removal of tumor. Operative result good. No signs of recurrence two months later.

Case of spindle-cell sarcoma in left nasal chamber and antrum. External radical operation. Recurrence and death in about a year.

Dougherty, D. S.—Case of Myxo-Fibro-Sarcoma of the Nose and Naso-Pharynx: Removed—Recurrence. Laryngoscope 21, 650, 1911.
Essential facts indicated in above title.

One case; tumor removed with wire snare, followed by cautcrization with trichloracetic acid. No return until thirteen years after when another tumor of similar histological type "alveolar sarcoma" was removed by external operation. No recurrence for 3½ years.

One case, sarcoma of nasal fossa, right side. Removed by radical operation. Good operative results. No later report.

Deals mostly with cancer. Reports only one case of fibro-sarcoma of the nasopharynx. Thorough curetage. Recurrence of symptoms and death.

One case melanotic sarcoma, radical operation. Operated November, 1911, reported January 1912 in excellent health, with no signs of recurrence, but considerable deformity owing to the operation.

Reports one case operated with good immediate results. No report on later result.

Reports one case of nasal sarcoma, radical operation, immediate results good. Later results not reported.

Essential facts indicated in title. Patient seen twenty years after last operation, tumor had disappeared, but nasal septum was bent to the left.
there was large cavity in the right naris, right cheek was prominent, and right eye blinded.

Growth involved left antrum, nose and hard palate; operation, free removal; no recurrence in three years.

One case that had been operated intranasally without relief; large growth in nasal sinuses removed by radical operation. Good operative result; no later report.

Giant-cell sarcoma in young girl; tumor removed without radical operation; several recurrences, removed in similar way; since last operation no recurrence for "nearly two years." Patient's general health excellent.

Operated with temporary improvement; recurrence of symptoms and treatment with Coley's serum; resulting in disappearance of nasal tumor, and reduction in size of glands in the neck.

Reports two cases of lymphosarcoma of the postnasal space. (1) Man 72 years old; operated; recurrence and death two years later due to apoplexy, not the tumor.
(2) A man 40 years old; several recurrences and operations; final operation followed by large doses of arsenic; no recurrence in seven years.
Also mentions one other case of round cell sarcoma operated; arsenic treatment; recurrence and death from pneumonia in a year.

Sarcoma originated from right ethmoid region, Moure's operation; report six weeks after operation, nose clean and healthy.

Author says: Removal "May be incomplete," but the single incision gives great advantage. Report two months after operation, no recurrence.

One case; operated; recurrence after one month.

One case sarcoma of nose (Left nostril); treated with X-rays until tumor was reduced in size about one-half (Sept. 1—Nov. 10, 1902). Remainder of growth removed (April 1903); stump treated with X-rays till August 15, 1903. Patient dismissed cured. No later report.

One case sarcoma of nasopharynx (occupying whole postnasal space). Treatment with X-rays began on June 7th, 1904 and continued until June 10th, 1905. No attempt at removal, but small piece taken for diagnosis. "The case appears to be well."

Aufmwasser, H.—Case of Intranasal Sarcoma. Laryngoscope 18, 659, 1908.

One case sarcoma of nose, repeated recurrences after intranasal operation; after removal by snare and curet in March 1904, patient was given X-ray treatment; another recurrence in Sept. 1904, removed intranasally, followed by X-ray for two weeks every other day. No further trouble. General health good and no symptoms of recurrence, Nov. 1, 1907 (three years).


Reports one case of sarcoma of the nasopharynx treated by injection of adrenalin; sarcomatous mass was reduced in size and pain alleviated. In spite of local improvement, patient died of general weakness and toxemia. Author recommends this method for inoperable cases only, as a palliative measure, not as a cure.

This case is included in Farrell's summary, 1911.

(See General Discussions and Collections of Cases).


Report of a case that improved temporarily with use of Coley's serum; after temporary improvement tumor began again to enlarge; a mastoiditis intervened and was operated. Marked improvement was noted after this, tumor disappearing almost entirely. "It has been suggested that during his attack of suppurative mastoiditis a vaccine was manufactured, which, in part, destroyed the growth."

A few months later tonsils and adenoids were removed, and the patient's general condition was not so good. Symptoms indicated that the nasal growth had increased in size. No further report.


Reports one case of sarcoma of the nasopharynx operated, in which tumor
recovered and was treated by 12 gluteal injections of colloidal copper. After the 12th treatment the tumor had entirely disappeared, leaving only a scar at the site of the operation. No later report.


Sarcoma filled nasopharynx. Tube equal to 82 mg. radium bromide inserted through a small incision in soft palate, left in place 16 hours. Symptoms improved in five days. Treatment on Aug. 25, 1913; patient well; no sign of growth, and slight scars, Dec. 5th, 1913.


Tumor on left side of nasopharynx. 4 X-ray treatments previously. Tube of radium (-47 mg.) inserted through nose retained 24 hours. Growth diminished in 4 or 5 days. About two months later no visible growth and surface healed.


The tumor filled the nasopharynx. Two radium emanation capsules each containing equivalent of 40 mg radium bromide inserted into anterior surface of growth, left for 24 hours. Whole mass disappeared in a week. In a month patient feeling well; only one small gland palpable under left ramus of jaw.

In the discussion Dr. Tilley says that he did not claim that the case was 'cured' but six weeks before the case seemed hopeless, while at the time of the report 'anyone might think he was normal.' He did not think such a result could be obtained by any other method.


One case, six X-ray treatments through mouth, tumor disappeared, but later radium applied through postnasal space. X-ray applications to neck; also operations on enlarged glands followed by X-ray. Last treatment July 29, 1914. Feb. 1915 no signs of recurrence.


Reports one case sent to Johns Hopkins Hospital for radium treatment, improvement reported, 'with a good chance of recovery.'


Sarcoma originating from right ethmoid region; treated by radium; patient died a few weeks after last examination from perforated appendix; autopsy showed no sign of tumor in the nose or nasopharynx, and no metastasis.
Dosage:
1st dose 100 milligrams of radium applied for five hours on three consecutive days; nineteen days later same amount for six hours each day; thirty days later 50 milligrams for four hours; sixty days later 50 milligrams for six hours, on two consecutive days. Radium also applied to large glands on side of neck.

In the discussion Dr. Woelfel claimed that sarcoma of the upper air passages is peculiarly susceptible to radium, but did not report any cases.


Author reports two cases of sarcoma of the ethmoid operated; results excellent; no recurrence in 16 months in one case, in "almost a year" in the second case. In the discussion, Dr. Green reported a case of sarcoma arising on the horizontal plate in the frontal bone on the right side; operation; same condition on left side in a few months; operation; recurrence on right side; deep X-ray treatment; tumor decreased in size, but toxemia caused death.

Dr. Mayer reported a case of Dr. Pfahler's, sarcoma of the orbit, treated by X-ray; tumor much decreased in size, eyeball receded and vision good.
REPORT OF A CASE OF SARCOMA OF THE PHARYNX.

By WILLIAM C. BANE, M. D., Denver, Colorado.

In the Transactions of the American Laryngological Association for 1915, Dr. Ralph Butler, in connection with the excellent report of a case of sarcomatous tumor of the pharynx, has ably reviewed the literature, and given a bibliography. I have therefore refrained from a repetition, and will confine myself, in this paper, to a report of a case coming recently under my care.

CASE REPORT.

On September 26, 1918, Louis K., a lad of 13 years, was referred to me by his physician on account of pain in the right ear. Five weeks previously this ear had given the boy pain lasting for seven days, and not returning until the night before I was called into consultation. During the previous two weeks there had developed a swelling below and in front of the right ear.

Examination revealed the following: hearing with the right ear, watch on contact; with the left ear, watch, 60/60. The right ear was not tender to pressure, the external auditory canal was free, and the membrane tympani was free from congestion, but somewhat dull and moderately retracted. The right parotid gland was swollen, with induration of the lymph glands at the angle of the jaw on the same side. Upon opening the mouth there was manifest the typical facies presented by a peritonsillar abscess. The right tonsil and the surrounding tissues were swollen and tender, the swelling extending back of the posterior pillar, and above the arch. The left side of the throat appeared quite normal.

The patient was somewhat stubborn and difficult to handle, so was sent to the Children’s Hospital, where at 4 P. M., September 27th, he was given a general anesthetic, and a search was made for a pocket of pus external to the right tonsil. The dissection was extended until the tonsil was enucleated, and a free opening was made with forceps into the swollen retropharyngeal tissues, yet with neither operation was any pus evacuated. A great deal of difficulty was experienced in keeping the patient from suffocating, so that it was necessary to keep his tongue drawn forward for several hours. Two days following the tonsillectomy, the swelling in the right side of the pharynx was much increased, and to inspection and palpation was suggestive of abscess formation. A free opening, however, evacuated only blood and serum. In as much as malignancy was not suspected, the tonsil was not saved for laboratory examination.

During the next ten days a course of tonics and stimulants was given, without much result. Very little food was taken, due to the difficulty in swallowing, as well as loss of appetite. The temperature varied from 100° to 105° F., and the pulse from 120 to 160. Two doses of antistreptococceic serum were administered, ice poultices applied to the neck and head, and the throat kept
clean with a spray of antiseptic solution containing adrenalin. At the end of three weeks, the infiltration of the tissues of the right side of the pharynx had disappeared somewhat, yet there remained a decided irregular induration of a semi-solid nature. Inasmuch as the lad kept his neck quite stiff, and suffered pain when the head was moved to its normal position, an X-ray was taken of the cervical vertebrae, but it revealed no caries.

During the fourth week there was manifest some induration and tenderness of the anterior cervical glands on the left side. This was not lasting, but at the same time the enlargement of the right anterior cervical glands increased and remained enlarged, varying slightly in size from time to time. About the seventh week there appeared a drooping of the right upper eyelid, and upon examination there was revealed an elongated, reddish glandular mass in the outer canthus and under the lid, which to palpation seemed to be connected to the lacrimal gland.

The dyspnea and the dysphagia gradually increased, and became so distressing that finally, on October 28th, in consultation with Dr. Shere, I again perforated the mass in the pharynx, but only a slight showing of blood and serum escaped. A small piece of this mass was excised and later examined by Dr. Helen Craig. She suspected malignancy, but the specimen was too small for her to make a positive diagnosis. On December 3rd, Dr. Lockard saw the patient with me in consultation. On December 9th, Dr. Shere removed a lymph gland from the right side of the neck under local anesthesia. This was examined by Dr. Craig, who reported as follows: "Sections from the gland, removed from the neck of L. K., reveals the lymph gland invaded by round cells with large irregularly staining nuclei. Most of the lymphoid tissue has been replaced by these cells. Diagnosis: Large round-celled sarcoma."

The lad was admitted to Schlessinger's radium laboratory, where he was given two treatments, on December 30th and January 13th. Dr. Shere observed a marked relief after the first treatment, in that the boy could swallow easier, had a better appetite, and that there was a decided shrinkage in the enlargement in the pharynx. However, this apparent improvement in the symptoms was only transient, for the lad grew gradually weaker, and soon developed still greater difficulty in breathing and swallowing.

Three weeks before the boy died, on February 2nd, beside the above symptoms, a severe cough developed, which was believed to be due to metastases in the chest. Unfortunately, an autopsy was not permitted. Numerous nodules, about the size of a large bean were noticed on the chest wall, while two were found in the right axilla, and one in the right breast about the size of a crab-apple. During this period the growth about the right eye also increased in size quite rapidly, pushing the eyeball forward and to the nasal side so far that the lids would not cover it, and the patient complained very much of pain about the eye and head.

There was obtained a history of an automobile accident about a year ago, in which the boy received an injury of the right side of the head and neck, but whether this had anything to do with the development of the sarcoma is very doubtful, although traumatism has an important place in the etiology.
Dr. Harmon Smith, New York City, summarized his observations, after ten years’ experience and three operative cases of sarcoma of the tonsil: The disease always appeared unilaterally; removal of the growth on the side of its origin was always followed by recurrence on the other side; all sarcomata of the tonsils were of the lympho-sarcoma type, never small or round cell or melanoid. Surgical removal of the growth was easy. He cited a case in a man 18 years of age. He removed the tonsil of the right side, and two years later recurrence in the tonsil of the other side was apparently successfully removed. About a year later the patient drifted into the clinic again, with asphasia and other mental disturbances, and ultimately died of sarcomatous deposits in the brain. The second case was similar to this in character, the patient dying in about four years. The third case was that of a man who had sarcoma of one side. He was sent to the General Memorial Hospital, where there is the largest supply of radium in this country. After six months of radium treatment there were no recurrences and no metastases, so far as could be determined. Operative interference was unjustifiable at this time, as it would be apt to set up a metastatic process elsewhere. While radium had its limitations in the deep tissues, in sarcoma of this size and in this situation it was better to rely upon radium alone. He had always feared hemorrhage in any operative procedure in these cases but these expectations were never realized. In sarcoma of the bone, in the sinuses, and in the nose, neither operative procedure or radium was of benefit. The inflammatory type of lymphoid tissue often simulated sarcoma but was not sarcoma. Where the diagnosis of sarcoma was verified, the patients did not recover after removal of the growth by the snare or other major surgical procedure. The same applied to the maxillary sinuses and ethmoid. When he had tried to follow sarcomatous projections they had usually been found to go up into the ethmoidal region, through the cribiform plate, and into the brain, and operation was useless in such a case.

Dr. Thomas J. Harris, New York City, said the question of malignant disease of the upper respiratory tract was an oft-recurring subject of discussion, and always would be so long as efforts at understanding the cause of the disease were unsuccessful and the profession remained ignorant of the cure. He had read Dr. Bane’s paper and had been familiar with Dr. Roy’s work, but he was surprised to know of the amount of literature on the subject. He recalled having heard Jonathan Wright say that it was not an uncommon experience to have these cases run in groups. The speaker had had six cases a few years ago, but since that time he had had none. He had failed utterly with radium in the treatment of sarcoma of the nasopharynx. Dr. Freudenthal would doubtless recall a case seen in consultation with the speaker some years ago, in which radium failed eventually. This did not apply to benign growths of the larynx. He agreed with Dr. Smith with regard to sarcoma of the tonsils.

He wished to call attention, without in any sense advocating it, to the theory of Dr. L. Duncan Bulkley, of New York, who had contended for years that the surgeon was working at the wrong end, that the surgeon was too prone to use the knife, and that he was merely removing the result of an abnormal process in the body and not the disease itself. Dr. Bulkley had reported remarkable results by means of treatment directed toward the removal of toxins from the alimentary canal. The speaker cited a case of epithelioma of the tongue in which the ulcer had been completely held in check, not by surgical operation or other treatment, but by directing attention to the pronounced intestinal toxemia. He was inclined to believe that hope would be found along this line rather than through surgery or radium.

He had one case in which good results were obtained from the use of Coley’s fluid.
DISCUSSION.

Dr. Wolff Freudenthal, New York City, was glad to hear that Dr. Roy had depended upon his own clinical diagnosis. The injection of salvarsan would do harm, but that was all. He had had one series of cases in which every patient died. He had been able to keep patients alive longer by means of radium than by any other method of treatment, but every one of these patients died too. These were cases of nasopharyngeal sarcoma. It was different with sarcomata of the tonsils. He had seen quite a number of these cases. Two were cured, one lived eight years after the commencement of the treatment. After eight years erysipelas developed and the patient died. This was peculiar, in view of the contention that infection with the germs of erysipelas had a curative effect on sarcoma. For all he knew, his next fifty cases might all die, nevertheless he considered radium the best means of treatment at the present time. He mentioned, in this connection, a paper which he had read in a Spanish journal, by Dr. Botey, of Barcelona, who recommended radium in carcinoma of the larynx, applied by means of an intubation tube, in which he placed the radium. It was used with or without tracheotomy.

Dr. Harris P. Mosher, Boston, Mass., thought the first two speakers (Dr. Smith and Dr. Harris), had left a pessimistic impression regarding sarcoma of the accessory sinuses. He shared their ideas to a certain extent, but was pleased to hear Dr. Freudenthal give a ray of hope. Referring to the remarks of the first two speakers with regard to the surgical treatment of these cases, he emphasized the point that the man who operated should be familiar with the use of the head-light and he should know the anatomy of the accessory sinuses. If the cases were seen early, and a thorough operation performed, and if a liberal incision were made in the cheek, Moure’s incision preferably, and if the opening in the cheek were left, and radium used often and thoroughly, a few cases might be saved.

Dr. Joseph A. White, Richmond, Va., mentioned a case which he thought quite remarkable. When he called Dr. John Dunn to see the woman and told him she had been under treatment for thirteen years, the patient promptly corrected him with the statement that he had been treating her for twenty-three years. She was seventy-three years of age at the time. When he first saw her he found a smooth growth blocking the right nostril. It seemed impossible to pass a snare around it, but he succeeded in removing a piece for examination. This proved to be spindle-celled sarcoma. In about eight months the patient returned with a recurrence, which again completely blocked the nose. He used the galvano-cautery this time. Two or three times a year since that time he has used the galvano-cautery. The swelling was reduced, the nose opened and the patient apparently became comfortable after each treatment. However, the nose would soon become blocked again and she would return for another treatment. About five months ago when she returned, he found that there was an external projection, showing that the growth had apparently invaded the antrum cavity.

The galvano-cautery was used as before, but more vigorously. In twelve to eighteen hours the reaction resulted in great swelling of the eyelids, with redness, and projection of the eye, all the symptoms apparently of acute orbital cellulitis, but there was no pain. The sight of the eye, however, was almost abolished, having only perception of light. Dr. Dunn and the speaker examined the eye, finding optic neuritis, with slight evidence of thrombosis. The patient was kept in the hospital two weeks, during which time the condition progressed to blindness in the affected eye. The enormous swelling and pressure produced by the use of the galvano-cautery, with probable thrombosis, had caused atrophy. There was no doubt as to the character of the growth, several pieces removed from time to time having been found to be large spindle-celled sarcoma, yet the patient had
lived for more than twenty years, and was perfectly well in all other
respects. In view of this experience he would recommend the galvano-
cautery, especially in cases where operation was refused, as in this
case.

Dr. John F. Barnhill, Indianapolis, Ind., spoke in favor of the surgical
side of the treatment of these cases. The discussion had drifted away
from the subject of the papers, although Dr. Roy had mentioned ex-
tension to the sinuses. Few diseases had been prognosticated upon
less favorably than sarcoma of the tonsil. This was not at all true of
the accessory sinus system. Treatment of sarcoma of the sinuses had
been in the situation of the man "between the devil and the deep blue
sea," the devil representing the general profession and the deep sea the
surgeon. Two years ago he had read a paper on this subject before
the American Laryngological Association in which he stated the position
to which he adhered at the present time, namely, that the work
of the special surgeon had been short of what it should be, while the
general surgeon on the other hand, did not see these cases until so
extensive an operation was necessary that the patient would not submit.
Sarcoma of the jaw and hard palate often recovered when subjected sufficiently early to radical operation. This applied to cases
which were clearly sarcomatous. He recalled such a case, which oc-
curred after injury. Examination revealed that it was sarcoma of the
round-celled variety. The patient, a young girl, was alive after seven
years. Early diagnosis and early radical surgery were the points to be
emphasized.

Radium had been a failure in all cases in which the speaker had seen
it employed. He had yet to see a case of sarcoma in the neck or in the
sinuses benefited by radium. In epithelial and superficial malignancy
it did good, but not in deep-seated glandular growths.

The block dissection of the tissues had been proposed, and he had
tried the method in a few cases of sarcoma of the tonsil.

Dr. John O. McReynolds, Dallas, Texas, had seen very large tumors
disappear rapidly under the application of radium, but all had recurred.
Radium should be given a trial in the early stages of the disease, before
the condition had become inoperable. Unless a surgeon had the
ability to remove every particle of the malignant tissue he should not
operate. This point was well illustrated in several cases of melano-
sarcoma of the choroid, in which it was possible to remove absolutely all
of the growth, and in which there were no recurrences. Unless
this could be done the case might just as well be left alone.

Possible variations in degree of malignancy were always to be borne
in mind. He recalled a case, presenting all the clinical, macroscopic
and microscopic evidences of sarcoma of the nose, in which nothing
was done for seventeen years, and yet the growth did not advance
to fatal conclusion during this period of observation.

Dr. Frank Rose, London, England, had found that cases of round-
celled or lymphoid sarcoma inside the nose were fatal, whether one
operated or did not operate. He had been told that the application
of radium was beneficial, but his experience did not confirm this. He
felt, therefore, whenever he encountered a case of round-celled sarcoma
of the nose, that the patient would die, and die very soon. He had
heard of cases which ran a more favorable course, but he had not
seen them.

In the nasopharynx and the tonsil growths of the round-celled sar-
coma type were unfavorable. He cited the case of a girl, admitted to
his service three weeks before her death. At the post-mortem there
was found a continually growth, extending from one side of the neck
to the other, in front of the vertebral column. It extended to the
ethmoid, and projected into the interior of the skull. That was in
April of this year. The patient had no symptoms at all before Decem-
ber of last year. By what operation could one remove such a growth? On the other hand, there were growths sometimes classed as sarcomata which ran a much slower course, and which gave the surgeon the opportunity of doing much more for the patient’s relief. He had had under his care such a case, an endothelioma, which caused an ulcer of the size of a fifty-cent piece. Radium was applied, and after an interval fresh ulceration appeared, to which radium was again applied, the ulcer again healing. The patient then disappeared from his observation, but when last seen there had been no recurrence.

Another method, not mentioned by any of the speakers, had been successfully employed in cases of epithelioma, namely, diathermy. Of course sarcomata did not produce superficial ulceration, but an epitheliomatous ulcer of large size would heal under the use of diathermy. He had presented, at the meeting of the Laryngological Association in London this year, a man who had been treated by this method. The ulcer, which invaded the wall of the pharynx, the tonsil and the palate, had healed completely. The patient had returned to the hospital two years later because of the appearance of the ulcer on the other side. He suggested, therefore, that in these cases of malignant ulcers of the pharynx and nasopharynx diathermia offered relief, although in many cases only temporary.

Dr. John J. McCoy, New York City, held that in all cases of malignant disease surgery offered the best hope, if taken early; radium next. For six months he had been watching the work of the General Memorial Hospital, where they did not rest with the application of radium on the surface, but injected the radium into the growth. The radium was kept in a large safe, out of which came tubes, more and more finely graduated, until they could be broken off half an inch in length and one-twentieth of an inch in diameter. These tubes were broken off and placed in the needle, which was plunged into the center of the growth. They had gotten wonderful results in cancer of the tongue and tonsil. He had seen growths decrease remarkably with two applications. The radium seemed to prevent the growth from spreading and to decrease its malignancy.

Dr. Roy, in closing the discussion, called particular attention to the fact that he was not considering sarcoma of the antrum. He had seen cases in which the general surgeon had removed the growth and which, with the application of radium, had remained cured for years and years. But his paper dealt with sarcoma in the nose and nasopharynx. His optimism had been borne out largely by those who had discussed the paper. He hoped that radium would give the hope that had not yet been found.
THE LYMPH DRAINAGE OF THE ACCESSORY NASAL SINUSES.*

By W. V. MULLIN, M. D., Colorado Springs, Colo.

I.

The purpose of this investigation has been to determine the course of lymphatic absorption from the antrum and frontal sinus, and, incidentally, from neighboring tissues—the nasal fossae, the palate, the gums, the meninges, and the subcutaneous tissues of the face.

We have been able to find but little reported work dealing with the lymphatics of the accessory sinuses. Neither anatomists nor rhinologists seem to have given much attention to the subject, and such information as they give is not well supported by experimental and clinical data. According to Da Costa's edition of Gray's Anatomy, which follows the more special work of Sir Frederick Treves and of Delamare, Poirier, and Cunéo, the accessory sinuses drain into the retropharyngeal lymph nodes, which receive tributaries also from the nasal fossae, nasopharynx, and Eustachian tube, and perhaps from the cavity of the tympanum. They in turn send vessels to the internal jugular group of upper deep cervical nodes, which communicate freely with each other and with the external group, and terminate in the jugular trunk, which on the right side helps to form the right lymphatic duct or empties directly into the junction of the internal jugular and subclavian veins, and on the left side empties directly into the venous junction or into the thoracic duct.

Of the literature available in support of this description, the work of André is the most considerable: he covers the ground of his predecessors, Key and Retzius, Küttner, and Most, and adds new data of his own. By the method of Gerota—local injections under hydrostatic pressure made through puncture with a fine canula on the cadaver—André made extensive studies of the lymphatics of the nose and nasal fossae. His investigations cover in great detail the distribution of lymph nets and trunks, but owing to the limitations of the method he was not able to follow the lymphatic course very far from any one point of injection, and

* Candidate's Thesis Recommended for Publication by the Council.
to illustrate the continuous route of absorption, as in the case of
an infection, from a primary lesion through node after node to
its arrest or generalization. In some cases, however, his injection
reached a second group of nodes and indicated at least one route
of possible functional absorption.

In brief, his conclusions are as follows:

The lymphatics of the external nose, with parts of the eyelids,
forehead, lips, and cheeks, drain into the submaxillary nodes,
sometimes also into the parotid, subhyoid, and the small facial
nodes observed by Küttnner. From the submaxillaries the route
is onward to the deep cervical nodes along the internal jugular
vein. This cutaneous group communicates at its origin with the
lymphatics of the vestibule of the nasal fossa.

The upper or olfactory portion of the nasal fossa, which com-
unicates with the meninges, has a system of lymphatics more
or less independent of the lower or respiratory portion, but both
systems run backward to the posterior wall of the nasopharynx
where there is "a veritable rendezvous of lymphatics from the
nasal fossae and from their accessory cavities." Here they com-
unicate with some lymphatics of the Eustachian tube, and occa-
sionally with tiny subtubal nodes, and empty into the retro-
pharyngeal nodes, which drain into the upper nodes of the inter-
nal jugular chain, especially the large node beneath the posterior
belly of the digastric muscle. Sometimes a node directly behind
the pharynx is interposed in the series, and in this system and in
the anterior or submaxillary system, anastomoses from one side
to the other, and from node to node in a group, are very frequent.

The upper nodes of the internal jugular chain also receive some
lymphatics direct from the floor of the nose, together with the
drainage from the tonsil and soft palate, without the interposition
of the retropharyngeal—or, as André prefers to call them, "re-
trolateral pharyngeal" nodes.

André injected the lymphatics of the antrum in two child
cadavers, of five and eight years, and demonstrated many lymph
vessels converging to the antral orifice, passing out, and joining
the lymphatics of the middle meatus, upper surface of the in-
ferior turbinate, and lower surface of the middle turbinate.
Others passed out through the thin "posterior fontanelle" in the
internal wall of the antrum to join those of the middle meatus.
Of those passing out through the foramen he writes, "We suc-
cceeded in following them in the middle meatus, where they con-
sisted of four to six large collectors, with frequent anastomoses, and having an anteroposterior direction. We saw them continue thus as far as the crease which separates the posterior end of the inferior turbinate from the anterior projection of the Eustachian tube. It is probable then, that in joining the lymphatics of the nasal fossae, they end, like these, by emptying into the pharyngeal nodes and the jugular chain."

When the injection was made under high pressure, it penetrated not only the lymphatics of the mucosa, but also those of the subjacent periosteum in small scattered areas.

André also demonstrated the delicate lymphatics of the ethmoid cells, and assumed, but did not prove, that "if the lymphatics of the antrum, the middle meatus, and the inferior surface of the middle turbinate were filled, the ethmoidal lymphatics would of necessity become injected through tiny canals perforating the paper-thin walls of the ethmoid cells."

Following the early work of Key and Retzius, André investigated the communications between the lymphatics of the nasal fossae and the perimeningeal space, in rabbits and dogs, and also on the human cadaver, and concluded that these communications, which exist not only in the sheath of the olfactory nerve, but also by independent lymphatics passing through the cribiform plate, belong exclusively, or almost exclusively, to the olfactory field, and should be regarded as homologues of the communications which exist between the pericerebral spaces and the orbital and labyrinthine lymphatics. They are almost entirely independent of the respiratory field, and extend to a much greater area of the nasal mucosa in animals with a very highly developed sense of smell; and the area, like that sense, diminishes with age.

Finally André emphasizes the richness of the lymphatic system in the nasal field, the free anastomoses from side to side and between the cutaneous and mucous lymphatics, and the important fact that the nasal lymphatic system is not an independent entity, but is closely connected in its vestibular and cutaneous portions with the lymphatics of the forehead, cheeks, eyelids, and upper lip; in its respiratory and olfactory portions with the Eustachian tube, palate, pharynx and perimeningeal space. This contrast between free anastomosis on the one hand, and clearly demarcated fields of origin on the other, is hard to reconcile, but it was André's experience that, at least on the cadaver, both facts were demonstrated.
Following André, Grünwald injected the antrum of a sixty-year-old man, and virtually proved the anatomical lymphatic continuity "of the whole lymph-vascular system of the accessory sinuses between themselves and with the nose, directly in the level of the mucosa and continuously in its course, not through walls." The injection fluid entering the antral mucosa in the region of the hiatus semilunaris, extended to most of the mucosa of the middle meatus and inferior and middle turbinates, also to the ethmoid cells, sphenoidal sinus, and posterior wall of the frontal sinuses; passing backward to the pharynx it ended at the projection of the Eustachian tube. No communication was established with the orbit or the gums.

Though demonstrating the anatomical connection, Grünwald deprecates the drawing of clinical conclusions from a single experiment performed under artificial conditions of pressure, upon a dead subject.

A. B. Wood worked on the lymph drainage of the tonsil by the same method of injection on the cadaver, and demonstrated the importance of the upper node of the internal jugular chain, lying beneath the posterior belly of the digastric, as a receiver from the tonsil, and the continuity of absorption down this chain of deep cervical nodes into the great lymph ducts.

Crowe, Watkins, and Rothholz, following Wood emphasize the role of the deep cervical nodes as receivers of drainage from the various nodes of the head, especially those of the air passages, and the fact that this chain of nodes empties by way of the ducts into the great veins, probably without previously communicating with the supraclavicular nodes and the lymphatics of the lung apex.

Dowd, from the study of one hundred clinical cases of tuberculous cervical adenitis, corroborates Wood's conclusions as the importance of the "tonsil gland"—i.e. the node beneath the posterior belly of the digastric—as the first point of metastasis for disease of the tonsil. However, what is important in relation to our research, he emphasizes the frequent obscurity of the primary lesion from which the cervical nodes become infected. "In eleven instances," he writes, "the submaxillary group of nodes was the first enlarged, indicating infection from the teeth or interior part of the mouth or face." "In two instances the parotid nodes were the first to show infection."

We may interrupt the résumé here to suggest that a thorough search for the primary lesion in cases of cervical adenitis of
obscure origin, might sometimes reveal the source in an unsuspected infection of one of the accessory nasal sinuses.

J. B. Thomas in a recent article reports seven cases of tuberculosis of the frontal sinus. In one the disease involved the frontal and sphenoidal sinuses, and the autopsy showed tuberculosis of the cervical nodes, also the right apex and bronchial nodes. Another case was complicated by mastoid disease and "glands", location not given. H. A. Lothrop reports eighteen cases of suppuration of the frontal sinus, one of which had also double antrum disease and enlarged cervical lymph nodes. It is significant that among the complications mentioned in these two reports, retropharyngeal abscess does not occur.

As already suggested, all the experimental work we have been able to find on the lymphatics of the accessory sinuses, and most of that on the associated regions of the nose and throat, rests upon the method of injections on the cadaver, and therefore, as recognized by the investigators themselves, is not a sure criterion of function in the living subject. One extension of study into the physiological realm, however, has already been referred to in connection with the lymphatic communications between the nose and perimeningeal space, and a few others have been found.

Cornet, for example, brushed tubercle bacilli on the nasal mucous membrane of healthy guinea pigs, and later found enlarged tuberculous cervical lymph nodes, without any demonstrable lesions of the mucous membrane. Goodale and Henderson found that powdered inert substances could be taken up in a similar way from the apparently uninjured mucous surface of the faucial and pharyngeal tonsils.

For us the most important example of such work is that of Grober, who injected the tonsils of living rabbits and dogs with rather large amounts of an emulsion of black Chinese paint. Autopsy showed pigment in the lymph vessels and nodes of the neck including those of the supracleavicular fossa, extending to the parietal pleura, and running down into the thorax along the trachea and esophagus. In the light of our own experience with a similar method, we infer that the injection was made with great force. Pigment was also found free in the blood, and microscopically within leucocytes. In the neck there was some extension to the side opposite the injection. In some instances Grober found an exudate containing pigment at the apex of the lung, together with pigmentation of mediastinal and bronchial
nodes, and he assumed that infection might reach the lung apices from the cervical lymphatic system by way of the internal jugular and supraclavicular nodes, the lymphatics of the parietal pleura, and such an exudate. Assuming that something like this might occasionally happen, it is not necessary to attach great importance to it; for we know that any infection which passes the cervical nodes enters the main lymphatic ducts, the veins, and the right heart, from which it is pumped directly into the lungs.

F. R. Sabin has approached the subject of lymphatic anatomy from the embryological point of view, by injections of pig embryos and comparison with microscopic study of living embryos of various lower forms. In an exhaustive study she demonstrates the origin of the lymphatics by budding from the veins, and describes the fundamental topography of the lymphatic system in mammals. The part of her work which chiefly concerns us is summarized by her as follows:

"The jugular lymphatics bud off from the anterior cardinal veins (in the embryo), form large sacs in the neck, from which lymphatics grow to the head and neck, the foreleg and thorax, and to the heart and lungs. Later the primitive sacs differentiate in part into the lymph nodes and lymph ducts of the neck. From the sac stalk and anterior curvature arise the pharyngeal, Eustachian, and nasal vessels, from the apex of the sac arise the suprascapular and occipital lymphatics, while from the cervical (lymphatic) plexus arise the posterior auricular, temporal, facial, submaxillary, anterior cervical, and the superficial lymphatics of the arm and thorax. These groups of lymphatics begin as distinct plexuses of vessels which arise from the sac or from the secondary cervical plexus which in turn comes from the sac. . . . Subsequently all the groups anastomose and this is an important point. . . . The lung seems to have a double supply of lymphatics, part from the jugular sac and part from the renal sacs by way of the diaphragm and by way of the thoracic duct."

These important findings go far to explain the disagreements among different investigators as to the lymphatic connections between the various regions of the head, neck, and thorax. Such connections exist developmentally, and in all probability idiosyncrasies of individual adult lymphatic anatomy, as well as varying conditions of pressure or infection, may in some cases serve to bridge over from one part of the jugular field to another, in other cases fail to do so. Therefore, when one chooses a limited portion of the field for study, as we have done with the accessory sinuses,
LYMPH DRAINAGE.

one should not expect to find an absolutely distinct and narrowly limited course of absorption therefrom. For a fundamental characteristic of lymph drainage is that it is widely regional and rich in anastomoses.

II.

We have investigated the lymph drainage of the antrum and frontal sinus, and associated regions, by means of a series of experiments on living animals, compared with the observation of clinical cases.

The experimental work has consisted chiefly of injections and inoculations of the antrum in rabbits and the frontal sinus in cats. The anatomy was worked out on the animals of the series, and also on Rabbits A and B and Cats A and B (see protocols.) The antrum in the rabbit and the frontal sinus in the cat are both fairly large as compared with the whole skull, and the anatomical relations are quite similar to those in man. As a rule, direct communication between the sinuses and the nasal fossae is somewhat freer than in the human subject.

The lymph nodes are much less numerous than in man, and their arrangement more constant. Those which figure in our experiments are as follows:

Submaxillary—Two, or occasionally three, on each side, situated below and within the ramus of the jaw, external to the submaxillary salivary gland.

Internal Jugular or Carotid—Sometimes a single long smooth spindle-shaped node, sometimes deeply lobulated, sometimes divided into several nodes in a close series, it forms a pillar of lymphoid tissue extending along the carotid sheath from the level of the upper part of the pharynx to the level of the larynx. It corresponds to the entire chain of internal deep cervical nodes in man, including the retropharyngeal.

Subparotid—A small node lying beneath the parotid salivary gland. In the rabbit it is extremely small, and in all our injections of the antrum region it was only found affected in two cases (Rabbits 1 and 7). It is proper to state, however, that the node is so small and hard to locate that it may have been overlooked and destroyed in dissection when only very slightly pigmented.

Postauricular—In the rabbit, one or two tiny nodes at the base of the auricle. In none of the antrum series have these nodes been found affected. In the cat there is a chain of very small nodes running from behind the auricle downwards and forwards between
the parotid and submaxillary salivary glands toward the deep cervical nodes.

**Bronchial**—In the rabbit one or two, in the cat several, small nodes at the root of the lung. In full-grown cats, as in man, these nodes and the lungs usually show anthracosis. Kittens are free from it, and so are young rabbits and guinea pigs. When it occurs, the carbon is fixed in the tissues, never free in the blood. Since it may occur spontaneously, however, we feel that the finding of small amounts of carbon in the lungs and bronchial nodes after our experiments would be inconclusive, and having established the route in Rabbit 1, where the quantity of carbon was considerable, we have not tried to demonstrate it microscopically in later members of the series, except in the case of infections.

**Mediastinal**—One or two nodes just behind the upper part of the sternum.

**Faucial Tonsils**—Situated as in man. In none of our experiments have they been found affected.

**Antrum.**

The study of the antrum was undertaken first, and began with a series of injections with India ink. This fluid—a suspension of finely divided carbon—was chosen because the pigment granules are about the size of cocci, and are absolutely insoluble; it is therefore practically the same in physical characteristics as a dense emulsion of bacteria. The technique consisted simply in entering the antrum with a hypodermic needle, under ether anesthesia, by penetrating the skin of the face and the thin external wall of the superior maxillary bone. The fluid was then injected and the needle quickly withdrawn. If the point of the needle was free in the cavity of the antrum, some of the ink nearly always escaped into the nose and ran out at the nostril. However, we found that ink was quite readily carried away from the nasal fossae by secretion, without being absorbed, while it stagnated in the antrum and was in part taken up by the lymphatics.

After several days the animals were killed with chloroform and autopsied, and in many cases the diagnosis of pigmentation—or, in the inoculated cases, of infection—of nodes and other tissues was confirmed by microscopic sections.

The first rabbit injection (Rabbit 1, see illustration) gave the most striking result. In this case the point of the needle, after passing through the left antrum, penetrated the mucosa of the
inner wall, and about 1 c.c. of ink was injected beneath the mucosa against strong resistance, resulting in marked exophthalmos of the left eye. The left nasal fossa was then probed with an applicator.

The rabbit was chloroformed after two days. Autopsy showed considerable pigmentation of the subcutaneous tissue over the left antrum, very deep pigmentation of the mucosa of the left antrum, purulent exudate and marked pigmentation of the mucosa of the left nasal fossa in the region adjacent to the antrum, with fainter extension upward almost to the roof of the superior meatus, laterally to the left ethmoidal cells and across the median line to the middle and lower part of the right nasal fossa, and even to the lining membrane of the right antrum, backward on both sides to the posterior wall of the nasopharynx, where microscopic sections showed it in large masses within lymph spaces, backward on a higher level into the sphenoidal sinus, and forward on both sides almost to the nostrils. No discoloration was detected in the bone or cartilage of the nasal septum, the extension to the right side apparently being around the posterior edge of the septum. Thus the distribution of the injected substance in the nasal fossae and accessory sinuses corresponds quite closely with that observed by Grünwald in the human subject, and illustrates again the complete continuity of the lining membrane.

There was very marked pigmentation of the whole of the left orbit, extending as far as the conjunctiva but not into it, and of the tissue surrounding the sockets of the left molar teeth, but no extension to the oral cavity, the tonsils, or the larynx. There was some pigmentation of the meninges around the optic chiasma and left olfactory nerve.

So far the findings are open to the same criticism which applies to injections on the cadaver, namely that the injection was made under pressure and may have broken through where there is no normal functional communication. Beyond the field of direct extension this criticism is not so valid. There was very deep pigmentation of the submaxillary and internal jugular lymph nodes on both sides, without any discoverable pigmentation of the other tissues of the neck, thoracic wall, or pleura. The left subparotid node was strongly pigmented. The lungs showed numerous small round spots, almost black, especially noticeable on section, and the blood in the heart appeared abnormally dark. Microscopic sections showed carbon in the blood, endothelium, and tissue spaces of both sides of the heart, perhaps slightly more
marked in the right side, much carbon in the branches of the pulmonary arteries in the lungs, both free and dotted through the vessel walls, less in the other vessels of the lungs, a good deal in more or less dense focal masses within the lymphatics of the lung tissue, and very small amounts in a bronchial node. There was slight pigmentation of the retrosternal nodes, and experiments on guinea pigs indicate that these nodes probably occupy an intermediate position and may be reached directly from the lymphatics of the body cavity either above or below the diaphragm.

Microscopic sections of the various affected nodes showed carbon granules free in the lymph sinuses, sometimes in considerable masses, and in smaller quantity and finer division within blood vessels and endothelial cells.

The course of absorption here is perfectly clear, from the general left nasal field to the cervical lymph nodes of both sides, the lymph ducts, the great veins, the right heart, and the lungs, whence a residuum filtered through to be left heart and the general circulation. However, owing to the massive injection and the size of the field reached by direct extension, the experiment is not sufficiently limited either in the source of absorption or the degree of effect upon the different cervical lymph nodes. It was therefore necessary to follow it by a series of experiments with the injection more strictly confined to the antrum itself, or to other limited regions.

The reports of this series follow:

PROTOCOLS—ANTRUM.

RABBIT 2.

About 1/2 c.c. ink in left antrum. Some escape from nose.

Autopsy, 4 days—Much ink in left antrum, considerable amount in overlying tissues. Traces lying free on mucosa of nasal fossae, and mixed with pus in right antrum (proved by microscope). Very little absorption. Very slight pigmentation of left anterior and posterior submaxillary nodes. None elsewhere.

RABBIT 3.

Two c.c. ink in right antrum. Much escape from nose. 1.5 c.c. ink in subcutaneous tissue of left side of face, and submucosa of left side of palate.

Autopsy, 3 days—Small amount of ink in right antrum and overlying tissues. None in nasal fossae. Large amount in subcutaneous and muscular tissues of left side of face and submucosa of left side of palate. Moderate discoloration of left anterior submaxillary node, very slight of posterior. Deep discoloration of left internal jugular node. Pharynx, larynx, thorax and cranial cavity negative.
LYMPH DRAINAGE.

Microscopic sections—Tonsils and postauricular nodes, normal. Left posterior submaxillary node, small amount of carbon.

RABBIT 4.

One c.c. ink in left antrum. Needle passed through into left nasal fossa with some escape of ink.

Autopsy, two days—Small amount of ink in tissues over left antrum. Very small amount in antrum and around perforation on internal wall. No discoloration of lymph nodes.

This rabbit had a spontaneous nasal infection ("snuffles") and there was thick pus in the nasal fossae and antra. The submaxillary and internal jugular nodes on both sides were enlarged, and microscopic sections showed a moderate degree of nodular swelling.

RABBIT 5.

About ½ c.c. ink in right antrum. Some escape from nose. About ½ c.c. ink in tissues over left antrum.

Autopsy, 2 days—Moderate amount of ink in tissues over right antrum. Small amount in right antrum, with slight discoloration of mucosa of nasal fossae extending to the left side around the posterior edge of the septum. Much ink in tissues of the left side of the face. Marked discoloration of right and left posterior submaxillary nodes, very slight of left anterior submaxillary node. None elsewhere.

RABBIT 6.

About 1 c.c. ink in right antrum. Much escape from nose. About 1 c.c. ink in tissues of left side of face and submucosa of left side of palate.

Autopsy, 1 day—Moderate amount of ink in tissues over right antrum. Small amount in right antrum and right nasal fossa. Very large amount in tissues of left side of face and submucosa of left side of palate, showing through mucosa but not infiltrating it. Marked discoloration of left posterior submaxillary and left internal jugular nodes. Very slight discoloration of left anterior and right posterior submaxillary nodes.

RABBIT 7.

2 c.c. ink in right antrum. Free escape from nose.

Autopsy, 4 days—Considerable amount of ink in tissues over right antrum. Much beneath mucosa of antrum, moderate amount mixed with pus within antrum. Trace in right nasal fossa and right side of nasopharynx. Moderate discoloration of submaxillary nodes on right, slight on left. Considerable discoloration of right internal jugular nodes, which occur in a group, the uppermost one being the most pigmented. Moderate discoloration of left internal jugulars, more uniform in distribution. Slight discoloration of left submandibular node (verified by microscopic sections).

RABBIT 8.

About ½ c.c. ink in right antrum. Some escape from nose.

Autopsy, 1 day—Moderate amount of ink in right antrum. Very slight discoloration of right anterior and posterior, and left anterior, submaxillary nodes. Slight discoloration of right internal jugular node. Verified by microscopic sections.

RABBIT 9. (See Illustration.)

A few drops of emulsion of 11-weeks-old culture of human tubercle bacilli in right antrum. Lining mucosa of antrum scratched with needle.
Autopsy, 37 days—In mucosa of right antrum several small yellowish plaques, which in microscopic section showed tuberculosis at a fairly advanced stage of caseation, and loaded with tubercle bacilli. Right anterior and posterior submaxillary nodes, moderately advanced tuberculosis. Right internal jugular node, early tuberculosis with moderate number of bacilli. Left posterior submaxillary node, moderately advanced tuberculosis; left anterior, apparently normal, no bacilli found. Left internal jugular, early tuberculosis. At upper margin of lower lobe of left lung, near the root and immediately beneath the pleura, a whitish rounded elevated mass about 5 m.m. in diameter, which in microscopic section proved to be a tuberculous focus in a fairly early stage of caseation, with numerous bacilli. The remainder of the lungs showed scattered foci of extremely early tuberculosis, especially at the bases. The bronchial nodes on microscopic section showed very early tuberculosis with beginning caseation and numerous bacilli. The spleen showed diffuse incipient tuberculosis. The meninges appeared somewhat congested, and microscopic sections of meninges and brain showed some lymphocyte infiltration around the vessels, but no bacilli were found in several sections examined, and no perfectly characteristic tubercles.

**Rabbit 10**

Emulsion of tubercle bacilli in right antrum, as in Rabbit 9.

Autopsy, 70 days—No tuberculosis found on gross or microscopic examination. The liver contained several circumscribed abscesses of chronic type, but repeated stains with carbol-fuchsin failed to show acid-fast bacilli, and the other tissues were normal. The antrum was large and drained freely into the nasal fossa. Apparently the entire injection ran out over the mucous membranes, even the needle puncture escaping infection.

**Rabbit 11.**

About ½ c.c. fresh pus from antrum of Case P. in right antrum. This patient (Case P.) had a chronic suppurative of the left antrum, and bronchiectasis. Smears of the pus from the antrum showed pneumococci, staphylococci, and a variety of bacilli both Gram-positive and Gram-negative; 24 hour broth culture chiefly pneumos and staphs.

Died, 11 days. Autopsy—Marked inflammation of right antrum, slight of nasal fossae. Slight congestion of submaxillary and internal jugular nodes. Intense hemorrhage inflammation of trachea and bronchi. Pneumonia of left lung in stage of red hepatisation, of right lung in stage of resolution. Moderate nephritis. Spleen small and pale. Smears—Right antrum, pneumos and staphs. Right internal jugular node, pneumos and staphs. Left lung many capsulated pneumos, free and in phagocytes. Trachea same. Right lung same, but less numerous. Heart blood, very rare pneumos, numerous staphs.

**Rabbit 12.**

About ¼ c.c. broth culture (24 hours) from Case P. in right antrum.

Inoculation was followed in first week by slight nasal discharge and (doubtful) enlargement of the submaxillary nodes. These signs disappeared, but the rabbit developed emaciation and paralysis of the hind legs. Autopsy after about three weeks showed no evidence of infection, but great emaciation, anemia, fluid in the thoracic and peritoneal cavities, and dilatation of the stomach, which was greatly distended with food residue.
LYMPH DRAINAGE.

RABBIT 13.

About 1/4 c.c. broth culture (24 hours) from Case P, in right antrum.


Microscopic sections—Moderate acute inflammation of submaxillary nodes, marked inflammation of surrounding connective tissue. Marked acute inflammation of internal jugular nodes. Very marked hemorrhagic inflammation of trachea and bronchi. Congestion and infiltration of lungs.

RABBIT A.

Dissection for normal anatomical relations.

RABBIT B.

About 1/2 c.c. ink under skin of forehead.

Autopsy, 2 days—Much ink in skin and subcutaneous tissue of forehead on both sides from between eyes to between ears. Little absorption. Slight pigmentation of right postauricular node, moderate of right and left subparotids, slight of right internal jugular.

GUINEA PIG 1.

Inoculated under skin of belly with about 1/4 c.c. 24-hour-inoculated pus from Case W. (Chronic suppuration of left antrum. Chronic suppuration of right antrum previously cured by operation. Chronic pulmonary tuberculosis.) This pus in fresh state contained very rare pneumos, no other organisms found. After incubation for 24 hours it showed many encapsulated pneumos. These failed to grow on culture media, but a few colonies of staphs appeared.


FRONTAL SINUS.

The study of the frontal sinus has been made on cats, using essentially the same methods employed in the study of the antrum. The results so far have not been quite so satisfactory. It is necessary to drill a small hole in the frontal bone in order to enter the sinus, and this generally results in some escape of the injected fluid into the tissues of the scalp. Moreover, drainage into the nose is quite free, and is aided by gravity, and attempts at inflammatory closure of the nasofrontal duct have been only partially successful. It is harder therefore to get the injection retained, and to limit the primary source of absorption to the sinus. But while we do not regard this part of the research as finished, and work upon it is still in progress, the results already
obtained are interesting, and we give them for what they may be worth.

Cat 9, which may be selected as on the whole the best of the series, was given a few drops of iodin in the left frontal sinus, followed by about 1/2 c.c. of ink. There was very little escape of the fluids by way of the nose, practically none into the scalp around the needle.

The cat was chloroformed after four days. Autopsy showed a very small amount of ink in the subcutaneous and periosteal tissues over the left frontal sinus, a moderate amount in the sinus itself, along the nasofrontal duct, in the left ethmoidal cells and the left nasal fossa. There was a small amount in the right nasal fossa, chiefly on the surface of the middle turbinate. There was slight infiltration of the posterior bony wall of the left frontal sinus. In Cat 5, this infiltration occurred to a much more marked degree, penetrating the bony wall at many points and entering the subjacent dura, but not the pia or brain.

To return to Cat 9, there was very slight discoloration of all the submaxillary nodes, and traces of discoloration in the subparotids and postauriculars. None was found in the internal jugulars, either in the gross or in microscopic sections. They were slightly affected in Cats 5 and 7, but in both cases there was a possibility of ink reaching them from the scalp, as in Cat 3. It is quite certain, however, that they form the next relay after the submaxillaries—as well as receiving some drainage independently—and that a massive injection, or infection, which reaches the submaxillaries, is pretty sure to pass on to the internal jugulars.

We append the protocols of the series, a number of which contain matter of interest, though none of them is absolutely conclusive as regards absorption from the frontal sinus alone.

**PROTOCOLS—FRONTAL SINUS.**

**Cat 2.**

About 1 c. c, ink in cranial cavity through puncture at upper edge of left frontal sinuses.

About 1 c. c. ink in right frontal sinus. Posterior well punctured.

Autopsy, two days—considerable ink in subcutaneous and periosteal tissues over right frontal sinus. Small spot over left. Small amount in right frontal sinus and nasal fossa. None in left frontal sinus. Much in anterior part of dura and in pia of entire brain, extending forward around optic and olfactory nerves, and back around the spinal cord, everywhere more marked on right than left. Slight discoloration left anterior and posterior submaxillary nodes, moderate of right posterior submaxillary. Marked discoloration right in-
ternal jugular nodes, moderate of left. Very slight of right subparotid. Very slight of bronchial nodes (probably normal anthracosis).

Microscopic sections—Brain, much carbon in meninges, small amount in sheaths of vessels which enter cortex of brain, numerous scattered granules in substance of cortex, with much rarer ones in the medullary substance. They can nearly always be seen to lie close to an endothelial (?) nucleus, and probably still correspond to the distribution of the vessels, so that the findings do not contradict the accepted belief that brain tissue proper has no lymphatics. Right subparotid node, small amount of carbon.

Cat 3.

One c. c. ink in left frontal sinus. Some escape from nose.

Autopsy, three days—Small spot of discoloration in tissues over left frontal sinus. Small amount in mucosa of left frontal sinus. No discoloration of lymph nodes or any other tissue found.

Cat 4. (See Illustration.)

A few drops iodine in right frontal sinus, followed by about 1 c. c. ink, a good deal of which flowed back around the needle. No escape from nose.

Autopsy, two days—Purulent exudate in right nasal fossa, seropurulent exudate in incision over right frontal sinus, with a good deal of ink in subcutis and periosteum, extending slightly to left of median line. Much ink in right frontal sinus, visible through posterior wall from cranial cavity. None in nasofrontal duct or nasal fossa. Slight discoloration right anterior submaxillary node, trace in right posterior submaxillary. Very slight discoloration left anterior and posterior submaxillaries. Moderate of right subparotid, slight of left subparotid. Traces in right and left postauriculars (confirmed by microscopic sections). None found in internal jugulars.

Cat 5.

A few drops alcohol in right frontal sinus, with some escape into nose, followed by about 1 c. c. ink. Considerable escape of ink around needle in scalp, none from nose.

Autopsy, four days—Much ink in tissues over right frontal sinus extending well across median line and back as far as parietal bone. Much in right frontal sinus, penetrating the posterior bony wall at many points and infiltrating the subjacent dura, but not the pia or brain. Seropurulent exudate in nasal fossa, no ink. No discoloration right nasofrontal duct. Very slight discoloration all submaxillary nodes. Slight of right internal jugulars, none found in left. Marked of right subparotid, moderate of left subparotid and right postauricular. Some anthracosis of lungs and bronchial nodes.

Cat 6.

Few drops alcohol in right frontal sinus, followed by about 1.5 c. c. ink. Much escape by nose, none around needle.

Autopsy, four days—Small amount of ink in right frontal sinus. None in nasofrontal duct, but moderate amount in mucosa of right nasal fossa and right ethmoid cells. None found in lymph nodes.

Cat 7.

Few drops of iodin and trichloracetic acid in right frontal sinus, followed by about 1 c. c. ink. Some escape from nose, very little around needle.

Autopsy, four days—Moderate discoloration of tissues over right frontal sinus. Considerable ink in sinus, with moderate infiltration of posterior bony
wall, but not of dura. A good deal of ink mixed with pus in right nasal fossa and ethmoid cells, both free and in mucosa. None in deep tissues of nasal septum. Some extension around posterior edge of septum to floor of left nasal fossa and left middle turbinate, including anterior ethmoid cells. Moderate amount in sphenoidal sinus. Moderate discoloration right and left postauricular nodes, trace in left subparotid. Slight discoloration all submaxillary nodes, very slight at upper end of left internal jugular (verified by microscope).

Cat 8.

Few drops iodine in right frontal sinus, followed by about 1 c.c. ink. Some escape from nose.

Autopsy, four days—Inflammation of scalp around incision over right frontal sinus, very slight discoloration. Small amount of ink in right frontal sinus, none in nasofrontal duct. Inflammation of nasal fossa, no ink. Inflammation of right submaxillary, postauricular, anterior and posterior submaxillary, and left jugular nodes, slight of left internal jugular—no discoloration. Congestion of kidneys, slight of bases of lungs. Eechymoses in spleen and pancreas. Anthracosis of lungs and bronchial nodes.

Cat 9.

See text, pp. 22-23.

Cat 10.

Attempted inoculation of right frontal sinuses with emulsion of tubercle bacilli (rapid-growing pigment-producing culture, suspected of low virulence).

Guinea pig 2, control, inoculated under skin of belly with same emulsion. Result negative.

Autopsy, Cat 10, six weeks—No evidence of tuberculosis anywhere. Skull thick, frontal sinuses abnormally small. No gross evidence of disease in meninges or nasal fossae. Right submaxillary and internal jugular nodes large, firm, and white.

Microscopic sections—Tissue over right frontal sinus, healthy young connective tissue, containing many plasma cells. Meninges, moderate degree of chronic non-tuberculous inflammation, one small septic thrombus with many polymorphonuclears noted. Right submaxillary and internal jugular nodes, general follicular swelling. Right postauricular node, slight swelling. Right subparotid node normal. Lung, no evidence of disease.

Cat A (1)

Dissection for normal relations.

Cat B.

About ½ c.c. ink under skin of right brow.

Autopsy, three days—Much ink in scalp over both brows, extending forward almost to tip of nose and back to parietal bones. Very deep discoloration of right posterior submaxillary node, deep (focal) of right anterior and left anterior and posterior submaxillary nodes. Considerable discoloration anterior end of right internal jugular node, slight of left. Very deep discoloration right and left submaxillary and postauricular nodes. Slight anthracosis of lungs and bronchial nodes.
LYMPH DRAINAGE.

Conclusions.

1. Lymphatic absorption from the antrum, whether of bacteria or of inert substances, is by the way of the submaxillary and internal jugular nodes to the lymph ducts, the great veins, the right heart and the lungs. Substances reaching the lungs may of course pass on to the left heart and the general circulation.

2. Absorption from the tissues of the face in the antrum region, and from the palate, is by the same route.

3. The subparotid and retrosternal nodes may sometimes be reached by absorption from the antrum and neighboring tissues.

4. Absorption from the frontal sinus seems to follow the same course as absorption from the antrum. From the scalp over the sinus absorption usually reaches the subparotid and postauricular nodes as well.

5. Absorption from the meninges reaches the internal jugular and probably also the submaxillary nodes.

6. There is little if any absorption from the uninjured mucosa of the nasal fossae.

7. Lymphatic drainage is widely regional. Anastomosis from node to node and from side to side is free, so that it is not always possible to fix on a single node or group of nodes as the certain point of election for metastasis from a given region.

8. In respect of lymphatic function, as well as anatomically, the lining membrane of the nasal fossae and accessory sinuses is a continuous whole, and infection at one point can probably be conveyed by lymphatics to practically any other point.

9. There are lymphatics penetrating the posterior bony wall of the frontal sinus, and these may carry substances from the sinus to the dura over the frontal lobe of the brain under exceptional conditions of pressure in the sinus.

10. The region draining into the tonsils in these animals must be very limited, since the tonsils have not been found affected in any of our experiments, even when the palate or nasopharynx was involved.

We have not found any direct lymphatic communication from the plexuses and nodes of the head and neck to the lungs and pleura. Theoretically, on the basis of development, connections may exist, and may even occasionally function. But this seems a far-fetched explanation of lung metastases from nose and throat infections. The obvious, easily demonstrated, and insuf-
sufficiently emphasized course is down the deep cervical chain and by the ducts and veins to the right heart, thence directly to any or all parts of the lungs.

Throughout the series, and especially in the experiments on the frontal sinuses where an incision is made, the possibility of aspiration of the injected substances by injured veins is not excluded. However, the findings considered as a whole, and in view of the extremely slight injury done to vessels by the technique used in the antrum series, make it almost certain that venous aspiration has been a negligible factor.

We must of course recognize that this research only enables us to draw conclusions in the case of the animals used, the rabbit and cat. But we have been struck repeatedly by close parallels between our experimental findings on the one hand, and clinical and anatomical observations on the other, and we are convinced that further study will establish further parallels, and that most, if not all, of our conclusions can be proved to apply to the human subject.

Note.—The writer is indebted to Doctors Gerald B. Webb and G. Burton Gilbert of Colorado Springs. It was through their laboratory that it was possible to carry on this research. To Doctor Charles T. Ryder of Colorado Springs who carried on the work, and to Doctor James C. Todd of the State University of Colorado at Boulder, who so kindly made the microscopic photographs.

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Rabbit I.—Front view of head and thorax.
R. I. J.—Rt. internal jugular node. L. I. J.—Left ditto.
S. G.—Submaxillary salivary glands.
P.—Pin inserted in the puncture made when injecting the left antrum.

Note.—This picture is semidiagrammatic, the nodes having been darkened in the print. Wherever this has been done, it will be indicated in a foot-note.
Fig. II.

Rabbit I.—Right side of head and thorax.
R. A. S.—Rt. anterior submaxillary node.
R. P. S.—Rt. posterior submaxillary node.
L. P. S.—Left posterior submaxillary node.
P. G.—Parotid salivary gland. The subparotid node lies directly beneath this.
A.—Base of auricle.

Note—Semidiagrammatic as regards nodes.
Rabbit I.—Left side of head and thorax.

R. A. S.—Rt. anterior submaxillary node.
L. A. S.—Left anterior submaxillary node.
R. P. S.—Rt. posterior submaxillary node.
L. P. S.—Left posterior submaxillary node.
R. I. J.—Rt. internal jugular node.
L. I. J.—Left internal jugular node.

P.—Pin in puncture made when injecting left antrum. Some ink discoloration around it.

I. O.—Ink in tissues of orbit, extending to edge of conjunctiva.

Note—Semidiagrammatic as regards nodes. L. I. J., however, has not been retouched.
Rabbit I.—Transverse section of head through antra.
R. A.—Rt. antrum, normal (approximately).
L. A.—Left antrum, containing ink.
L. E.—Left ethmoid cells, containing ink.

Rabbit I.—Transverse section of head through nasopharynx and anterior part of orbits.
N. P.—Nasopharynx, somewhat pigmented.
O.—Areolar tissue of left orbit, containing ink.
T.—Tissue surrounding sockets of left molar teeth containing ink.
L. S.—A left submaxillary node.
Fig. VI.

Cat 4.—Front view of head and neck.
R. A. S.—Rt. ant. submaxillary node.
L. A. S.—Left ant. submaxillary node.
R. P. S.—Rt. post. submaxillary node.
L. P. S.—Left post. submaxillary node.
R. I. J.—Rt. internal jugular node.
L. I. J.—Left internal jugular node.

Note—Semidiagrammatic as regards pigment in nodes.

Fig. VII.

Cat 4.—Sagittal section of head.
L. F. S.—Left frontal sinus, with septum in place, opened to show interior. No ink.
R. F. S.—Rt. frontal sinus, full of ink.
Rabbit 1. Posterior wall of pharynx. (x 90). The black areas are masses of carbon granules in the lymph sinuses, the rest of the field is normal lymphoid tissue.

Fig. VIII.

Rabbit 1. Rt. post. submaxillary node (x 40). Showing black masses in the lymph sinuses and finer granules scattered through the lymphoid tissue.

Fig. IX.
Fig. X.

Rabbit 1. Left lower lobe of lung (x 40). Showing two pulmonary artery branches containing carbon masses and granules, with finely divided carbon in their walls. Also accumulations of carbon in the lymphatics of the lung tissue proper, as at C.

Fig. XI.

Fig. XII.

Rabbit I. Inner edge of wall of right ventricle of heart. (x 350). Showing carbon mixed with blood corpuscles in ventricle and in endothelial lining, as well as in blood and lymph vessels of ventricular wall.

Fig. XIII.

Rabbit I. Inner edge of wall of left ventricle of heart. (x 350). Showing carbon on and beneath the endothelial surface, but in smaller quantity than in the right ventricle.
Fig. XIV.

Rabbit 9. Mucosa of right antrum. (x 40). The thin portion at the left is normal mucosa, with unbroken epithelium on the upper surface. The rest of the field is a tuberculous ulcer, the primary lesion of the experiment. The darkest portion is caseous and loaded with tubercle bacilli.

Fig. XV.

Rabbit 9. Detail of XIV (x 1000). From the caseous area of the antral lesion stained with carbol-fuchsin, showing countless tubercle bacilli.
Rabbit 9. Rt. ant. submaxillary node (x 40). The dark areas are dense lymphoid tissue. The lighter areas are tuberculous lesions, consisting mostly of "epithelioid" cells, with spots of caseation as at C.

Rabbit 9. Rt. int. jugular node (x 40). Showing lymphoid (dark) and tuberculous (light) areas, as in XVI.
Fig. XVIII.

Rabbit 9. Left int. jugular node. (x 40). Showing dark lymphoid and light tuberculous areas. The lesion is less advanced than in the right int. jugular.

Fig. XIX.

Rabbit 9. Lesion from left lung (x 40). The light area on the right is approximately normal lung tissue. The dark solid area on the left is tuberculous tissue with virtual destruction of lung tissue, and much dense caseation. In the middle and lower left portions of the field the lesion is in an intermediate stage.
Fig. XX.

Rabbit 9. Bronchial node (x 40). The darker areas are lymphoid tissue, the lighter areas early tuberculous lesions. (The black streak in the upper right sector is an artifact).
INTRA-TRACHEAL INJECTIONS.

By THOMAS W. MOORE, M. D., Huntington, West Va.

The direct application of medicines within the trachea and bronchi in a practical manner seems to have originated with Dr. Horace Green of New York. In 1838 Dr. Green succeeded in passing a small sponge saturated with a solution of nitrate of silver through the glottis into the trachea. He continued his efforts in this direction and, in 1854, succeeded in passing an elastic tube through the larynx into the bronchi, injecting from one and a half to two drams of strong nitrate of silver solution into the lungs in a case of tuberculosis.

Dr. Green suffered a very common fate of the medical pioneer and was criticised and doubted by the medical profession and a committee appointed to investigate his statements and methods. After six months a majority of this committee reported unfavorably to Dr. Green, although a minority report fully sustained him. For the latter Fordyce Barker was largely responsible.

It is interesting to note that Morton was at this time being severely censured by the medical profession for claiming that ether is an anesthetic.

However, Dr. Green was not discouraged, but continued with this treatment and in December, 1859, he stated in a paper before the Medico-Chirurgical College. "Such has been the amount of success which has continued to attend this plan of treatment, that I am now ready to affirm, after an experience of many years in a field of observation, unusually large, that, if I were required to relinquish all other known therapeutic measures, or topical medication, in the treatment of thoracic diseases, I should choose the latter with hygienic means alone, in preference to the entire class of remedies ordinarily employed in the treatment of these diseases."

"During the three or four years since my report of one hundred and six cases, I have treated large numbers of patients afflicted with chronic laryngeal and bronchial diseases, with asthma, and with tuberculosis and the success which continues to attend this practice has served to increase greatly my confidence in this measure as a therapeutic agent"—a position requir-
ING VERY EXTRAORDINARY COURAGE WHEN WE REMEMBER THE GREAT DEVOTION OF OUR PROFESSION TO DRUGS AT THIS PERIOD.

IN 1893, DR. EDWIN J. KUH READ A PAPER BEFORE THE CHICAGO MEDICAL SOCIETY, CALLING ATTENTION TO AN ARTICLE BY WILLIAM MURRELL IN WOODS MEDICAL AND SURGICAL MONOGRAPHS OF 1890 AND ALSO TO AN EARLIER ARTICLE BY THE SAME AUTHOR IN THE LANCET IN 1874 ON "IPPECAEUAHHA SPRAY IN WINTER COUGH AND BRONCHITIC ASTHMA." THIS WAS IN THE FORM OF A SPRAY INSTEAD OF AN INJECTION, BUT SUGGESTED TO KUH THIS MODE OF TREATMENT AND TO HIM IS DUE THE CREDIT OF BEING THE FIRST TO ABANDON THE WATERY AND ALCOHOLIC MENSTRUUM FOR AN OILY ONE. KUH REFERRED TO THE EXCELLENT RESULTS HE WAS HAVING IN CHRONIC BRONCHITIS AND EMPHYSEMA OF THE SEVERER TYPES. FROM A NOTE OF RECENT DATE IN WHICH DR. KUH STATES HE USES THE SAME ATOMIZER BUT WITH A MODIFIED TIP, I INFERR THAT HE STILL FINDS THIS TREATMENT BENEFICIAL.

IN 1896, DR. J. L. BARTON OF NEW YORK PUBLISHED AN ARTICLE IN THE MEDICAL RECORD ENTITLED "DISEASES OF THE TRACHEA, BRONCHI, AND LUNGS TREATED BY INTRA-TRACHEAL INJECTIONS."

IN THIS ARTICLE, TO WHICH I AM INDEBTED FOR MUCH OF MY HISTORICAL DATA,—I FIND THE FOLLOWING QUOTATION FROM THE MEDICAL RECORD OF DECEMBER 1ST, 1883. "AT A RECENT MEETING OF THE FRENCH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCES HELD IN ROUN, DR. BERGERON PRESENTED A MEMOIR ON THE SUBJECT OF THE INJECTION OF MEDICATED SUBSTANCES INTO THE TRACHEA, IN WHICH HE ASSERTED THAT THE INJECTION OF MEDICATED SUBSTANCES INTO THE RESPIRATORY PASSAGES BELOW THE LARYNX WAS VERY WELL BORNE BY COWS, HORSES, AND DOGS." DR. BARTON ALSO CALLS ATTENTION TO THE EXPERIMENT OF COAKLEY IN WHICH HE INJECTED A SOLUTION OF INDIA INK INTO THE TRACHEA OF RABBITS AND THE ANIMALS KILLED IN FROM FIFTEEN MINUTES TO TWO HOURS. "IT WAS FOUND IN EVERY CASE WHETHER FIFTEEN MINUTES OR TWO HOURS HAD ELAPSED, THAT NOT A TRACE OF PIGMENT COULD BE FOUND IN THE TRACHEA, BRONCHI, OR ALVEOLI, BUT ALL HAD BEEN ABSORBED. EXCEPT WHERE A FEW CELLS HAD RUPTURED THERE WAS NO FREE PIGMENT IN THE LYMPH CHANNELS, BUT WAS ALL CONTAINED WITHIN THE LYMPH CELLS OR PHAGOCYTES WHICH WERE SCATTERED THROUGH THE LYMPH CHANNELS OF THE LUNGS, UNDERNEATH THE PLEURA, AND IN BRONCHIAL GLANDS."

THIS CONSIDERED IN CONJUNCTION WITH THE RECENT PAPER OF FREUDENTHAL IN WHICH HE OFFERS VERY STRONG PROOF THAT FLUIDS ENTERING THE TRACHEA DO NOT PASS BEYOND ITS LOWER LIMITS OR AS HE EXPRESSES IT, "AN INJECTION INTO OR THROUGH THE LARYNX WILL NEVER PASS BEYOND THE MIDDLE AIR TRACT, AS I TAKE THE LIBERTY OF CALLING THAT
portion," (referring to the larynx and trachea) confirms the conclusion that there must be a very rapid absorption of fluid injected into the larynx or trachea, providing they do not pass beyond its lower limits—of which I am not fully convinced.

Be this as it may we must admit that in intra-tracheal injections we have a very valuable,—to me our most useful method of treating that condition of tracheitis where there is cough and hawking in the mornings, frequently continuing for half hour or longer until a small amount of mucus is expelled, after which the condition is relieved until night when there is a recurrence. This is frequently spasmodic and in children is difficult to differentiate from whooping cough. Hoarseness is another symptom.

This condition has been so frequent following the recent influenza epidemic, it has been almost invariably relieved by an injection of menthol in liquid petrolatum, and I have concluded that in this class of cases it is the mechanical lubrication of the effected parts that gives relief.

In 1914 Bourgeois advocated intra-tracheal or even intra-bronchial injections of adrenalin-novocain solution in either oil or water for asthma and arrived at the conclusion that the good effect of these injections is probably due to the anesthetic and vaso-constructive action of the solution. He reminds us of the extremely rapid absorption of an aqueous adrenalin solution and its great diffusibility and that it is to this fact it owes its efficacy.

He says the only contraindication is advanced age of the patient or arterial hyper-tension, and concluded that intra-bronchial injection of novocain adrenalin is very successful in asthmatic attacks, and may be tried in the intra-paroxysmal period, although it is less constantly useful at such times. My results with adrenalin, in common with Freudenthal and other observers has not been encouraging, and I have concluded that more relief is given with a one per cent. solution of camphor in liquid petrolatum. In asthmatic conditions the statement of Hubbard made in 1904 still covers the ground when he says, "In fact all things considered, the neurotic element and the chronicity of these cases, I would place tracheal injections as very useful adjuvants to the general treatment of bronchial asthma."

In tuberculosis I regard intra-tracheal injections still as our most valuable local therapeutic measure. I prefer a two per cent. guaiacol in liquid petrolatum. At times the results have been almost phenomenal. I recall several years ago a patient presenting himself at my office telling me that he had been
ailing for over a year and that his physician had advised him to try a more favorable climate, which he wished to do, but begged for relief until he could arrange his affairs so that he could leave. He was weak, emaciated, no appetite, pulse rapid, and temperature 102 degrees.

I advised him to go to bed and gave him an intra-tracheal injection of a two per cent. guaiacol in liquid petrolatum. The next day he returned for another injection, stating he felt much better; this he continued daily for four or five days, when his temperature was normal. About one year later he came into my office, stating that I had cured him, but that he had caught cold and wished another injection. This occurred at intervals of six months or a year for several years, when I lost track of him. During this time he continued at work as a machinist, and, whilst thin and frail appearing, he insisted that he felt all right.

I have recently been informed that intra-tracheal injections were used with great satisfaction in soldiers who have been gassed. Of this I have seen nothing in the literature, but probably some of the gentlemen present will give us some information as to what was used and the results.

Menthol-guaiacol-camphor-orthoform-adrenalin and sometimes iodin, always dissolved or emulsified in some bland oil, preferably, liquid petrolatum, are the medicaments I have used, and with the possible exception of guaiacol where I have noticed reduction of temperature and other constitutional benefits after its use, my treatment has been directed entirely to the local ailment, and not as a method of administration for maladies whose pathology does not involve the locality immediately treated, although the earlier papers offered much encouragement for making this a method of administration of remedies whose action was intended to be systematic. It has often been a question with me whether the benefits obtained were due to the mechanical lubrication or to the medicinal effects of the drugs.

My method has been always with the mirror and not by direct bronchoscopy or tracheoscopy. Sometimes in homes where it is impossible to use the mirror I have tried to apply the method advocated by Mendel in 1905, which consisted in holding the tongue out of the mouth and having the patient refrain from swallowing, the pharynx thus forms a funnel the only inferior outlet of which is the glottis, as the gullet opening is closed, so that a small amount of liquid projected against the wall of the
pharynx runs down into the air passage; this is greatly facilitated if the patient will inspire at the time the liquid is introduced.

Mignon combines traction of the tongue with pushing the epiglottis out of the way with the finger. This aids intratracheal injection of a fluid without special illumination or assistance. The epiglottis is pushed down with the left index finger until it rests on the drawn-out tongue. This opens the larynx wide while reducing the opening into the esophagus to the minimum.

With the syringe of Arrowsmith for the patient's use I have not had the success of some of my confreres, possibly due to my not fully grasping his technique.

In conclusion my apology for bringing before you a method so trite, and one with which you are doubtless all familiar, is to remind you of this very useful procedure which seems to have been much neglected, as I find it not even mentioned in three recent text books on diseases of the throat. No other one routine of treatment in my practice is so satisfactory to me or gratifying to my patients.

DISCUSSION.

Dr. Wolff Frendenthal, New York City, was glad that Dr. Moore had mentioned the work of Dr. Horace Greene, who might easily be called the father of this method. But it was not until Coe read his paper that laryngologists began to employ the method. It was important, in treating the bronchi, to remember that substances injected do not go below the trachea. There was something that prevented foreign bodies entering the lower part of the respiratory tract, and medicines were foreign bodies. At any rate, these medications did not go down much below the bifurcation.

He had used the drugs mentioned in the paper, and had found them beneficial, but he wished to call attention to orthoform, which he had used with great satisfaction, especially the preparation which goes under his name. This was an emulsion of orthoform. He mentioned in this connection a girl whom he had treated for laryngeal tuberculosis. The ulcers healed very nicely, yet the patient came twice a week for an injection of the emulsion, which, she said, made her feel easier in the trachea. The incessant cough from the trachea in the beginning of grippe could be stopped almost immediately by injecting orthoform or quinalcol.

He believed the time would come when laryngologists would treat not only laryngeal but pulmonary tuberculosis as well, and that the result would be just as successful in the latter disease as they had been in laryngeal affections.

Dr. H. H. Briggs, Asheville, N. C., had not employed the method suggested by the essayist. The most efficient method he had used in introducing the solution into the trachea was to place the tip of the curved canula over and just beyond the tip of the epiglottis, resting the posterior portion of the canula against the upper incisor teeth in order to steady the instrument. The patient was then requested to close the lips, and to take a quick, deep inhalation through the nose, at
which time the solution was forced into the larynx and trachea. In that way the larynx was caught unawares, as it were, and a greater amount of the solution was drawn into the trachea than by the usual method.

He had frequently found that the patient felt the pungent effect of the medication more in the lung which contained the tubercular lesion; from which one might infer that a slight amount, at least of the medication might reach the alveoli.

Dr. Clifton M. Miller, Richmond, Va., had used this form of medication for sixteen years or more. The formula which he used had been given him by a tuberculosis specialist. Whether it did any good in general tuberculosis or not he did not know, but it had a wonderful effect on tuberculous ulcerations of the larynx. It burned them frightfully for the first two or three times. He did not feel that he had cured a case of ulceration of the larynx unless the man handling the lung condition had obtained a cure, but he had succeeded in giving wonderful relief with this prescription, which is as follows:

Oil of Eucalyptus
Oil of Thyme
Oil of Cinnamon

aa 15 grains

Mix and add iodoform sufficient to saturate, then add sterilized olive oil q. s. ad 100 grains.

Keep in opaque bottle.

Dr. Joseph C. Beck, Chicago, Ill., had had perhaps five or six hundred of these gassed cases in which this method of treatment had been employed. The men objected to it very decidedly. Of course one commanded them, as soldiers, to take the treatment when offered, but they objected nevertheless. Furthermore, the effects did not seem to last very long. This subject had been discussed in Paris at the Academy, especially with regard to the cough keeping other patients awake at night. One of the doctors explained that the cough was not due to tracheo-bronchial irritation but was a neurotic cough, that these patients were of that group of cases, with other neurotic symptoms, and that he had succeeded in controlling the cough by means of suggestive therapeutics.

He did not agree with Dr. Goldstein regarding the absorption of oils. Physiologically the saponification of oils was necessary for their absorption. The use of medicaments in the nose, throat and respiratory tract was not of great value from the point of view of absorption, nor did they adhere to the mucous membranes as well as did watery solutions, unless in the presence of ulceration.
SEVERE AND UNCONTROLLABLE HEMORRHAGE FOLLOWING MASTOIDECTOMY IN A PATIENT SUFFERING FROM PURPURA.

By THOMAS J. HARRIS, M. D., New York City.

The following case occurred in the oto-laryngologic service at the U. S. General Hospital No. 14, Fort Oglethorpe, Ga. The history is a transcript of the hospital records.


Family history: Father living and well, negative history. Mother had frequent bleedings, died from "dropsy of the heart"; one brother died from hemorrhage following a tooth extraction and another brother bled to death following an injury to the mouth. (One brother had rheumatism.) No history of neuropathies or malignancy in family.

Previous personal history: Mumps, varicella, otitis media bilateral with incision of both drums followed by bleeding. Vaccinated against smallpox; inoculated against typhoid. Gives history of almost bleeding to death several times following slight injury. Head injury seven years ago. Fracture of right ulna. Gonorrhea 1918.

Was in Ward No. 5 of this hospital for about one month, being discharged June 29th, 1918. He was admitted at that time for rheumatism of the right elbow and shoulder. Has had rheumatism in other parts of the body, but this was the first attack in two and a half years. Never had any throat trouble, but has two hollow teeth.

On admission July 6th he complained of pain in right elbow. Condition on admission: Pulse 62, temperature 98.2°, respiration 22, weight 120. Physical examination shows nothing abnormal except slight enlargement of right elbow joint and extension of both elbows not quite normal. The affected joints always show blue discoloration. At this time anterior and outer surface of the arm shows large subcutaneous hemorrhage. Above this, on lower portion of upper arm, is a yellow discoloration, also below the forearm. Left upper thigh shows a small subcutaneous infiltration.

Treated for arthritis, and on July 25th it was noted that a hemorrhage spot two by three inches appeared on the outer aspect of the right shoulder; another about the size of a dollar appeared on inner aspect of left elbow; another 1 1/2 inches in diameter in right popliteal space. The throat is slightly reddened and the gums bleed easily. Diagnosis made on this date of Schoenlein's Disease. Arthritis continued in transient and migration form until about October 1st, when C. D. D. papers were sent in.

October 7th he complained of pain in both ears with slight hemorrhage from left ear and some discharge from right ear. On this date Capt. Sauer, M. C., made diagnosis of otitis media, suppurative, acute, bilateral and
myringotomy of both ears was performed. The next day bleeding from both canals was noted. October 9th the bleeding had almost ceased and the inflammatory process seemed to be subsiding. On October 10th, Lieut. Hill, M. C., attempted to remove clot from right meatus, which resulted in oozing. Left ear appeared to be clearing up nicely.

October 12th left ear was normal, with still some clot in right ear. October 13th showed sero-sanguinous discharge from right ear and on next day patient complained of pain in right ear. The right ear continued to show periods of subsidence only to be followed by recurrent episodes of inflammation, and on October 16th the left ear commenced to discharge again. October 22nd the left ear showed larger degree of inflammation with every clinical indication of acute mastoid involvement, but operation was not undertaken because of history of hemophilia.

October 24th the left ear appeared to be clearing up with no mastoid tenderness or edema, and this condition continued until November 3rd, when the following was noted: moderate purulent discharge from left ear, membrana tympani quite swollen and tender, and some thickening over posterior aspect of the mastoid tip. A blood count on this date showed 16,000 white cells and the differential count showed small mononuclears 4%, large mononuclears 16%, transitional 1% and polymorphonuclears 79%. Since the question of operative interference had to be seriously considered at this time, a brief resume of the different blood examinations made up to this time will be of interest. On October 21st the coagulation time was 10 minutes, and blood type IV; while on October 10th the clotting time was 4 minutes and blood platelets 275,000.

November 4th the patient complained of dizziness on sitting up; less pain in the ear, but pain on pressure over the left tip. Whispered voice heard four inches and spontaneous nystagmus to the left. November 5th the patient seemed somewhat better and nystagmus had disappeared. On this date the radiographic report says, "the left mastoid is of the pneumonic type, but the cells are small in area. In the region of the antrum there is some sclerosis. In the right mastoid there is an increased density throughout, that suggests an acute process. The knee of the lateral sinus is about 2 1/2 cms. posterior to the external auditory meatus."

November 6th the process seemed to be subsiding, but there was still moderate discharge. November 7th and 8th the patient had considerable pain in the right shoulder, but no pain in the ear. November 9th the patient had bleeding from gums along the upper incisors which, he says, commenced at 10:00 P. M., last night and has continued until now. November 10th ear condition slightly improved.

November 11th there was a marked swelling over the tip of the left mastoid, Diagnosis: Bezold's Abscess. Operation advised, following transfusion. At 10:30 A. M. 230 c.c. of blood from Jaurnig, donor, type IV Wassermann negative, together with 25 c.c. of 2.5% sodium citrate solution were transfused. The patient had no reaction of any kind. Thirty minutes later coagulation time was 10 minutes. At 11:40 A. M. the patient had a chill lasting 20 minutes, temperature 102°, pulse 112, respiration 24, with nausea and vomiting. On the same day left mastoid was exenterated by Lieut. Colonel Harris, M. C., assisted by Lieut. Curtin, M. C. Cortex found to be hard, no cells, antrum contained small amount of granulation. Deep cells broken down along canal,

November 12th the patient bled constantly, but not profusely, throughout the night. On this date his systolic blood pressure was 82, diastolic 60. Another blood transfusion, indirect from Farrell, donor, was done by Lieut. Spearman. The wound oozing controlled promptly by 5% of coagulon ciba.


November 18th, last night bleeding occurred. New outer dressing and coagulon ciba applied. At 11:00 A. M. 500 c.c. of blood from Farrell, donor transfused by Lieut. Spearman, M. C. No reaction. Mastoid dressing and drainage changed by Lieut. Colonel Harris and reapplied with gauze saturated with coagulon ciba. Apparently perfect control of bleeding after applying tight bandage. At 9:00 P. M. dressing had to be reapplied because of free bleeding. November 19th, bleeding recurred at 3:00 A. M. and redressed at 9:00 A. M., but dressing was ineffectual and had to be done over at 10:30 A. M. The bleeding persisted and at noon Colonel Harris sutured the mastoid wound completely and this controlled the bleeding. At 3:00 P. M. the transfusion wound in the left arm commenced to bleed and required dressing.

November 20th pronounced edema of both lids of left eye. Examination by Major Wiener, M. C., who decided edema was probably due to temporary blocking of lymph channels from suturing of wound and will probably disappear shortly. Very free bleeding again at 11:00 A. M. and pressure bandage applied. This did not control bleeding. At 2:15 P. M. dressing reapplied. Systolic blood pressure 120, diastolic 65; at 6:00 P. M. Lieut. Spearman, M. C., did a direct transfusion of 100 c.c. of blood from Jaurnig. November 21 bleeding from lower end of mastoid wound. Packing and pressure bandage effective; 5 c.c. hemoplastin given and coagulin was applied over wound before applying dressing. November 22d, outside dressing changed, packing in wound not renewed. The edema of eyelids much less. November 23, dressing changed, no bleeding; 2 c.c. hemoplastin given. November 24, dressing changed, no bleeding though there was about a dram of dark clotted blood in the ear, evidently having bled from the middle ear. November 25, dressing changed, some bloody discharge from wound. Hemoplastin 2 c.c. given. Clotting time 7 3/4 minutes. November 26th, wound dressed, no bleeding either from wound or canal. November 27th, wound dressed. Gauze renewed. Lower part of wound covered by a dense blood clot. Very little bleeding which was easily controlled. November 28th, dressed wound, found clean, no bleeding. Clotting time 8 minutes. November 29th, no bleeding, the wound is beginning to granulate. November 30th, wound still doing nicely. December 1, patient allowed to sit up and be rolled about the ward in a chair. December 2, wound doing nicely, went for a drive. December 3, dressed. Slight discharge from ear but wound looks well, no bleeding.

The subsequent history of the case was one of slow but complete recovery. The patient was discharged from the army to his home in Michigan the early part of the year. He died at his home in April after a brief illness, the nature of which was apparently not recognized but was unattended by bleeding.
Comment: Mastoiditis occurring in a “bleeder” and requiring operation is in our experience unique. We have made no survey of the literature, but the only case that we are acquainted with is one reported by Dr. Philip D. Kerrison at a recent meeting of the New York Otological Society. The clinical features of the case just reported chiefly concern us as otologists. To fully appreciate these, however, some consideration of the blood picture is in order. During the last decade much careful study of the normal and abnormal processes of coagulation have been made. On this side the water Howell of Baltimore and Hess of New York stand out conspicuously among those who have contributed to the subject. The result of their work has served to set forth clearly the chief distinguishing features of the two hemorrhagic states into which bleeders are divided, namely, hemophilia and purpura. These have to do first with the coagulation time and second with the number of blood placlets. In a general way it may be said that hemophilia is a hereditary disease characterized by a deficiency in one or more of the clotting properties of the blood which results in prolonged coagulation time. Purpura, on the other hand, representing many different conditions, is characterized by a deficiency of the blood placlets. Hemophilia as is well known is wont to occur in males although it is transmitted through the female. Purpura occurs both in male and female. The bleeding in hemophilia is really unduly prolonged normal bleeding and occurs usually after injury. The bleeding in purpura is wont to occur spontaneously. As shown by Duke, bleeding time following the puncturing of the skin is increased in purpura. It is not increased in hemophilia. Purpura is characterized by frequent subcutaneous hemorrhages. A definite deficiency in the amount of prothrombin has been shown by Howell to be demonstrable in hemophilia. In purpura, on the other hand, it is normal. It would seem that with these characteristic differences the differential diagnosis between the two disorders would not be difficult. In the majority of cases it is not. There is, however, a certain number of border line cases where the diagnosis is exceedingly difficult. These present features of both diseases. In them the bleeding may occur both in male and female members of the same family. Clinically, these cases closely resemble one another. It would seem to point to the fact that there is an intimate association between them in the blood pathology which up to the present time has not been determined. To quote Hess, “The striking hereditary character of true hemo-
philia has frequently led to the assumption that the mere fact that the bleeding tendency was hereditary constituted strong evidence for the hemophilian and against the purpuric nature of the disorder. This has been our experience in regard to cases referred to us by physicians and is the point of view which pervades the literature of hemorrhagic disease. The matter, however, is not so clear cut. The fact is that although purpura may not be hereditary and may be idiopathic or due to sepsis or many other causes, there is a definite hereditary purpura. Our case falls in this class. The family history of the two brothers dying of hemorrhage as well as of the mother suffering from frequent attacks of hemorrhage, the history of frequent subcutaneous hemorrhages is in line with this. More important still is the fact that the clotting time was never above 15 minutes and shortly before the operation was as low as 4 minutes. Further confirmation is the number of blood plaeclets, which while not greatly diminished, was below normal. It is a source of regret that the unexpected death of the patient prevented a more extended study of the blood. From a clinical standpoint, the case was of more than usual interest to us. Some years ago we reported a case of purpura where the life of the patient was apparently saved by the injection of normal blood serum. In the case under discussion there were given altogether 1900 c.c. of human blood by transfusion. This had undoubtedly the effect of temporarily saving the patient’s life. It did not, however, appear to have any effect upon checking the bleeding. The interesting question presented itself in this connection, whether the use of the citrate solution had the tendency to prevent clotting. Opinions differ on this point. On account of this possible effect, the last transfusion was given by the direct instead of the indirect method but without any appreciable difference in the result.

It will be further noted that the hemorrhage during the operation was in no way excessive. Tight packing failed to control the bleeding, which came from no one part of the wound but from its entire extent superficially and deep. More efficacious than anything else was the suturing of the wound. This had the effect of completely stopping the bleeding for a time. It was followed by the edema of the eyelid referred to, but strangely enough there was no escape of blood into the throat through the Eustachian tube. As was noted, the coagulen ciba gave no benefit. Hemoplastin, on the other hand, appeared to be of decided benefit. This is in keeping with the results obtained by Hess in
several of the cases which he reports. Composed as it is of normal tissue juices, the benefit secured would point to the deficiency of these in our case. Giving whatever credit is due to the employment of this, it seemed to us that there was gradually a recovery of the power of coagulation as the case progressed and that to this chiefly is to be ascribed the ultimate recovery. A gratifying and unexpected feature of the case was the absence of all evidences of septic absorption from the abscess in the neck in spite of the enforced imperfect drainage, which took place on account of the necessity of keeping the mastoid wound tightly packed. The final fatal termination of the case, according to the experience of those who have followed similar cases, was not unusual. It is Hess's opinion that a case of purpura rarely lives to adult life. They do not necessarily die of hemorrhage. Often as in the present case, the cause is some intercurrent infection.

DISCUSSION.

Dr. John F. Barnhill, Indianapolis, Ind., had seen no such result following mastoidectomy as that described by Dr. Harris. He had had a similar experience, however, following tonsillectomy and adenoidectomy. The patient, ten years of age, the son of a physician, had been brought to the speaker by his father, who had brought his daughter at the same time, for operation on the tonsils and adenoids. The father had made no report of any other trouble. The patients had been in the hospital over night, the tonsils and adenoids were removed in the usual way, and there was no more hemorrhage than usually occurs. About six hours later the boy began to bleed, and continued to do so despite horse serum or any other method that was used. The horse serum had no effect, neither had coagulin, fibrinoplastic (Squibb). Transfusion was begun, first of the father's blood, which did no good, so far as could be determined, except temporarily. He found that the hemophilic tendency had come from the father's side and not from the mother's, as usual. One hundred and fifty c.c. of the father's blood was transfused at one time, and 290 c.c. at another, no permanent relief following. The mother's blood was then used, and after three transfusions of 200 c.c. each the child was in a safe condition. The case emphasized the importance of obtaining, if possible, the condition of the blood of the person acting as donor in the transfusion.

Dr. Clifton M. Miller, Richmond, Va., recalled an interesting experience he had had eight years ago, when the science of serology was not so well understood as at present. The patient, a young man seventeen years of age, had been brought to him for an exact diagnosis regarding hemorrhage which occurred, not at stated times, but when he had enough blood in his body to bleed. He was put to bed for observation. The hemorrhage seemed to come from the adenoids. Investigation of the family indicated that the tendency to bleed came from the mother's side. The coagulation time was eight minutes. The boy was very well developed physically. This condition had been manifest for about two years and a half. A direct transfusion of 150 to 200 c.c. of blood from his brother was done. The brother's coagulation time was two to three and a half minutes. The patient's adenoids were then removed with no more trouble than one would
DISCUSSION.

expect. About two weeks after the operation there was another attack of bleeding, with the loss of only about a tablespoonful of blood.

In cases of apparently acquired hemophilia he had had very good results with both horse serum and thromboplastin, injecting the latter agent into the tonsillar cavity where there were apparently little bleeding points.

Dr. Thomas H. Farrell, Utica, N. Y., referring to the bugbear of anaphylaxis, cited the case of a young man who died in a few minutes from the use of horse serum for the control of hemorrhage. The patient was apparently in perfect health previous to the operation, which was not of serious moment.

Dr. Seymour Oppenheimer, New York City, said the routine examination of all patients requiring operations on the nose and throat had shown in many individuals a tendency toward a decided protraction of the bleeding time. The question of the bleeding time was far more important than that of the coagulation time. There might be a normal coagulation time and an abnormal bleeding time. He recalled a case in which the coagulation time was five minutes and the bleeding time twenty-nine minutes. In other words, many patients showed a purpuric tendency. Purpura, in his opinion, was not transmitted through families. He had recently published a report, in the American Journal of Surgery, of five hundred children who had been subjected, during the past two years, to tests of the bleeding and coagulation time prior to any surgical procedure. It was interesting to note the number of children who showed a protraction of the bleeding time.

He did not believe that calcium lactate had any effect whatsoever on either the coagulation or the bleeding time. Human serum was the only thing of any value. The transfusion of 10 c. c. of serum from father or mother, and the bleeding and coagulation time tested after twenty-four hours, was advocated. In some instances he had injected human serum three or four times before he had been able to modify the bleeding or coagulation time enough to warrant undertaking operation. The speaker said that he felt that most surgical work of the nose and throat was undertaken without sufficient preliminary preparation.

Dr. Joseph C. Beck, Chicago, Ill., was reminded of a case of true Schönlein's disease, in a woman about thirty-five years of age, who developed this condition shortly after post partum hemorrhage. He was called to the house to stop nose-bleed which the family physician could not check. No point on the septum of the nose could be seen from which this bleeding came, but he found around the knee-joints and elsewhere old purpuric spots. The patient subsequently developed bleeding from the gums, and from points in the ear, which showed no inflammatory condition whatsoever. Her husband had Professor His come over from Europe to treat her. His suggested the use of placenta blood. As the placenta cord was cut, the blood was allowed to trickle over the bleeding point. It would stop the bleeding like a marked styptic, but the effect was not permanent. The patient went on to cerebral coma and death. Six or seven years later two of her children had repeated abscesses in the middle ear, and diseased tonsils and adenoids. The family physician and father wanted the children operated upon. It was found that they had clotting times of ten and eleven minutes. All sorts of things were used to decrease this which was finally brought down to six or seven minutes. The children were operated on, under general anesthesia, every precaution being taken, with no untoward results.
Dr. Harris, in closing the discussion, said it was with considerable hesitation that he had made this individual case report, to which he was as much opposed as most of the fellows of the Society, but it was done with the hope that it would drive home this question of bleeding. He had not overlooked Dr. Goldstein's report, but had disclaimed, in his paper, any attempt at going over the literature of bleeding following mastoidectomy.

He had tried to make it plain that it is important to differentiate between bleeders who are purpuric and bleeders who are hemophiliacs. The distinction between coagulation time and bleeding time was also important.

He did not use hemoplasin locally, but injected it, in other words, used it internally. He was afraid of horse serum, and he could not say, with Dr. Goldstein, that where human serum failed horse serum succeeded. Dr. Hess, whom he quoted frequently in the paper, and who was one of the best authorities in this country, felt that transfusion should not be done before the operation, because it increased rather than mitigated the bleeding. He agreed with Dr. Oppenheimer with regard to calcium lactate.

Summing up, he emphasized the points that each case should be carefully studied, that operation should be resorted to only with the greatest hesitation, that hemoplasin, thromboplasin, or other similar agents should be used, and that human and not horse serum should be employed.
TONSILLITIS VERSUS ADENITIS.

By M. A. GOLDSTEIN, M. D., St. Louis, Mo.

The frequent occurrence of cervical adenitis following closely in the wake of tonsil and faucial infections during the recent flu epidemic have stimulated our observations in the Department of Surgery of the Head at Camp Dodge Base Hospital, and have enlisted a number of definite clinical conclusions.

The form of infection in which this sequel of cervical adenitis seems to predominate is that induced by the streptococcus hemolyticus. The severity of the invasion in the lymph glands of the neck is not dependent on the apparent severity or original area of invasion in the tonsils or pharynx. Sometimes the most insignificant form of hyperemia affecting the posterior pharynx wall, palate or faucial pillars will be followed by an extensive invasion of the lymphatics of the neck. This invasion is rapid and occurs within twenty-four to forty-eight hours after the throat symptoms have been noticed. The patient presents himself with the usual symptom complex showing similar indefinite type—namely, headache, pain on swallowing, an occasional earache on the affected side, nausea, general lassitude and moderate rise in temperature, 99.6° to 101.6°. The tonsil itself, which we most frequently suspect as the source of the deeper infection of the glands of the neck is often but slightly hyperemic and swollen and in most instances shows no exudate.

The chief adenitis symptoms that are not noticed are slight and diffuse swelling over the focus of infection in the neck and tenderness to pressure. This swelling and tenderness becomes more marked in the course of two or three days and there is a greater rise in temperature. On palpation it is difficult in most instances to outline any individual gland or group of glands and the affected area takes on the appearance of a more diffuse cellulitis. In three cases of the series observed the skin appeared intensely red and erysipelatous; in one case erysipelas developed within forty-eight hours. This induration is so marked that the fluctuation of pus, if present, cannot be determined by palpation.

The patient shows a general weakness and depression, which seems to be entirely out of proportion to the local infection.
Within two or three days the area of infection spreads to the median line of the neck anteriorly, toward the clavicle inferiorly and to the occiput posteriorly. The swelling becomes marked and all natural curves and lines of the neck disappear; the head is held in a fixed and rigid position, swallowing is painful, and pain is intense.

It has been our rule to make deep and free incisions into the most involved area of infection. In only two cases have we succeeded in finding pus at the time of the first incision. Usually there is a thin serous fluid and considerable hemorrhage. The muscle tissue is tough and the fascia is difficult to penetrate with forceps or blunt scissors. Where we assume this pathology to be of a lymphatic character we would expect to find the lymphatic glands embedded in this indurated mass, much enlarged and easily outlined; this is not the case, however, for the muscles and cellular tissues seem to bind the gland structures effectively.

Resolution takes place slowly, sometimes by the formation of large quantities of pus, sometimes by a very gradual subsiding of the inflamed tissues. Where pus forms it appears after the fourth day and in surprisingly large quantities. This is, perhaps, due to the exhausted hemolysis of the specific microorganism found in these cases. The pus tracts seem to be along the muscle fascias rather than the lymph channels. Most of the cases show a burrowing of pus forward, backwards, and downwards, limited only by the broader muscular attachments of the neck. In one instance I was able to introduce an eight inch curved dressing forceps through the wound in the left side of the neck along the anterior border of the sterno-cleido-mastoid muscle under the fascia of the platysma myoides to the border of the sterno-cleido-mastoid on the opposite side. In this case nearly 60 c.c. of pus were drained at one time. In another case the invasion and extent of the suppurative process was downward toward the mediastium. In a third case the extension was backwards involving the entire quadrangle from the occiput to the superior border of the scapulae and latterly from one sterno-cleido-mastoid muscle to the other. In one of the most unusual cases of this series the infection penetrated upward beyond the angle of the jaw, invading the parotid gland of the affected side. During the course of this case almost the entire parotid gland was broken down and sloughed away, leaving a surprisingly slight deformity in this side of the face.
In every case we demonstrated the presence of streptococcus hemolyticus in swabs from the throat with the onset of the infection and the same microorganism in the culture of the incised wound.

The treatment that seemed to be most effective in these cases was early free incisions, the use of a small rubber fenestrated drainage tubes and the liberal injection through the drainage tubes of dichloramine-T.

Slow recovery followed these infections in all but one of our cases. In this patient the cellulitis and induration became so extensive that it got beyond surgical control. Pus invaded every fascia in both sides of the neck anteriorly, and on the right side extended down and apparently through the mediastinum into the lungs.

DISCUSSION.

Dr. Francis P. Emerson, Boston, Mass., thought Dr. Goldstein must have had a peculiar strain of hemolytic streptococci to have given this series of cases. In all the camps there was present a constant infection. At Camp Lee all cases were isolated. On the first of February he examined all the cases in quarantine, all of whom had had one to three cultures. All the cases showed hemolytic streptococcus infection. It was interesting to see how closely clinical and laboratory findings tallied. Most of the cases of follicular tonsillitis had hemolytic streptococcus infection. A second culture, or, at most, a third, was negative. These were easily cleared up. As to the others, it was a question whether they had a deep infection which would warrant operating, and this was the reason for his looking them over. All cases that followed influenza or measles showed anywhere from twenty-five to seventy-five per cent. hemolytic streptococci, and instead of having cheesy detritus they had mucopurulent foci. In the majority of the quarantined cases the tonsils were hypertrophied. All those showing a large percentage of hemolytic streptococci showed mucopurulent secretion in the tonsillar crypts. He recalled no cases similar in type to those mentioned by Dr. Goldstein.

Dr. William H. Haskin, New York City, had noticed throughout the entire program, a careful avoidance of any phase of influenza. Yet it was a tremendously important subject. At West Point there had been many cases, but there had been no cases of mastoiditis or other complications, and of two epidemics only two patients died, one from pneumonia and one from empyema. This was the more remarkable in view of the absolute lack of facilities. There were no special rooms, no isolation rooms, only forty beds for fifteen hundred cadets, and a hospital built in 1875. The success in the management of the cases was due to the fact that they were taken in the very beginning.

Dr. Lee Wallace Dean, Iowa City, la., had encountered this same type of infection of the glands of the neck, during the influenza epidemic, in individuals whose tonsils had been removed. The hemolytic streptococcus was found in these cases in the nasal sinuses. Dr. Goldstein's paper was an exact interpretation of this very serious condition. This peculiar type of adenitis, which seemed to resist all forms of treatment, was a very serious condition in the Students' Army Training Camps. In the Camp with which the speaker was con-
OSTEOMYELITIS OF THE FRONTAL BONE FOLLOWING FRONTAL SINUSITIS.

By GEORGE B. WOOD, M.D., Philadelphia, Pa.

An acute inflammatory process within the para-nasal cells is usually limited to the lining mucous membrane, and it is the unusual when the periosteam is entirely destroyed so that the inflammatory process can attack the bony structures, causing an osteitis of enough severity to produce necrosis. We do know, however, that under certain conditions, such as lessened resistance, virulent infection, poor drainage, etc., necrosis of the walls of the sinuses does take place and the infective process then gains access to the neighboring structures, such as the orbit, the face, and the cranial cavity. As with the ear, the most dreaded complication of disease of the nasal sinuses is an extension of the process to the cranial cavity. The frontal sinus is the most frequent offender in this direction, due to the fact that it presents toward the brain the whole of its internal wall. Necrotic processes of one or both walls of the frontal sinus are not so very uncommon, and quite a number of cases of consequent brain abscess and meningitis have been reported. The ethmoid cells are next in importance in the production of intracranial lesions.

T. Passmore Berens (Annals of Otology, Rhinology and Laryngology, June, 1913) in reporting one case of his own, collected from literature 49 cases of abscess of the frontal lobe, and later (The Transactions of the American Laryngological Association, 1916, page 236) reports six more from literature and one more case of his own. A majority of these cases of brain abscess followed frontal sinus disease, and one reported by Karl Lubbers, Archiv fur Ohrenheilkunde, vol. XC, 1912-13, page 172, developed as a sequela of osteomyelitis of the frontal bone, following a chronic frontal sinusitis. A typical case of extensive osteomyelitis of the frontal bone following acute frontal sinusitis is reported by Lewis A. Coffin, (Transactions of the American Laryngological Association, 1908, page 164.) In this case, there was found numerous soft areas in the scalp containing pus, somewhat similar to those which characterized the spread of the osteomyelitis in my own cases.
Destructive lesions of the bone more frequently follow acute sinusitis than chronic. In all of the four cases which have come under my personal observation, the bone lesion developed within an extremely brief period of time after the first symptoms of any trouble in the sinus showed itself. The first two belonged to the class of limited bone destruction in which the disease did not reach the diploe between the inner and outer tables of the skull, and hence, cannot be considered as real osteomyelitis cases.

CASE REPORTS.

Case 1. About ten years ago, I saw a young man with a large subperiosteal abscess over the right frontal sinus. His head-ache had existed only three days, though he had had an acute cold in the head for a few days before this. At the operation, a fairly large opening through the external wall of the frontal sinus was found connecting the external abscess with the frontal sinus, the cavity of which was filled with pus and granulation tissue. A second operation was necessary two or three weeks after the first one to remove a large sequester which involved practically the whole of the supra-orbital ridge. Following the removal of this sequester, the patient made a complete and permanent recovery, though with considerable deformity.

Case 2. A soldier seen at Camp Meade, who, while suffering from an acute coryza, received his third typhoid inoculation, and on the following afternoon he developed a severe right frontal head-ache, with a copious mucopurulent and bloody discharge from the right side of his nose. On examination nine days later, there was marked edema over the right frontal sinus, and pus coming from under the anterior end of the middle turbinal. The frontal sinus was easily entered after breaking down the anterior ethmoidal cells, and this intranasal operation gave him complete relief from his head-ache. But the morning after the operation, the external edema had increased, and there was distinct fluctuation. An external operation was then done. There was, however, no recognizable communication between the external abscess and the frontal sinus. Six days later, the patient suddenly developed signs of brain abscess which was not located at an exploratory operation, and the patient died the next day. At the autopsy, a large frontal lobe abscess with a general encephalitis of the right frontal lobe was found. There was a very small osteomyelitic area in the extreme upper angle of the right frontal sinus going through the posterior wall where it joined the inner table of the skull.

These two cases are representatives of the more common type of bone involvement in which the bone disease is more or less limited. Any involvement of the osseous wall of the frontal sinus is an extremely serious condition, but the simple necrotic cases do not present the almost hopeless picture which is seen when the disease spreads to the diploe of the frontal bone. It has been my unfortunate experience to have seen two of these cases within the last two years, following them from an early stage of the bone involvement through all the hideous course of the disease process up to the fatal termination.

Case 3. C. C., a boy fifteen years of age was first seen at his home in Glassboro, N. J., on September 6, 1917. About two weeks before this visit, he had
developed a cold in the head, following bathing. Five days later, he first noticed that stooping over made his head throb. In the course of a few days this discomfort developed into a severe head-ache. He went to Atlantic City for relief, but became so sick that he had to go home and go to bed. He was then treated by a country practitioner who used hot and cold applications without affording any relief. At the time of my first visit, there was marked swelling and redness over the whole of the forehead, more marked on the right side, with distinct fluctuation. Both eyelids were swollen and edematous. The left nasal fossa was practically normal, but on the right side, the middle turbinal was swollen, congested, and pus was oozing out from under the anterior end. Diagnosis of acute right frontal sinusitis with perforation of the anterior wall was made, and the patient sent to the city for operation.

He entered the Howard Hospital on September 7th. On admission, his temperature was 100.2°, pulse 80, and respiration 20. The blood count showed a leucocytosis of 13,400, the polymorphonuclears being 89%. The urine was normal except for a few cylindrds.

September 8th. Under ether anesthesia, an incision was made over the right eye-brow, extending from the external limit of the brow to the glabella. This was joined by an upright cut in the median line leading upward for about two inches toward the hair-border of the scalp. A large collection of pus had lifted the periosteum from practically the whole anterior surface of the frontal bone, on the left side as well as the right. There was a small perforation of the anterior wall of the right frontal sinus. The rest of the external table of the frontal bone appeared normal. The anterior wall of the right frontal sinus was removed and the cavity found to be filled with pus and considerable granulation tissue. The anterior ethmoidal cells were curetted, and a large opening was made into the nose. The internal wall of the frontal sinus was carefully examined, but no evidences of necrosis of this plate could be found. A large rubber drainage tube was inserted into the nose and brought out the nostril. The eye-brow incision was closed with horse hair except where the drainage tube projected, a loose suture inserted to hold the flaps of the vertical incision in place, and the rest of the wound packed with iodoform gauze.

Although there was relief of pain following the operation, the patient's temperature kept running between 98.2° and 101.3°. The wound over the right brow seemed to be healing all right, but it was difficult to obtain drainage from the subperiosteal abscess over the left forehead.

An incision was made over the left brow external to the supra-orbital notch, and a rubber drainage tube passed from the original incision and brought out the new one.

September 10th: The white count was 17,200, and the culture made from the pus at the time of the operation showed a pure growth of staphylococceus aurens.

September 12th: The white blood count was 13,000, polymorphonuclears 74%.

September 15th: The white blood count was 8,400, with 71% polymorphonuclears.

September 17th: The patient seemed a great deal more comfortable. The edema around the wound had practically disappeared, but there was a heavy discharge of pus.

September 18th: An examination of the eye-ground showed normal fundi.
September 20th: His temperature was normal for the first time since he was taken to the hospital, pulse 70, and respiration 12.

September 29th: A few granular and hyalin casts were found in the urine, but no albumen. The white blood count was 14,400.

October 5th: The temperature remained normal, having been slightly sub-normal most of the time, with a pulse ranging between 60 and 80. The white blood count was 10,000, with 74% polymorphonuclears. The wound was doing only fairly well, the incision over the right frontal sinus was practically closed, and there was no discharge from the incision over the left brow. Considerable pus, however, was coming from the upper part of the vertical incision. Lately, the patient had become quite irritable and hard to manage, which was entirely opposite to his normal disposition.

October 13th: Patient had a severe occipital headache and some projectile vomiting. Mentality of the patient was bad, and he appeared at times slightly delirious. His temperature became markedly sub-normal, with a pulse running at one count, as low as 40, but generally ranging around 60 or above. The blood pressure was 104 systolic, and 70 diastolic. There was no rigidity of the neck or other evidences of meningitis, except the severe headache. The eye grounds were normal, but the field of vision was narrowed on the nasal side of the left eye. The patient was seen by a neurologist, who believed that there was some cerebral irritation, but no localizing symptoms were present sufficient to indicate an exploratory operation in any particular region.

October 14th: The temperature was normal, with the pulse running between 64 and 80, but the mentality of the patient was very little improved, and there was still occasional vomiting. Under ether an inverted "T" shaped incision was made, the horizontal limb running through both brows, and the vertical incision running from the glabella upwards above the hair-line. This made two triangular flaps, which when pushed back exposed the greater part of the anterior surface of the frontal bone. Extensive areas of osteomyelitis were found, one high up in the hairy scalp with normal bone between it and the more extensive lesion below. There were several actual sequester. These were removed, and all the soft bone freely curetted away so that the dura was exposed over both frontal lobes, leaving only a bridge of bone in the median line. Retaining sutures were inserted, the wound sprayed with dichloramine-T, and then packed with iodoform gauze.

Following this operation, the patient did very well, although for a day or two, he had some nausea and more or less headache. This gradually cleared up. From time to time, small particles of necrotic bone were removed from the wound, but by the end of October the patient was up and around, with normal mentality, normal temperature, and the wound practically healed.

October 28: His temperature became slightly sub-normal, but there was no slowing of the pulse and he felt in very good condition.

October 31st: About 8 A.M., patient began to vomit, which in an hour or so became projectile in character. During the vomiting, the hands were clenched and the body stiff, though there were no true convulsive movements. Somewhat later, the reflexes became increased, with distinct rigidity of the neck and a positive Koenig sign in both legs. The temperature was sub-normal in the earlier part of the day, but gradually rose up to 99.2°, while the pulse which was running normal in the early morning, became slow. He rapidly became unconscious and rigid, with involuntary passage of urine. When
seen at 10.25, both pupils were dilated, with no reaction to light, there was some paresis of the lower part of the right face, convulsive movements occasion-ally in both shoulders, and increased reflexes over the whole body. Koenig present; no ankle clonus; Babinsky on both sides. Patient died at 10.45 A. M.

The white blood count on October 31st had risen to 16,600, and on November 1st, the day of his death, to 20,200.

Unfortunately, no autopsy was permitted. Although without an autopsy, a positive diagnosis of the lesion which caused his death cannot be made, it is probable that there was an inert frontal lobed abscess which suddenly ruptured into one of the lateral ventricles, causing an over-whelming meningeal infection.

*Case 4.* M. C., an Armenian, age 24, first seen by me on January 9, 1918. His personal history was unimportant, except that he had had influenza in Octo-ber, 1918, from which he had apparently completely recovered. He had had typhoid and pneumonia earlier in life, and denied any venereal infection. He had never been subject to colds in the head.

One week previous to his visit, he was struck by an automobile, but did not seem to have suffered any injury of note. He said he had slightly bruised the right side of his head just above the ear. Two days later, he noticed a pain in his right forehead, and this was almost immediately accompanied by symp-toms of coryza. This pain continued, becoming more severe, and a swelling gradually developed over the right brow involving the upper eye-lid. The gen-eral practitioner who had referred him reported that there was a leucocytosis, some evidence of pleurisy on the right side, and a small quantity of albumin with casts in the urine. The patient said he did not believe that the swelling over the right eye was as bad when seen as it had been the day before.

Examination showed marked edema over the right brow and the upper lid of the right eye. The left nasal fossa was free with no excess of secretion, the right fossa was narrowed by a slight deflection of the septum, the turbinals were somewhat swollen, and a small quantity of pus was seen under the an-terior end of the middle turbinate. The general condition of the patient was bad, and he fainted while being examined. He was sent immediately to the Howard Hospital.

On admission to the hospital, his temperature was 100.4°, pulse 108, and res-piration 26. He had a leucocytosis of 15,400, polymorphonuclears 70%, large lymphocytes 13%, small lymphocytes 6%, transitionals 11%. His urine at that time was normal, with no albumin and no casts. X-ray examination showed a partial opacity of the outer portion of the right frontal sinus shading inward, which was believed by the X-ray-ologist to be due to an over-lying denseness rather than to an exudate in the sinus itself. There was clouding of the right anterior ethmoidal cells, probably due to exudate.

January 10th: Under cocaine anesthesia, the anterior end of the right mid-dle turbinal was removed, and the anterior ethmoidal cells broken up, but sat-isfactory probing of the right frontal sinus could not be done. There was, how-ever, quite an escape of purulent material when the anterior ethmoidal cells were curetted. His temperature the afternoon after the operation was 103.2°, and pulse 100.

January 11th: There was considerable drainage from the right side of the nose. The edema over the brow was distinctly less, and while the patient felt more comfortable, his temperature still remained high, and the white blood
In Leucocytosis reached the region, gave suggested was pulse quarter lyphocytes, count the temperature complete side, the fluctuating was in the neighborhood portion foration had above the frontal sinus itself was much less than at first. The temperature, however, reached 104.6° on this date, while his white blood count fell to 11,200. His pulse was running from 90 to 104 and respiration from 28 to 36. The chest was examined by the internist of the hospital who said that there was a grazing sound over the upper part of the right chest posteriorly, and below this impaired resonance and diminution of the vesicular sound. This condition suggested fluid, but if so, it was small in quantity. Tapping of the chest gave only a very small quantity of sterile fluid.

X-Ray examination of the right chest showed a general opacity of the right side, probably due to thickened pleura, though strongly suggestive of an incomplete resolution following pneumonia.

The findings in the chest were such as to make it possible that the increased temperature was due to the pulmonary condition, especially as the edema and the pain over the forehead had decreased. However, when the fluctuating area was found, an external opening of the frontal sinus was thought imperative.

Under chloroform anesthesia, an incision was made through the right brow joined at the external end by an upright incision, which opened up into the fluctuating area. A small subperiosteal abscess was found, and the periosteum was raised from above the brow upwards sufficiently to thoroughly examine the external table. This, however, was perfectly normal. No trace of perforation could be found in the region of the collection of pus or in any other portion had bare at this operation. The frontal sinus was then opened, and the external wall almost completely removed. The cavity was filled with pus and some granulation tissue was found in the external angle and in the neighborhood of the osteum. The internal wall was apparently normal. The inner part of the brow incision was closed with silk worm sutures, and the rest of the wound was packed with iodoform gauze. The patient's condition was such that the operation had to be hurried so that the opening into the nose was left for a future operation.

The culture made at the time of the operation showed staphylococcus aureus in pure culture.

January 19th: Leucocytosis was 13,800.

January 20th: In spite of free drainage from the wound, the temperature had been running rather high and quite irregular, reaching on January 18th and 19th 104 degrees. The next day it was about 99°. A Widal test was made but proved negative.

January 21st: Another fluctuating area was found to have developed just above the small abscess which was opened at the external operation on January 13th. This was incised, and the pus was found to be under the periosteum, but no evidence of any necrosis of the external plate could be detected.

January 22nd: X-ray examination of the frontal sinus and frontal bone showed an osteomyelitis involving the right side of the frontal bone extending to the parietal region. The area in the frontal bone extended to the frontal sinus on the right side.
January 26th: Leucocytosis was 14,400. Culture of the wound showed staphylococci in pure culture. Urine remained negative.

January 27th: Patient's general condition had been better lately. The temperature was on the whole much lower, but the wound had been suppurating freely. In spite of the free opening which still existed in the anterior wall of the frontal sinus, large quantities of pus saturated the daily dressing, and there had recently appeared a third fluctuating area toward the median line.

Under chloroform anesthesia, the whole original brow incision was freely opened, and from the inner end a perpendicular incision carried upward so as to form a triangular flap which was turned upward and outward off the anterior surface of the frontal bone. This was necessitated by the fact that on curetting some granulation tissue away from the extreme upper limit of the frontal sinus just external to the median line of the sinus, the curet suddenly slipped into a large extra-dural abscess from which an ounce or more of pus was evacuated. On turning back the flap with the periosteam from the frontal bone, it was noticed that while the periosteam was very easily removed, no evidence of any necrosis of the external plate could be discovered. A large portion of the skull, however, was removed from the inner part of the upper limit of the frontal sinus upwards for about two inches, uncovering the extra-dural abscess. In removing the skull, the external table was found hard and apparently normal, while the internal table and diploe were extremely soft and infiltrated with pus, which condition seemed to extend in every direction. After removing as much of the external table as was thought justifiable, the diploe and internal table was curetted from the under side of the external table until approximately healthy bone was reached. At the external portion of the brow wound where the original subperiosteal abscess had existed, some necrosis of the external plate was found, and this led to an extensive undermining of the diploe and inner table in this region, but at this time, no extra-dural abscess was found in this region. The perpendicular incision was loosely approximated with sutures, but the rest of the wound was packed with iodoform gauze. The patient stood this operation very well.

January 30th: A Wassermann test was negative, but realizing the possibility of a leuitic infection existing in spite of a negative Wassermann, the patient was placed on mixed treatment, and I might here add that while this was continued for several weeks, it gave absolute negative results.

February 4th: For a few days after the last operation, the patient's temperature remained normal, but for the last four days it has been irregularly up and down, reaching as high as 103°. A blood culture was taken but proved to be sterile.

February 6th: Another subperiosteal abscess developed on the right side of the frontal bone. Under ether, some of the old incisions were opened up, and at this operation, the first evidences of extensive necrosis of the external table was found. Several sequester were removed, and an extra-dural abscess opened over the right upper temporal region.

February 27th: Following the operation on February 6th, there was marked improvement in the patient's general condition, and though at times there would be temporary elevations, the temperature usually ran along the normal line. Two or three subperiosteal abscesses developed over the scalp of the frontal bone necessitating incision and usually removal of sequester. The necrotic process had spread beyond the median line and part of the left frontal
bone became involved. The process also reached up to the coronal suture, and possibly a small portion of the right parietal was involved. The patient's condition after each of these operations was good, and within a day or so he would be up out of bed and walking around. The white blood count on this date was 10,000.

March 19th: Up to today, the patient had been doing very well, and except for two unexplainable twenty-four hour drops in temperature, the curve had been normal. Some of the wounds had healed, though from those higher up there was still a considerable discharge of pus, and sequester were occasionally removed. He had been out of bed, had no head-ache, and there was no change in his rather happy disposition. Pulse usually between 80 and 90.

This morning he became suddenly unconscious, had frequent recurring convulsions, rapid pulse, temperature rising to over 102°, and the respirations were around 48. The convulsive movements apparently began in both hands and spread over the rest of the body. When seen a number of hours after the convulsions first started, the patient was semi-conscious. There was slight, if any, rigidity of the neck, pupils equal and respond to light, though there was a lateral deviation of the eyes to the left. Koenig sign in both legs, but no Babinsky and no ankle clonus. All tendon reflexes were exaggerated. The right arm, though not paralyzed, was distinctly spastic; there being rigidity of the shoulder, elbow, wrist and fingers. There was no facial palsy.

Lumbar puncture showed a clear fluid under distinct pressure. There were only ten cells per cubic millimeter, and the culture was negative.

Under local anesthesia, a horse-shoe flap was turned down from the left motor area, and an opening about the size of a half dollar was made through the skull. The bone here was perfectly normal. The dura was not pulsating, and on being opened, the pia was found markedly edematous and cloudy. On opening the pia, a considerable amount of clear fluid escaped, but no abscess could be found extra-durally or in the brain substance. Silk worm gut drain was placed under the flap and the flap sutured back in place.

March 21st: Temperature was normal, pulse 100 and respirations 24. Patient's mental condition had entirely cleared up, and the spastic condition of the right arm was scarcely perceivable, though the reflexes of the legs were still exaggerated. Lumbar puncture done on the 20th showed normal amount of clear fluid. Report on culture made from the pia at the time of the operation gave no growth on culture media, though a few small diplococci were found on smears.

March 28th: Examination of the urine showed a trace of albumin and a few granular casts. For a few days after the operation, the patient showed very few, if any, localizing symptoms, but there had gradually developed signs of irritation of the left motor area. An examination by a neurologist presented the following condition. Marked paresis of the right side of the face, though the tongue is protruded straight. Pupils equal and respond normally. Slight loss of power in the right arm, accompanied by distinct ataxic movements. Hypermetria in trying to touch nose with his right index finger, distinct adiadokokinesis, asteriognosis, and slight anesthesia of the right hand with a loss of localization. Biceps jerk increased on the right. There was no Koenig sign on either side, knee jerks double plus both sides, with Achilles jerk. No Babinsky. Oppenheim present on the right; none on the left. Sen-
sation in legs good. The wound in the left motor area healed by primary intention.

April 29th: Barany test made this date gave the following data: Spontaneous nystagmus, slightly horizontal on looking either to the left or to the right, and none on looking down, possibly slight on looking up. No spontaneous past-pointing—Romberg negative—On turning to the right, nystagmus 32 seconds, vertigo 7 seconds, past-pointing normal. On turning to the left, nystagmus 28 seconds, vertigo 11 seconds, past-pointing normal, and slightly more intense than when turning to the right.

April 30th: Several of the wounds in the scalp around the osteomyelitic area were still discharging a fairly large quantity of pus, but the frontal sinus wound had cicatrized. Very unexpectedly, the patient’s condition, as described on March 28th, gradually cleared up so that he was able to be out of bed and walking around the hospital. There was no change in his disposition. His temperature had remained normal, with pulse varying between 80 and 96. Examined by the neurologist who gave this report: No facial asymmetry, and no involvement of the extra-ocular muscles. Pupils equal, and respond to light. Power in right hand about one-half of that in the left. Pain sense is normal in both hands. Still cannot distinguish objects in the right hand, especially if they are small, and there is slight ataxic movements of the leg. There is still some aphasia, but it seems more sensory than motor in character. Diagnosis of cerebral lesion—probably a meningal thickening in the neighborhood of the second parietal convolution left side, which is apparently being gradually absorbed.

May 8th: Patient had been doing very well up to this morning when while sitting in a chair he had a convolution, and during the rest of the day he was very drowsy, but there was no change in temperature or pulse. The convulsive movements seemed to involve chiefly the right side of the body beginning in the face, and there was almost complete motor aphasia. He vomited several times, and was at times unconscious and always rather drowsy.

May 12th: Condition of the patient generally was distinctively improved, though there was almost complete loss of motion in the right arm and still some headache. Temperature had been raging between 98° and 100°, and pulse between 70 and 90.

May 14th: Examination by neurologist who reported paralysis of the right side of the face and tongue, complete sensory aphasia, with partial motor aphasia. The right arm showed slight movement in the hand, but otherwise, paralyzed. Distinct loss of power in the right leg, right side Babinski’s, though knee jerks were normal, and no ankle clonus and no areas of anesthesia.

May 15th: Complete paralysis of the right arm, and almost complete paralysis in the right leg. Under local anesthesia, a ‘‘U’’ shaped flap was turned back from the region of the left motor area, slightly in front of the scar of the earlier operation in this region. At the sight of the old trephine opening, the dura was found very thick and adherent to the scalp. The brain was not pulsating, but exploration with the hypodermic needle did not find any pus.

May 16th: Examination of eye-grounds negative.

May 20th: Patient had gradually become more lethargic with increase of his paralytic condition. Repeated vomiting, but very little headache. Occasional convulsions with a temperature running an irregular course, gradually
becoming higher. Pulse ranging between 70 and 90, even when the temperature was 102°. Patient died on this date, having been unconscious for the past twenty-four hours.

Autopsy by Dr. James C. Raeker, May 21, 1919.

On removal of the scalp, the calvarium was found riddled with seven dehiscences, one of which in the left motor area was a trephine opening. Through this trephine opening, a hernia cerebri, 5 c. m. in diameter, was protruding. Considerable thick, yellow pus was exudating from this opening. After removal of the skull cap, necrosis of the inner table of the skull was found in the right frontal region surrounding one of the openings, approximately 5 c. m. in diameter. Several of the other openings were the seat of new bone formation, which in some places, almost occluded the dehiscence. A large amount of thick purulent exudate covered the dura over both frontal areas. There was a small amount of necrotic material in both frontal sinuses. The base of the indentation from which the brain hernia seemed to arise was filled with thick purulent material and necrotic brain tissue, and is rather well circumscribed by an abscess wall of fibrous tissue. From the right frontal lobe, a thin, yellowish purulent material oozed in considerable quantity, and the whole under surface of the right half of the brain is bathed in this sero-purulent exudate. The whole of the dura was deeply congested, even that covering the cerebellum, and everywhere was seen a thick, yellow pus. The entire pia, even that covering the cerebellum was also deeply congested. On the under surface of the left frontal lobe, there was a small necrotic area of brain tissue, approximately one c. m. in diameter. Cultures of the pus from the frontal sinuses, the under surface of the frontal lobes, and from the abscess in the left parietal area gave a preponderance of streptococci and gram positive diplococci.

There was some pleural adhesions around the lower portions of the upper lobe of the right lung and chest wall and base of the right lung was firmly adherent by pleural adhesions to the diaphragm. The third lobe of the right lung was very small. On neither side was there any pneumonic consolidation, but there was some hypostatic congestion in the posterior portions of both lower lobes. There was no exudate in the pleural or pericardial cavities, and the heart was normal.

Examination of hardened brain by Dr. John H. W. Rhein.

Over the left motor area, there is a fungus cerebri extending through the dura at the opening made by operation. This opening in the dura corresponds to the trephine opening in the skull. The base of the hernia is 4 c.m. across, and the neck 3 c.m. There is a half moon shaped organized clot at the upper part of the opening. The dura is adherent to the brain at the upper part of the opening over an area 2 by 1 ½ c.m. which spot is also the seat of a thick plastic exudate. Also about one and a half c.m. above the opening in the dura and on its superior surface just to the left of the median line and over the first frontal convolution, is a dense exudate measuring antero-posteriorly 4 c.m. and transversely 4½ c.m. and in the thickest portion 3 c.m. thick. The fungus cerebri originates from the middle third of the pre- and post-central lobules, right over the fissure of Rolando. Beneath the fungus cerebri is seen disorganized brain tissue and a cavity 2 c.m. deep, 4 c.m. antero-posteriorly and 3 c.m. transversely. The hernia is composed of a caseous mass which had undergone softening until it was purulent in appearance.
The walls seem to be made up of a rather hard hemorrhagic substance which is probably pia. There is what appears to be a plastic exudate in the superior part of the right lateral ventricle. Cross sections of the cerebrum show widely diffused punctuate hemorrhage both in the basal ganglia and in the white matter of the cortex. There is a general thickening of the pia over the anterior half of the brain, especially over the sulci.

The histologic examination of the brain, by Dr. Rucker.

The wall of the right lateral ventricle shows the blood vessels congested, and in this region both the white and grey matter of the brain are edematous. There is considerable round-cell infiltration in the white matter, and the peri-cellular spaces in the grey matter are enlarged.

In the region of the right paracentral lobule, the pia is thickened and infiltrated with round-cells and a few polymorphonuclear cells. The blood vessels of the pia are congested and dilated. The white matter is edematous, and its blood vessels are congested. The grey matter is also edematous and its blood vessels are congested, and the walls of the vessels show an infiltration with round cells. The peri-cellular spaces are enlarged.

In the region of the left paracentral lobule, the pia is mostly absent, but where present, shows thickening and infiltration with small round cells and polymorphonuclear cells. In a few places, these latter have slightly invaded the white matter. All the blood vessels in the brain substance, both white and grey, are dilated and congested, and the tissue is edematous. In one place in particular in this section, there is a very largely dilated and congested blood vessel, the walls of which are heavily infiltrated with polymorphonuclear cells. On one side of the vessel, this infiltration extends out into the white matter producing an area of necrosis, containing degenerated leucocytes and tissue detritus. There are several such areas of necrosis in this section.

In the section removed from the left base, the pia vessels are congested. The vessels of the grey and white matter are also congested, and the brain tissue is edematous.

A section from the cortex of the right frontal lobe shows the blood vessels congested and brain tissues edematous. There is a small area of polymorphonuclear infiltration, but no necrosis of tissue and no fibrous tissue on the wall such as would be seen in abscess formation.

The exudate around the fungus cerebri is made up of fibrin degenerated tissue cells, polymorphonuclear cells, and a few small lymphocytes. The fungi cerebri is composed of degenerated brain tissue and pus cells in great abundance, surrounded by fibrous tissue wall.

Pathologic Diagnosis: Brain hernia and abscess of left motor area with diffuse pachymeningitis and leptomeningitis.

Remarks: In Case 3, it is probable that the very large uncovering of the frontal bone by the subperiosteal abscess was a very important factor in the production of the necrotic process. The external table was apparently first involved, though the spread of the disease to distant parts of the frontal bone was due to the diploic infection.

In Case 4, access to the diploe was gained through the breaking down of the internal wall at the extreme upper limit of the frontal
sinus where the two walls join at an acute angle. The breaking down of the inner table and diploe advanced to an almost unbelievable extent before there was the slightest evidence of any involvement of the external table, and it was this fact that made it practically impossible to reach the limits of the disease by operation. Another difficult phenomena to explain was the occurrence of numerous small subperiosteal abscesses with macroscopically healthy bone beneath them. though in the latter part of the disease, the opening of these abscesses did uncover small necrotic areas of the external table. The fact that at the autopsy some of the operative openings in the skull had become almost obliterated by new bone formation, removes to a certain extent some of the timidity which I felt in removing large areas of the skull, so that in a similar case, I should have less hesitation in the radical removal of even suspected areas of involvement.

DISCUSSION.

Dr. Dunbar Roy, Atlanta, Ga., asked whether Wassermann tests had been made, to which the essayist replied in the affirmative, adding that the results were always negative.
RE-EDUCATION AND RECONSTRUCTION OF DEFECTS OF HEARING AND SPEECH IN THE U. S. ARMY.

By CHARLES W. RICHARDSON, M. D., Washington, D. C.

Early in September 1917, it was suggested to me that in all probability I would be placed in charge of the section of defects in hearing and speech, Division of Reconstruction, Surgeon General's office. As a preliminary procedure, I was asked to collaborate with Major James Bordley, who has been assigned from the Section of Oto-laryngology, Division of Surgery of the Head, to the newly created division of Physical Reconstruction, to assume directorship of the blind and defects of hearing and speech.

As a result of this information, in liaison with Major Bordley, a preliminary meeting was held between a few teachers of the deaf and others in order to outline a policy to be pursued in connection with this endeavor.

This meeting was held in Washington, and those present agreed to certain suggestions to be made to Major Bordley in connection with the re-education of defects of hearing and speech. Dr. Max Goldstein of St. Louis manifested great interest in the respected work.

This plan which was then outlined was formulated by Major Richardson, and presented to Major Bordley for the consideration of Major King, Chief of the Division of Physical Reconstruction. The principle ideas conveyed in this scheme were as follows:

1. Consideration of the methods of the physical treatment of the defects of hearing and speech at the front.

2. The re-education of the deaf and the correction of the speech defects.
   (a) At the front immediately after the injury or disease.
   (b) Transportation from the front to the interior districts where the re-education could be begun, or transportation to the United States where the re-education could be carried on under better circumstances and to greater advantages.

3. It was decided that in re-education in the near or complete deaf, one method should alone be followed, that is speech reading. It was admitted that there possibly would be a few to whom the manual method would have to be employed.

4. Teachers: Those at the meeting seemed to think it would be impossible to obtain enough teachers to meet the demands. It was decided, therefore, to suggest a method of educating teach-
ers for the work that was thought to be in view. It was further decided that teachers accepted should between the ages of 25 and 45 years.

5. In connection with speech defects, attention was called to the fact that a number of these defects would probably be traumatic in origin, and therefore, would require a certain amount of plastic restoration before the speech correction, through teaching, could be instituted.

6. Rehabilitation: The consideration of this important feature in connection with these defects, especially of hearing, was thoroughly considered.

The submission of these tentative plans was followed by a request from Major Bordley for an elaboration of the plans. This was followed by a communication to Colonel Edgar King, attention of Major Bordley, subject, Reconstruction of the Deaf.

In this communication it was suggested that an attempt should be made for a thorough canvass of the teachers of lip reading of the United States.

It was suggested that the physical treatment in connection with the defects of hearing and speech, be carried out as completely as possible before the return of the patient to this country. It was considered advisable that all methods of re-education should be done in the United States. Very definite reasons were given why it was not thought feasible to start the re-education abroad:

(a) The soldier needing this treatment could not be properly selected and segregated abroad.

(b) The place and environment for the teaching of the defective soldiers would be unfavorable.

(c) The difficulty of maintaining proper supervision of re-educational work of this type abroad.

(d) The adding of our burdens abroad by the prolonged maintenance of useless non-combatant elements in foreign lands.

(e) The great additional expense and the difficulty of obtaining competent teachers for service abroad.

It was suggested that re-education of the defects in hearing and speech could be done within the walls of the U. S. Army General Hospitals, but attention was called to the fact that this work could be much more easily or ideally done in a specially created home or institution, devoted solely to this purpose.

A thorough discussion of the methods of educating and training cadet-teachers for the work in hand and the expense incident thereto was detailed.
Attention was called to the necessity of vocational re-education for some of the deaf. It was pointed out that shops would be required and the necessity for the creation of an adequate vocational force to meet these requirements.

Attention was further called to the fact that the public employment agencies, and the industrial organizations throughout the country, must be advised of the fact that the deaf are not abnormal people, but are perfectly normal beings who have substituted one sense for another, in which they have been handicapped.

In this connection attention was called to the fact that the Rucker bill now before Congress had in consideration the establishment of a Bureau in the Department of Labor for assisting in the information of employers about the deaf working men, and to help the latter to obtain employment.

This report lay dormant apparently in the Division of Reconstruction during the formative state of this division. During this period, I was actively engaged in connection with the Section of Oto-laryngology. Nevertheless, I found time between October 25 and March 8th to collect data in connection with the defects of hearing and speech. On March 1st, Colonel Edward King, advised me that there was to be a separation of the directorship of the blind from that of the defects of hearing and speech, and that I should assume charge of the directorship of defects of hearing and speech in the Division of Physical Reconstruction. On March 8th I received official orders, relieving me of my duties in the Section of Oto-laryngology as soon as I might complete my work, and assigning me to the Reconstruction Division. Previous to assuming Charge of the Section of Defects in Hearing and Speech, in the Division of Reconstruction, I had found that many ideas in connection with the original plans and suggestions which had been forwarded to Major Bordley had been considerably altered by a further consideration of the subject.

The number of probable patients did not seem so great as we had been led to believe. Most of the statistics obtainable had been at fault, and disagreed. The nearest information we could obtain was that there would be about two per cent. of defects along these lines in all casualties. From the fact that the American registrants were subject to a more rigid physical examination, and that certain types of cases were entirely eliminated from the service, we were led to believe that the number of defects in the American army would not be over one or even one-half of
one per cent. It was thus evident that our whole plan of organiza-
tion could be built upon a different basis.

We found after a systematic investigation at the source there
were more than enough available teachers, anxious to take up the
work, who were willing to assume the obligation, and enter the
service under full army regulations. We, therefore, thought it
absolutely unnecessary to even consider the plan for education
of teachers to enter this service.

On March 11, 1918, Major Richardson assumed charge of the
Section of Defects of Hearing and Speech, Division of Reconstruc-
tion.

Immediately a plan of organization was outlined, and presented
to the new chief of the Division of Physical Reconstruction, Colonel Frank Billings.

ORGANIZATION
OF THE
SECTION FOR TREATMENT OF DEFECTS IN
HEARING AND SPEECH
DIVISION OF SPECIAL HOSPITALS AND PHYSICAL
RECONSTRUCTION.

Medical Staff: One director in the office of Section, Division of Special
Hospitals and Physical Reconstruction. One director for service abroad.
One medical officer to classify cases at point of debarkation, rank of major.
One major, one captain, two lieutenants at Hospital No. 11, Cape May, N. J.
One captain, one lieutenant, at Hospital No. 2, Fr. McHenry, Baltimore,
Md. One captain, one lieutenant, at Hospital No. 9, Lakewood, N. J. One
major, one captain, one lieutenant at teaching headquarters.

Civilian Staff: One civil, or sanitary officer as office assistant. One stenog-
rapher.

Teachers: One principal instructor, to have charge of all the instructors at
teaching headquarters. Five lip-reading instructors; these with the prin-
cipal are to be employed as soon as first teaching center is established and
placed in order. Five vocational instructors. Two instructors, with prac-
tical knowledge of music, for instruction in musical rhythm and amusement.
One masseur. One drill sergeant.

The question of compensation forms no element in connection with the
employment of the medical staff in the reconstruction of the defective in
hearing and speech as a result of the war, but it does with regard to all the
civil employees.

It must be essentially recognized that most of the teachers to be em-
ployed by this division are individuals who have, after considerable study
and expense fitted themselves for a highly specialized type of teaching. The
mental efforts to maintain practice and impart their knowledge is very great
and exhausting. Their compensation in the private practice of their art is
correspondingly remunerative; therefore, in the light of these facts it be-
comes necessary for us to consider carefully and thoughtfully the salary to be given these individuals. The compensation must be sufficient to dignify the position and enable the teachers to maintain themselves in befitting manner. From the fact that all of the individuals requiring reconstruction are males, and as most if not quite all the teachers are female, and as all of the teaching is to transpire during the daylight hours, it seems therefore expedient that the teachers be permitted to domicile themselves at other places than the actual teaching center.

Vocational Teachers: The deaf soldier will find it probably impossible to follow his former active occupation in life. He will be obliged to readjust himself according to the degree of his physical handicap. In order to fit himself for a new vocation, which he is required to master to place him among the respecting wage earners, it becomes necessary to have vocational teachers to instruct him to acquire knowledge of that industry, to which he can apply himself, without being inconvenienced by his permanent handicap. Having prepared a list of vocations suitable for these handicaps—in which this handicap is a negligible quantity—we must seek and obtain the necessary corp of vocational teachers to meet the exigencies. These vocational instructors should as the teachers above indicated, be compensated in proportion to the value of their services.

Speech Defects: Amusements. An essential feature in the training of the defects in speech is not only the amusement feature of music, but also the important psychological feature, as well as the physical restoration of the voice obtained thereby.

Teachers: Many of the deaf will require teachers to train their voices. There will return many wounded soldiers whose defects of speech will result from the injuries and resulting contraction about the face and air passages. These will require masseurs teachers specially skilled in reducing contraction, and as aid in the proper restoration of the spoken language. As a result of shock injury, many modifications of voice, non-traumatic in character, will be brought under our observation. Under this class we will note the stammerers and other modifications of voice. We will also have many deaf whose control of voice will require restoration. The treatment of returned soldiers afflicted with these disorders will require highly specialized teachers for this work. These teachers should be under the supervision of one or more medical officers, who are experts along this line of medical therapeutics. These teachers should have the same general consideration as the teachers to be employed in lip reading.

Compensation for Civil Employees: The principle instructor should have a compensation of two thousand to twenty-four hundred dollars a year. The teaching staff should be compensated according to their expertness from twelve hundred to fourteen hundred per year. Musical instructors should be compensated at the rate of twelve hundred per annum. Masseur should receive compensation of twelve hundred per annum. Vocational instructors should receive compensation according to the character of instruction they give and their efficiency. We should be guided in this work largely by what is usually regarded as a proper salary for these workers from twelve to eighteen hundred per annum.

Curriculum: In establishing the department of defects in hearing and speech, insofar as it is elementary teaching in its character there will be required
DEFECTS OF HEARING AND SPEECH.

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such regular pedagogie rules as prevail in all institutes, with the correspond-
ing discipline; as all of our students will be soldiers, the maintenance of
discipline should be very simple.

It is proposed that an intensive course should be pursued in teaching, but
not of such high tension as to cause mental fatigue to the pupils.

The period of study, before the pupil is fully prepared for discharge as a
finished lip reader, or defects of speech corrected, should not entail a period
on the average of over six months. During this period of instruction for
the deaf, and correction of speech defects, especially for the former there
is at the same time a course of vocational re-education being carried out.
Thus we shall have not only insured the handicapped the privilege of social
and business intereourse with his fellows, but have him also partially or
completely re-educated.

The Course: All educational work should be undertaken in the forenoon. All
vocational work in the afternoon. Advance students during their vocational
work will be able to practice their new found art.

The Deaf: The class work should be divided into three groups.

Lip Reading: (a) Lessons by trained teachers.
This work should be carried out as individually as possible, each teacher
having one pupil at each lesson. The number of pupils may be increased to
four. One hour for each pupil or group.

(b) Practice:
This work can easily be carried out in groups.

(c) Class work:
Commencing at nine, each pupil could have three hours of work before
the noon hour. The work will necessarily proceed in a circular method, and
the pupil will necessarily have a different teacher for instruction. The voca-
tional instruction for the deaf is to be given in the afternoon hours. In
the evenings moving picture views of lip reading may be given to supple-
ment the day time work.

Defects of Speech: The correction in speech is not attended with the same
mental effort and consequent fatigue that is attended upon lip reading;
therefore, the afternoon hours may be employed for this purpose; the
morning hours being employed in the vocational training for all of those who
require or request re-education.

Time Required for Teachers: Each teacher should be able to do five hours
work a day. Through the system which we have in view, three of these
hours should be devoted to the teaching of soldier pupils, two of them to the
training of cadets.

Each teacher available, should be able to teach from three to twelve
soldier pupils per day.

It would be well to employ a few cadet teachers, who could be taught by
the trained teachers in the afternoon hours. In the forenoon they should
be employed in practice work with the students.

These cadet teachers need receive only a nominal pay during the period
of cadetship.

Through this method, the probable necessary increase of teachers, as the
war progresses, can readily be made.

We have now in view, already pledged, twenty-four lip reading teachers
for service according to army regulations, prepared to go where their services are required.

We also have twenty-five teachers in lip reading, willing to accept service at their own homes, and twenty-two willing to accept service under army regulations during school vacation, and other restriction. Enough from these classifications could be obtained to give us sufficient teachers to meet all our demands during the first year of military activities.

Numerous applications have been received of individuals who are both able and willing to become cadet teachers. Most of these are intellectual and give promise, if accepted, of making fine teachers on the completion of their cadetship.

A list of teachers for the defects in speech is now being prepared and when completed will also show as favorable results as for lip-readers.

There are two important features which we must take cognizance of in connection with the work; first, the color question which affects the defects in both classes; secondly, the inability of a very few to acquire the lip method of communication.

The color question can be solved, as it has been in educational work elsewhere, by segregation of patients and employment of teachers from northern states for the negro.

The second question will only form an element of consideration after the teaching center has been established for several months. Those who are too obtuse to acquire the oral method, after demonstrating their incapability, may be transferred to other quarters where the manual method is taught.

In teaching the manual method, a high degree of qualification is not necessary in the teacher.

The great disadvantage of the manual methods is that it does not permit the totally deaf to communicate with others unless they are conversant with the method.

Vocations: A small number of those made permanently deaf, through war casualty, may through re-education be enabled to follow the vocation which they pursued previous to their entering of the United States Army.

A larger number though defective in hearing will be cut off entirely from their previous occupation and thus require vocational retraining.

It is well to remember that in all of those already trained in vocations which are silent and without motion re-education is hardly necessary. In the above mentioned occupation it is simply necessary to impress upon the employer the fact that a deaf individual is not an abnormal but a normal person, capable within a certain minor restriction of seeking and being able to take care of employment.

The types of employment which are opened to those deaf to the ears, but re-educated as to hear with the eyes are varied and numerous. Two methods of occupation are offered: viz., first, the outdoor occupation; secondly, the indoor occupation.

Vocations in which the deaf should be re-educated are as follows:

Indoor Occupations: Printing; Engraving in all of its branches; Lithography; Bookbinding; Chemistry; Mechanical Dentistry; Draughting; Photography and its allied arts; Sign Painting; House Painting; Interior Decorating, in all of its branches; Shoemaking; Saddling; Cabinet Making;
Woodworking; Artificiary in Iron Work; Broom and Mattress Making; Bookkeeping; Electricity; Engineering.

Out-of-Door Occupations: Carpentery; Bricklaying; Scientific Agriculture; Scientific Gardening; Horticulture; Mechanical and other work in Garages; Construction Work; Coopering; Tin Working; Masonry.

The chief difficulty which confronted us at the early stage of organization was obtaining the proper superintendent to take charge of the work. After a consultation of those we had under advisement, we feel that we made the best selection that could be thought of. Our superintendent, Captain A. C. Manning, proved most efficient for the work in hand, acted with thorough cooperation, and assisted very materially in the success of the undertaking in question. Later he was created an officer, a captain in the sanitary corps, assigned to reconstruction work, and afterwards removed to a larger field, in another hospital.

The principal in the defects of hearing and speech, Miss Enfield Joiner, was one of the happiest selections that could have been made, a most indefatigable worker, always happy, bright and cheerful, thoroughly proficient in the art of speech reading, one to whom obstacles seemed solely for the purpose of adopting methods of overcoming.

Among the reconstruction aides, we have seven in defects of hearing and three for defects of speech. I doubt if fortune ever favored one as it did the director of this undertaking in selecting the proper personnel as instructors in connection with this work, and I cannot speak too highly of this band of women, who have made the success that has been apparent in connection with the section of defects in hearing and speech.

It was our desire that this work should be done in an independent institution, somewhat of the character of the plant for the blind under Major Bordley. The hospital division seemed anxious that such a method should be adopted, and placed a well adapted summer hotel just outside of Baltimore for this purpose, for our consideration. It would have more than satisfied the needs of this section, but there were many difficulties in connection with its procurement. The general staff did not seem inclined for a consummation of the lease; after they finally granted permission to accept the lease, the owners withdrew their proposition. Later efforts were again made, and the proprietors were more than willing to renew the contract, but after a second, more thorough examination of the structure, we advised, and so notified the general staff that on account of the building being frame, with inadequate fire-escapes, it would be unwise to accept
Numerous other places were offered to us for the purpose of inspection to ascertain if they would meet with the requirements of a separate establishment, to be devoted exclusively to the work of hearing and speech. Several trips were made by the director of this section for the purpose of examining these various places. We found that most of them were large, summer residences of wealthy people, who were willing to place their homes at the disposal of the government. We found also that these residences, while large and commodious, were not adaptable to the work in view, except through considerable alteration, at great expense. Many of the homes were far from large cities, in which United States General Hospitals were located, and therefore ill-suited for the purpose in view. The director of this section, therefore, had to fall in line with the desires of the Chief of the Division of Reconstruction, Colonel Billings, and accept headquarters in one of the United States General Hospitals.

The Hospital Division made a special order by which the Section of Defects in Hearing and Speech could have as near an independent existence as possible in United States General Hospital No. 11, at Cape May, N. J., and this relationship has been maintained up to the present time.

A diagnostic chart which was to be entered up and form a part of the medical history of the patient was prepared. This card received the acceptance of the division, but in some way it was apparently lost. Fortunately copies of the chart had already been submitted to the chief of the oto-laryngological service at General Hospital No. 11, and a copy of it was in his hands.

This was not as complete a chart as had been finally prepared, but it served the purpose and has been lived up to in connection with the history of each patient in the Section of Defects in Hearing and Speech. The lost chart, many months afterwards was found.

After many plans had been suggested for the employment of an educational staff, the following was adopted; in order to adequately start the work, an authorization was given for the employment of

1 Superintendent at .......................$3,000 per year
1 Principal at .......................... 1,800 per year
8 Teachers at .......................... 1,000 per year

After this authorization, the question of appointing the teach-
ers as head reconstruction aides at $60 per month with rations and quarters was suggested and accepted.

In April, 1918, Captain John M. Ingersoll was assigned to General Hospital No. 11, as surgical resident, in charge of the Section of Defects in Hearing and Speech.

On account of the limitations placed on the director of the section, as a result of not being able to obtain the proper institution for this work, and as the director of the division of Physical Reconstruction seemed anxious that the work should be done in United States Army Hospitals the necessity of enlarging the staff both here in the Surgeon General’s office, in the hospitals and abroad was necessarily restricted.

On July 23, there was inaugurated at General Hospital No. 11, the opening of the treatment of defects of hearing and speech. This ceremony was attended by the staff, patients of the hospital and visitors. The opening address was made by Colonel Paul Straube, the commanding officer. It was followed by a few remarks by the director, Lieutenant Colonel Charles W. Richardson, as to the scope of the work and the methods of treatment. The address of the evening was made by Major W. W. Keen of Philadelphia, the subject being “Observations on the Difference Between the Medical Treatment During the War of the Rebellion and Those of the Present Day.”

On July 24, the treatment was inaugurated with seventeen patients in attendance.

All patients were examined in the oto-laryngological section of the hospital by the staff under the direction of Major John M. Ingersoll. They were all tested out and their conditions noted. The complete deaf of whatever character were immediately assigned for speech reading. The near deaf, and those having deafness in both ears under 5/20, in which the condition of the ears indicated that the hearing would become progressive, although gradually worse, were assigned to the speech reading department.

Most of the cases we found had some degree of impairment of hearing before entering the service.

It is very interesting to note that up to the period of December 31, 1918, we never saw what could be accurately designated so-called shell shock deafness. We have seen two cases that bear very close resemblance to shock concussions—that type of cochlea injury which is attendant upon those exposed to hours of intensive gun fire, in which high explosive shells predominate.
The course which we adopted in speech reading was one of the individual instructive type. Each patient was given one-half hour's instruction twice daily at the beginning. We found that two study periods a day were about sufficient for most men. They were given mirrors to study their own lip movements, and they were also given practice among each other. In fact, we found them very assiduous in their efforts toward improvement. Anxious to gain all the advantages that could accrue from intensive work.

In connection with the method which we adopted, that is, of intensive training, we wish to speak a few words:

It was our impression when we were beginning the organization of the work that the only method to pursue in order to accomplish the best results for the students in speech reading would be as intensive a method as it was possible for the patient to undertake without great mental fatigue. We feel that the results which we have gained through this method as indicated, proved the correctness of our idea. It has proven to us that the impression which we formulated, that the only methods to maintain and establish the visual impression of sound movements, and facial motion created thereby, was to create a new association or pathway between the eye and the centre for the correct interpretation of these movements. In order to establish and maintain this new pathway, and the proper correlation and interpretation in the brain centre, then it seemed necessary in the formative stage to keep up such a succession of impressions so that the association might be well and quickly established.

That this has proved true is indicated by most of the cases which we had under observation. We feel that the great success in this undertaking has been the intensiveness through which the method has been pursued.

We believe that the want of complete success in speech reading, among the lay is due to the want of intensiveness in their course of instruction. We believe that should a person seeking speech reading put himself under the same intensive course as is adopted by us at No. 11, he would gain the same results in the same period of time.

One thing which has been markedly evident in connection with our work is the fact that is recognized by all teachers of speech reading, that is that the complete deaf improve much more rapidly than the near deaf.

Not wishing to entirely neglect the other feature of our work,
I want to say that the correction of speech defects did not form a large part of our efforts. This was due to the fact that we had very few severe defects, independent of those due to injury of the speech centre. Various types of aphasia. This left a great deal of time for our speech reading aides, who improved their opportunities by correcting the illiteracy among some of our defective in hearing, and improving the pronunciation and enlarging the vocabulary in some of our alien patients.

Other methods which have been adapted in connection with this section are those which are purely medical. Certain cases were placed in the psychiatric division. Those in which there was needed a stimulation of the dormant auditory apparatus, whether centric, in the path between the centre and the end apparatus, or in the end apparatus were taught through the auricular method. The few so treated made good progress.

The number of patients discharged from the hospital is 32, all of whom are good readers, and are able to take care of themselves. These individuals have no difficulty other than that which is common to most proficient speech readers. Ordinarily it is not necessary for them to request a repetition of what is stated. In order to insure that none of these patients might lapse or deteriorate in their ability to read, but rather to be improved or be more perfect readers than they are at present, it was decided that all the patients discharged from United States Army General Hospital No. 11, should have the privilege of carrying on practice work at schools or with individual teachers in their home town or near their home towns. Arrangement was thus made with a number of schools and teachers throughout the country to give the benefit of their work and effort to our discharged patients. A similar arrangement has been made with the Federal Board for Vocational Education. The same schools and teachers who are to be employed by us have been given to the Federal Board for Vocational Education and they are to furnish practice and instruction to our patients after they have been discharged from the United States Army.

On December 31, 1918, we find that the enrollment of candidates for head aides in the speech reading section amount to one hundred. All of these teachers signified their willingness to accept service on notice and under full army regulation.

In the speech corrective section, as to the same date we find fifty-one candidates enrolled to accept service as head aides, under full army regulations. We also had fifty-four candidates
for speech reading, who were willing to give partial time service.

These facts are mentioned to demonstrate how well the country was canvassed for teachers of speech reading and corrective speech work.

Results: It is impossible to give more than a summary of the results we have attained both in the speech reading and the corrective speech work. We have discharged sixty-three patients from United States General Hospital No. 11 in the speech reading work. Of this number over fifty completed the course. The course was completed on an average in two months. We feel that the fifty who completed the course were as perfect speech readers as is ordinarily graduated from the best speech reading schools in this country. Our opinion, and that of our expert teachers, possibly prejudiced, is that they are far better perfected than the best students completing the course in the best civilian schools. I will quote from Captain Gordon Berry, who has been in charge of this work for the past two months, as to why he considers our work is better and the reasons therefor:

1st. The grade of teachers, each of whom is an expert.

2nd. The altruistic spirit makes them more efficient in class room work. They show an optimism as regards the patient that is infections, cheering the discouraged, and stimulating the good worker to better endeavor.

3rd. The individual instruction which each patient receives.

4th. The fact that the deafness is recently acquired.

5th. The optimism created by working with others who can demonstrate their progress.

6th. The orderly arrangement of the day, the perfect system adopted. The military regime under which the patient lives and has his being conduces to easy discipline.

All of these reasons demonstrate that the theoretical plans upon which the system was instituted has practically evidenced its thorough utility.

Many military medical officers, as well as officers not in the medical corps have made inspection of our work, and have been markedly impressed and extremely enthusiastic over the work being accomplished, its rapidity of attainment and the results gained. Many of these officers were well prepared to judge of the character of the work in hand.

Many teachers of the deaf, noted principals of schools for the promotion of speech reading, and heads of deaf and dumb institutions made visits to United States General Hospital No. 11,
and reviewed and inspected the work in progress. These people are the best judges of the character of work we are attempting to carry out and their opinion of it carries scientific value, so it is well worth noting.

We naturally were somewhat anxious as to their criticism and judgment of our efforts.

It will, no doubt, please you to know that they were unanimous in their approbation of our methods, delighted with the results which we were gaining, pleased with the possibilities, and congratulatory with the splendid work accomplished.

The most distinguished of these visitors were Dr. Crouter of Mt. Airy School, Philadelphia; Miss Yale and Miss Gaworth, of the Clarke School, Northampton, Mass.; Dr. Hall of the Gallaudet College, Washington, D. C.; Mrs. Marsh and Mrs. Berry of the Ohio School for the Deaf; Mr. Pope of the New Jersey Institute; and Mr. Steed of the Mt. Airy School, Philadelphia.

All of these visitors acknowledged that they had been more than repaid for the time and effort made in visiting Cape May. A compliment in itself. Dr. Hall gave a lecture to his faculty on the work at Cape May, on his return from his visit, and although not present, I was told by one of the faculty that it was exceedingly complimentary as to our methods, system, teaching force and results.

The corrective speech work has been as excellent in its results as the speech reading. Indeed, all of the work in connection with speech corrections has been a revelation to those who have not previously known of its possibilities. It stands out as one of the most remarkable results attained by the medical corps in the history of the war.

I will close my paper by adding the summary of all cases treated by us to May 31, 1919, followed by a graphic chart of the medical history of each patient.

Number of patients under treatment:

<table>
<thead>
<tr>
<th>Section of Defects of Hearing</th>
<th>31 patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section of Defects of Speech</td>
<td>25 patients</td>
</tr>
<tr>
<td>Total</td>
<td>56 patients</td>
</tr>
</tbody>
</table>

Patients having completed or partially completed courses:

<table>
<thead>
<tr>
<th>Section of Defects of Hearing</th>
<th>63 patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section of Defects of Speech</td>
<td>12 patients</td>
</tr>
<tr>
<td>Total</td>
<td>75 patients</td>
</tr>
</tbody>
</table>

Patients enrolled since July 23, 1918:

<table>
<thead>
<tr>
<th>Section of Defects of Hearing</th>
<th>99 patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Section of Defects of Speech</td>
<td>37 patients</td>
</tr>
<tr>
<td>Total</td>
<td>136 patients</td>
</tr>
</tbody>
</table>
Deaf patients improving under treatment so as to render continuing courses unnecessary, 10 patients or 16 2/3 % of the number discharged from section. Number totally deaf ............................................. 28 patients, or 29 %
Number having had trouble previous to entering the service 46 patients, or 47 %
Countries represented in birthplaces ............................................. 10
France, Russia, Poland, Italy, Norway, Ireland, Greece, Spain, America, Germany.

Average time for lip reading course ............................................. 2 months
Daily schedule, 1 1/2 hours per man, 3/4 to 1/2 hour periods.

Number of Instructors:
Section of Defects of Hearing, from ................. July 23 to Aug. 21 4
Section of Defects of Hearing, from ................. Aug. 21 to Sept. 3 6
Section of Defects of Hearing, from ................. Sept. 3 to Oct. 22 7
Section of Defects of Hearing, from ................. Oct. 22 to Feb. 1 8
Section of Defects of Hearing, from ................. Feb. 1 to May 1 7
Section of Defects of Hearing, from ................. May 1 to May 15 8
Section of Defects of Speech, from ................. July 23 to Aug. 21 1
Section of Defects of Speech, from ................. Aug. 21 to May 15 3

CLASSIFICATION OF CASES.

Section of Defects of Speech:
Aphasics .................................................. 14 patients
Imperfect phonation cases ............................................. 13 patients
Stammerers ............................................. 3 patients
Aphasic and stutterer ............................................. 1 patient
Multiple Neuritis ............................................. 1 patient
Aphonia cases ............................................. 2 patients
Stutterers ............................................. 2 patients
Stammerers and stutterers ............................................. 1 patient
Total .................................................. 37 patients

Section of Defects of Hearing:
Cases which have completed treatment ......................... 63

In line of duty ............................................. 43
Not in line of duty ............................................. 20
Having Otitis Interna, result of gun fire ......................... 2
Shell explosions ............................................. 8
Basal fracture ............................................. 2
Meningitis ............................................. 4
Other causes ............................................. 9
Extension from middle ear ............................................. 14
Deafness from catarrhal ears ............................................. 9
Deafness from suppurative ears ............................................. 22
Of the 22 suppurative ears, there were discharged dry ......................... 19
Cases hearing much improved ............................................. 14
Otosclerosis ............................................. 1
The labyrinth tests were not routinely done in all.
Of six tests noted, there were sluggish reactions in ......................... 3
No reactions, or dead labyrinths in ............................................. 3
Cases still under treatment ............................................. 39
In line of duty .................................................. 36
Not in line of duty .................................................. 3
Having otitis interna, result of gun fire .................................. 4
Having otitis interna, result of shell explosion .................................. 6
Having otitis interna, result of basal fracture .................................. 2
Having otitis interna, result of meningitis .................................. 14
Having otitis interna, result of other causes, other than middle ear .............. 0
Having otitis interna, result of extension from middle ear ......................... 6
Deafness caused by catarrhal deafness .................................. 2
Deafness caused by suppurative otitis .................................. 4
Four running cases, still here, now dry .................................. 3
Hearing much improved in .................................. 2
With otosclerosis .................................. 1
Almost all the labyrinths in this group were tested, and the balance will be:
Hyper-active labyrinths .................................. 2
Sluggish labyrinths .................................. 6
Dead labyrinths .................................. 12
These labyrinthine tests were done in the otitis interna cases. The "dead" labyrinths were in the otitis interna following meningitis cases.
"Shell-Shock cases":
There were two cases of otitis interna from shell explosion. The otitis interna had cleared or nearly cleared when they arrived here. The deafness continued from hysteria. Under suggestion, and with rest, the hysterical condition cleared and the hearing became normal in each case. In one case only one ear returned to normal because the other ear had been deaf for years, a chronic condition. These two were cases which earlier would have been considered shell-shock cases. Two cases died from meningitis, consequent on a chronic brain-abscess, secondary to a chronic otitis media, suppurative.
VERTIGO AND AVIATION. *

By H. W. LYMAN, M. D., St. Louis, Mo.

One of the most interesting medical problems arising in the development of aviation has been the study of the causes, behavior and correction of the disabling vertigo or dizziness experienced by aviators, which all too frequently is the cause of crashes, disastrous alike to the pilot and the plane.

As an aeroplane is absolutely dependent upon motion for its sustained flight through the air, it is self-evident that the pilot guiding it should possess the best possible motion-sensing equipment. For this reason the United States Air Service requires the most careful examination in all candidates for flying status of the special senses by which motion is perceived, namely, the tactile, deep muscle, visual and vestibular mechanisms, and accepts none save those who possess a normal and complete physical equipment for this function. The vestibular apparatus, while perhaps the least generally understood of these special senses, is the most constant in its action; and, because it is a motion-sensing mechanism, pure and simple, is one of the essential qualifications of the military aviator. Like all special senses, however, it occasionally conveys messages to the brain which, unless correctly interpreted, result in illusions. The illusion in this case is a false sensation of motion or vertigo.

The vestibular motion-sensing apparatus consists of the saccule utricle and semicircular canals of each labyrinth, the motion-sensing areas of the brain, and the nerve pathways connecting them. For the sake of brevity, it may be stated that the interaction between the nerve and the labyrinth is caused by movements of endolymph over the hair cells in the saccule, utricle and semicircular canals. The impulses, or messages, thus produced are transmitted to the cerebral centers and there interpreted as motion. The function of the saccule and utricle is the sensing of linear motion, and of the semicircular canals rotary or turning movements. Because of the arrangement of the semicircular canals at right angles to each other, no change in direction of motion of the head is possible without causing endolymph move-
ment in some of the canals and thus sending information to the brain.

Occasionally, however, this endolymph movement persists solely by momentum, after movement of the head has ceased or changed in direction, and continues to send messages to the brain which are still interpreted as motion. This sensation of motion, which is not in accordance with fact, is called "vertigo." It is confusing, and, unless recognized and correctly interpreted by the experience gained by continual repetition, may result in a loss of control of body movements. The vertigo induced by endolymph movement is always in the plane of the stimulation. Thus vestibular stimulation in a horizontal plane causes a sensation of turning in a horizontal plane,—a phenomenon all have experienced throughout life, and, because of its constant repetition, it is not found to be at all disturbing. Stimulation of the canals in a vertical plane, however, results in a sensation of being whirled in a vertical plane and is most disturbing to the individual. Thus, when an individual, who is blindfolded to exclude all visual impressions, is turned in a revolving chair with his head inclined 120 degrees forward, there will be an endolymph movement in the vertical canals. This vestibular stimulation will continue after the chair has stopped because of the momentum of the fluid and will cause a sensation of turning which is not in accordance with fact. As long as the individual keeps his head in this position he experiences no disturbance because his sensation of turning is in a horizontal plane. If he now sits erect he changes the plane of the endolymph movement from the horizontal to the vertical (frontal) plane and feels that he is falling to one side. This is so alarming that he violently throws his body to the other side in an effort to save himself. If, however, he quickly bends his head forward to its original position he again changes the vertigo from a vertical to a horizontal plane and the disturbed feeling is greatly relieved. By remaining in this position until the endolymph ceases to move he is able to sit erect without any dizziness.

The whirling in an aeroplane, performing various evolutions, stimulates the vestibular apparatus in a similar way and produces similar effects. For instance, in a spinning nose dive, often incorrectly called a tail spin, the ship falls nose downward, while the fuselage spins around a vertical axis. This causes the aviator to be whirled around face downward in a plane practically parallel to the ground and produces a vestibular stimulation in the verti-
cal canals in a frontal plane similar to the chair experiment previously described. As long as he continues in the maneuver he experiences no inconvenience, but as he comes out of the spin, by "flattening out" he changes his plane of vertigo to a vertical (frontal) plane and has a sensation as if the aeroplane were rolling over sideways. Until he has learned by practice to disregard this false sensation of motion, he is apt to "over-correct" with his "joy-stick" and rudder, lose control of the aeroplane, and crash before he can find himself. It is this vertigo in a vertical plane which is a potential source of danger to the aviator and which by practice he must learn to recognize and interpret correctly. This he is taught to do by being repeatedly taken through the evolutions as a passenger and as he becomes more and more accustomed to their effects he is allowed to assume control of the plane under the direct observation of his instructor and not until he is found, by actual experience, to be able to do this well is he permitted to enter upon his "solo" stage of flying.

It has been demonstrated that if the aviator, when coming out of a stunt, moves his head in such a manner as to keep the canals which have been stimulated parallel to the ground he will avoid the disabling effects of the vertigo induced by vestibular stimulation in a vertical plane. In coming out of a spinning nose dive, for example, if he inclines his head forward as the ship flattens out, thus keeping his vertical canals in a horizontal plane, he will not experience any sensation of rolling over and can manipulate his controls with perfect accuracy, and as soon as the movement of the endolymph caused by the whirling has ceased, he can raise his head without any sensation of vertigo. Various movements of the head have been worked out for the correction of the vertigo induced by the different stunts and their practical value has been appreciated by the aviators instructed in them.

There is a general misconception concerning the acquirement of this so-called "vertigo tolerance" which gives the aviator the ability to control his ship properly in performing evolutions. The statement is often made that the flier loses his vertigo as a result of repeated whirling in the air. This is not the case. Vertigo tolerance is the result of practice which educates the brain to interpret correctly these vertigo impulses in all planes and is not due to any disappearance of vertigo because of constant flying.

This has been proven by a series of experiments conducted in the Otologic Department of the Medical Research Laboratory at
Mincola. Tests in the turning chair were made on a series of individuals who possessed normal vestibular apparatus, but who had had no flying experience, and gave the following reactions:—

After turning to the right 10 times in 20 seconds the nystagmus lasted an average of ................. 24.4 See.

After turning to the left 10 times in 20 seconds the nystagmus lasted an average of ................. 25.1 See.

The individual was then placed with his head 120 degrees forward and turned 5 times to the right in 10 seconds. On sitting erect the falling reaction was measured in degrees, and gave an average of ......................... 23.9 Deg.*

He was then turned to the left 5 times in 10 seconds and gave an average falling reaction of ........ 25.75 Deg.*

The detailed reactions of twenty of these tests are shown in Table I.

Similar tests were made on a series of aviators, skilled in "stunt" flying and who had had from 50 to 2000 hours in the air, with the following results:—

The nystagmus after turning to the right was...... 24.7 See.

The nystagmus after turning to the left was...... 24.95 See.

The falling reaction after turning to the right was... 9.8 Deg.

The falling reaction after turning to the left was... 11.325 Deg.

The detailed reactions of forty of these aviators are shown in Table II.

These figures, showing a perfectly normal nystagmus in all cases, demonstrate clearly that the sensitivity of the labyrinth remains unimpaired but that there is developed by education through experience in "stunt" flying an ability to interpret properly the impulses received from the vestibular apparatus, and to control accurately all body movements.

These findings have been confirmed in the examination of a large number of fliers at various aviation fields throughout the country. In every series the falling reaction has been much less in the experienced fliers (especially those doing a considerable amount of "stunt" flying) than in the non-fliers, while the average of the nystagmus has undergone no appreciable change in either class.

*This figure is actually less than the true average degree of falling because the apparatus used registered accurately only to 35 degrees. Many of these individuals would have fallen more than 35 degrees if they had not been restrained by the chair.
That an ability of this sort may be acquired by any means which involves repeated whirling is illustrated by the reactions of Lieut. L. H. B. On October 11th, after turning, his falling reactions were 20 degrees to the right and 15 degrees to the left. On October 23rd, after being turned in the chair almost daily, his falling reactions were five degrees to the right and five degrees to the left.

A practical application of this has been made by the United States Government by the adoption of the "Orientator" in the training of aviators. This machine consists essentially of the cockpit of an aeroplane suspended by gimbal joints in three concentric rings in the same manner as a ship's compass. Power is furnished by a series of electric motors which can be governed by the student himself with a set of controls in the suspended cockpit, or, by the instructor with an outside set of controls. Because of the method of suspension the cockpit can be moved in any of the three planes—horizontal, vertical, sagittal, or any combination of them. Thus, by a proper use of the controls, either by the student or the instructor, the student can be put through every evolution of which an aeroplane is capable, except actual forward progression. Because of the smallness of the circle in which the student is turned, and the speed of the apparatus, the amount of whirling which the student experiences can be made far greater than it is possible to experience in an aeroplane in actual flight, and, by a graduated series of lessons, the aviator can acquire a so-called vertigo tolerance far beyond anything he will experience in an aeroplane.

As many crashes are known to have occurred because of the disabling effects of vertigo, the increased vertigo tolerance which can be acquired by the use of this machine will result in the saving of lives and planes.
TABLE I

FALLING REACTIONS OF NON-FLIERS

<table>
<thead>
<tr>
<th>No.</th>
<th>Nys. after turning to Right</th>
<th>Nys. after turning to Left</th>
<th>Falling Reaction after turning to Right</th>
<th>Falling Reaction after turning to Left</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>25 seconds</td>
<td>25 seconds</td>
<td>35 degrees</td>
<td>35 degrees</td>
</tr>
<tr>
<td>2</td>
<td>31 seconds</td>
<td>32 seconds</td>
<td>30 degrees</td>
<td>30 degrees</td>
</tr>
<tr>
<td>3</td>
<td>26 seconds</td>
<td>27 seconds</td>
<td>30 degrees</td>
<td>35 degrees</td>
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<tr>
<td>4</td>
<td>26 seconds</td>
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<td>35 degrees</td>
<td>35 degrees</td>
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<td>5</td>
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<td>35 degrees</td>
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<tr>
<td>6</td>
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<td>25 degrees</td>
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<td>7</td>
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<td>8</td>
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<td>18 seconds</td>
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<td>11</td>
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<td>10 degrees</td>
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<td>35 degrees</td>
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<td>16</td>
<td>25 seconds</td>
<td>27 seconds</td>
<td>35 degrees</td>
<td>35 degrees</td>
</tr>
<tr>
<td>17</td>
<td>19 seconds</td>
<td>25 seconds</td>
<td>30 degrees</td>
<td>30 degrees</td>
</tr>
<tr>
<td>18</td>
<td>29 seconds</td>
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<td>10 degrees</td>
</tr>
<tr>
<td>20</td>
<td>19 seconds</td>
<td>20 seconds</td>
<td>20 degrees</td>
<td>15 degrees</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>496</td>
<td>502</td>
<td>478</td>
</tr>
<tr>
<td>Average, 24.4 Sec.</td>
<td>25.1 Sec.</td>
<td>23.9 Degrees</td>
<td>24.75 Degrees</td>
<td></td>
</tr>
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</table>
### TABLE II

**FALLING REACTIONS OF Fliers**

<table>
<thead>
<tr>
<th>No.</th>
<th>Hours of Flying</th>
<th>Nys, after turning to Right</th>
<th>Nys, after turning to Left</th>
<th>Falling Reaction after turning to Right</th>
<th>Falling Reaction after turning to Left</th>
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<tbody>
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<td>50</td>
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<td>5 degrees</td>
<td>5 degrees</td>
</tr>
<tr>
<td>2</td>
<td>50</td>
<td>35 seconds</td>
<td>31 seconds</td>
<td>20 degrees</td>
<td>10 degrees</td>
</tr>
<tr>
<td>3</td>
<td>50</td>
<td>27 seconds</td>
<td>25 seconds</td>
<td>0 degrees</td>
<td>5 degrees</td>
</tr>
<tr>
<td>4</td>
<td>50</td>
<td>22 seconds</td>
<td>22 seconds</td>
<td>10 degrees</td>
<td>10 degrees</td>
</tr>
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<td>24 seconds</td>
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<td>10 degrees</td>
</tr>
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<td>5 degrees</td>
<td>9 degrees</td>
</tr>
<tr>
<td>12</td>
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<td>3 degrees</td>
<td>10 degrees</td>
</tr>
<tr>
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<tr>
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<td>10 degrees</td>
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<td>10 degrees</td>
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<td>23 seconds</td>
<td>8 degrees</td>
<td>8 degrees</td>
</tr>
<tr>
<td>39</td>
<td>250</td>
<td>26 seconds</td>
<td>26 seconds</td>
<td>5 degrees</td>
<td>8 degrees</td>
</tr>
<tr>
<td>40</td>
<td>*2000</td>
<td>24 seconds</td>
<td>24 seconds</td>
<td>0 degrees</td>
<td>0 degrees</td>
</tr>
</tbody>
</table>

Total: 8964 988 998 389 453

Average: 224.1 24.7 24.95 9.825 11.325

*This man was then turned 20 times as rapidly as possible with his head inclined 120 degrees forward and then sat erect with less than five degrees of falling, yet his vestibular reactions, nystagmus and vertigo were normal. Nystagmus 24 seconds and vertigo 28 seconds.*
CONSERVATIVE SURGERY OF THE LATERAL SINUS.*

By CHARLES C. JONES, M. D., Cincinnati, Ohio.

During the last few years I have been very much interested in the treatment of thrombosis of the lateral sinus. After having had several cases and having made a study of the literature on the subject I reached the conclusion that opinion as to the correct surgical procedure varies a great deal and an operator can find good authority for almost any operation that he cares to perform. I also reached the conclusion that it is a much more frequent complication of otitis media than is generally supposed.

In this paper I am going to give the result of my study of the subject along three different lines and then state the conclusions that I have deduced.

1. A study of the literature and a collection of 50 case reports with an analysis of the same.

2. The summary of the answers to a questionnaire sent to 100 of the leading otologists of the country.

3. My own case reports.

1. I am fully aware of the fact that a tabulation of case reports selected from the literature is not of as much value as a report of consecutive cases, because of the tendency to report only successful cases, but am presenting the subject at its face value. In following statistics I have not attempted to tabulate any symptoms or the pre-operative diagnosis because the symptoms can be found in any text-book on the subject and the ability to make diagnosis from the symptoms found depends on the individual. (See Chart Exhibit No. 1).

A study of these case reports will reveal the following points:

1. The condition occurred mostly in young persons, the oldest being 40 years of age while the average age was 18½ years.

2. It occurred as frequently in acute as in chronic otitis, 26 cases resulting from acute otitis and 24 cases from chronic otitis.

3. In 35 cases the thrombus was present and discovered at the primary operation on the mastoid. In 13 cases it followed the mastoid operation and two cases were not operated.

4. The jugular vein was resected in 16 cases. In 19 cases it was ligated and in 15 cases it was not treated.

*Candidate's Thesis Recommended for Publication by the Council.
<table>
<thead>
<tr>
<th>Symptoms of sinus thrombosis. Do you expose sinus first or ligate the jugular?</th>
<th>Sinus exposed and thrombosed. Do you treat it or ligate the jugular first?</th>
<th>Sinus treated and no bleeding from bulb. Do you ligate the vein?</th>
<th>Thrombus removed and free bleeding from both ends. Do you ligate jugular?</th>
<th>Do you treat the torcular end of sinus?</th>
<th>Do you ever expose the bulb?</th>
<th>When do you excise the vein and when ligate?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Expose sinus</td>
<td>Sinus</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Excise only when vein is diseased.</td>
</tr>
<tr>
<td>2</td>
<td>Expose sinus</td>
<td>Either one</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Excise except when condition of patient is serious.</td>
</tr>
<tr>
<td>3</td>
<td>Expose sinus</td>
<td>Treats sinus</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Has never excised vein.</td>
</tr>
<tr>
<td>4</td>
<td>Expose sinus</td>
<td>Treats sinus</td>
<td>Not always</td>
<td>No</td>
<td>Only where there is an infected thrombus.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Expose sinus</td>
<td>Ties vein</td>
<td>Yes</td>
<td>Yes</td>
<td>Attempts to get free bleeding.</td>
<td>Only when necrosis extends to it.</td>
</tr>
<tr>
<td>6</td>
<td>Expose sinus</td>
<td>Ties vein</td>
<td>Yes</td>
<td>No</td>
<td>Only where infected thrombus.</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Expose sinus</td>
<td>Ties vein</td>
<td>Yes</td>
<td>Yes</td>
<td>Attempts to get free bleeding.</td>
<td>No</td>
</tr>
<tr>
<td>8</td>
<td>Expose sinus</td>
<td>Ties vein</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Rarely</td>
</tr>
<tr>
<td></td>
<td>Expose sinus</td>
<td>Treate sinus</td>
<td>Always ligates vein and saves 75 per cent of cases.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>-------------</td>
<td>-------------</td>
<td>---------------------------------------------------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Yes</td>
<td>No</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>No</td>
<td>No</td>
<td>Yes</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>No</td>
<td>Only when reclosed</td>
<td>Yes except when patient is serious</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Expose sinus</th>
<th>Ties vein</th>
<th>Not always</th>
</tr>
</thead>
<tbody>
<tr>
<td>13</td>
<td>Yes</td>
<td>Yes</td>
<td>Attempts to wash it out.</td>
</tr>
<tr>
<td>14</td>
<td>No</td>
<td>Yes</td>
<td>Do not treat vein.</td>
</tr>
<tr>
<td>15</td>
<td>Yes</td>
<td>No</td>
<td>Depends on symptoms.</td>
</tr>
<tr>
<td>16</td>
<td>Yes</td>
<td>No</td>
<td>Depends on symptoms.</td>
</tr>
<tr>
<td>17</td>
<td>Yes</td>
<td>No</td>
<td>Does not curette</td>
</tr>
<tr>
<td>18</td>
<td>Yes</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Yes</td>
<td>No</td>
<td></td>
</tr>
</tbody>
</table>
5. Forty-three cases recovered and seven died.

(a.) In the 35 cases where the vein was either ligated or resected five died, 14.2/7 per cent.

(b.) In 21 cases the sinus was opened and the jugular ligated or resected afterwards, three died, 14.2/7 per cent.

(c.) In the 15 cases where the jugular vein was not treated surgically two died, or 13 1/3 per cent.

(d.) In the 35 cases where the vein was exposed for surgical treatment it was found collapsed in eight cases.

E. A. Crockett reported 60 cases from different operators in which the sinus was ligated before or immediately after opening the sinus. Nine cases died, making the death rate 15 per cent.

Kopetzky, "Surgery of the Ear," publishes a report of 308 cases collected by Körner:

Ligature of jugular without opening sinus, nine cases, four died, five recovered.

Sinus opened without ligation of jugular, 132 cases; 55 died, 77 recovered.

Ligature of jugular before opening sinus, 94 cases; 36 died, 56 recovered.

Ligature of jugular after opening sinus, 68 cases; 29 died, 38 recovered.

Ligature of jugular and sinus opened, order not stated, five cases; one died, four recovered.

The percentage of recoveries in the 132 cases where the sinus alone was treated was 58.3. The percentage of recoveries in the 167 cases where the jugular was ligated just before or after the treatment of the sinus was 58.6 per cent.

CASE REPORTS.

Case 1. C. J., age 7, was seen in consultation with Dr. Gunley and Dr. Greenebaum, on May 31, 1917. The history of the case was that five weeks previous the patient had a bad cold followed by a severe earache in the right ear. He was taken to a hospital, a paracentesis performed on the right ear and the following day the left ear began to discharge. The ears discharged for three days and then stopped entirely. The patient continued to have an afternoon temperature which continued to rise higher each day. At the end of four weeks the parents were told that the patient had tuberculous meningitis and advised that he be taken home, as treatment was useless.

The patient was well developed but very much emaciated. He was in semi-stupor and could not answer questions intelligently. Pupils widely dilated but reacted to the light. Knee jerks exaggerated. Kernig's sign absent. No rigidity of the neck. Was hard to elicit tenderness on account of the patient's
CONSERVATIVE SURGERY OF THE LATERAL SINUS. 161

mental condition, but there was apparently a slight amount over the right mastoid, in the region of the emissary vein. External canals of both ears were normal. There was only a very slight redness around the periphery of the right drum. The temperature was 104°, pulse 110. Examination of chest and abdomen was negative. Unable to get any history of chill having occurred at any time during sickness. Patient ordered to the Cincinnati General Hospital where an X-ray examination was made. The report was very slight cloudiness of both mastoid processes but no bone destruction. Blood count showed a leucocytosis of 11,000, polymorphs, 86%. Spinal puncture was made and the fluid escaped under slightly increased pressure, but was otherwise normal. On the history, the septic temperature, the leucocytosis, and a diagnosis by exclusion, a diagnosis of thrombosis of the lateral sinus was made. It was decided to operate the right side first because of the slight tenderness.

A simple mastoid operation was performed and a few of the upper, posterior cells contained granulation tissue and a very small amount of pus. The lateral sinus was then exposed and found to be covered with granulation tissue. The sinus was thrombosed down near the bulb; above that it fluctuated. The sinus wall was then incised and about two drams of thick yellow pus escaped, and after curetting, it bled freely from the torcular end, but not from the bulb. An incision was then made in the neck by Dr. Jos. Rausohoff, and a very small, collapsed jugular was ligated. The patient was returned to bed and made an uneventful recovery, the temperature at no time going above 100.5°.

Blood culture made the day following operation was negative.

The pus that escaped from the sinuses was almost a pure culture of staphylococci.

Case 2. A. L., aged 25, female, housewife, was admitted to the Cincinnati General Hospital on February 3, 1917. Family history negative. Ordinary diseases of childhood. Typhoid at the age of 24. Has had malaria. On January 29, she felt bad and had a severe headache. January 30 she had severe pain in her right ear, which continued until she came to the hospital on February 3. The ear ruptured while she was in the receiving ward. Upon examination the right external canal was found to be filled with mucopus. There was a large perforation of the posterior inferior quadrant of the drum. A paracentesis was made to enlarge the opening, and three-hourly irrigation with hot bicarbonate solution. Temperature 104°, pulse 130, respirations 24. Perfusion note over apex of right lung impaired, and the breathing was bronchovesicular in character. Urine negative.

February 5. No change, the temperature varied from 98° to 103.5°.
February 6. Temperature remains between 102° and 103°.
February 8. Patient complained of feeling chilly and then had a profuse sweat, but the temperature only reached 101.5°.
February 9. Very profuse discharge from the ear and temperature reached 104°.
February 11. Examination of the blood for malaria negative. Blood culture negative.
February 16. Patient complained of some tenderness in the region of the right mastoid, slight tenderness, very small amount of discharge from the ear. Blood culture negative. Temperature 102°. A mastoid operation was decided on. A simple mastoid operation was performed and there were a few broken down cells and some pus. Sinus was exposed but was apparently normal.
February 17. Patient in good condition. Temperature normal.
February 22. Patient had a severe chill, followed by a temperature of 104.5°.
February 23. Patient had another chill, with elevation of temperature. Operation and removal of granulations from the lateral sinus exposed a thrombosed sinus. The sinus was opened and the thrombus removed. An incision was then made in the neck and a collapsed jugular vein was ligated.

Two weeks later the patient developed a pleural empyema on the right side which was drained by a rib resection. Following this she made an uneventful recovery.

All blood cultures were negative, but a culture of the thrombus showed the presence of a staphylococcus. (Reported by courtesy of Dr. W. Murphy).

Case J. J. C., a well-developed white man, aged 38, was admitted to the Cincinnati General Hospital on March 10, 1918, complaining of very severe pain in the left ear. Gave history of having had earache when 10 years of age but not since until the present attack, one week ago. Has always had a slight foul discharge from the ear. Five days ago was seized with a very violent headache that has continued up to the present time. Family history negative. Eyes, nose and throat normal. Physical examination of chest and abdomen negative. Temperature 102°, pulse 110. The canal of the left ear filled with profuse, very foul-smelling, bloody discharge. The tympanic cavity almost entirely destroyed. A large amount of cholesteatoma could be dislocated from a large opening in the posterior wall of the canal. The mastoid process was not tender to pressure, but there was a great deal of tenderness along the anterior border of the sternomastoid muscle. Shortly after admission the patient had a hard chill, followed by a temperature of 104.2° and a profuse sweat. Patient was taken to the operating room at once. The mastoid process was opened and the bone was very sclerosed. The antrum was found to communicate with a very large cavity in which the lateral sinus lay in a state of necrosis, the anterior wall having been completely destroyed. All the necrotic sinuses was cleared away and the torcular end curetted until there was free bleeding. The wound was then packed, no attempt being made to perform a radical operation because of the critical condition of the patient. A thrombosed jugular vein was then resected all the way to the clavicle, the wound closed and the patient returned to bed. All efforts to stimulate the patient were of no avail, as he continued to run a very high, irregular temperature, rapidly became comatose, and died two days later.

A blood culture taken before the operation showed numerous colonies of a gram positive staphylococcus. Wassermann test negative.

The following is the report of the autopsy performed by Dr. P. G. Wooley:

PATHOLOGICAL REPORT.

The body was that of a white adult male about 35 years of age, well developed and well nourished. Post-mortem lividity was well marked and rigidity was fairly well marked. The pupils were unequal, the left slightly larger than the right. The teeth were in poor condition. Over the mastoid on the left side was a large incision. Over the neck below the hyoid bone running vertically, toward the jugular notch, was an incision about three inches long, in which there was packing. The whole area was necrotic.
Upon removal of the skull the pia was intensely congested and the whole brain exceedingly edematous. In the temporal lobe, immediately over the roof of the middle ear, was an abscess penetrating directly into the temporal lobe for about one-half inch and about one-half inch in diameter. There was no other evidence of abscess within the brain. In the top of the petrosal bone, immediately over the middle ear, was a small perforation exuding pus from the middle ear. Upon removal of the roof, the whole middle ear was filled with heavy, thick, yellowish pus. On the left side, the lateral sinus backward along the sinus to where it joined with the right portion was entirely thrombosed. The sphenoid and ethmoid sinuses were entirely free from infection.

Upon opening the thorax, the lungs did not collapse, were considerably edematous and congested. The pleural cavities each contained about 100 to 200 c.c. of a dark greenish-blue fetid fluid. The left lung, upon section, showed several small abscesses. One of these near the pleura had burrowed through the pleura and drained in the thoracic cavity. The right lung contained two rather large cavities full of thick yellowish-black fluid. In the left lower lobe was a large infarct about 8 c.m. in diameter, which was infected.

The abdominal cavity contained no fluid. The bowels were considerably distended with gas. The liver was large, yellowish and soft. The gall bladder was free of any stones or signs of cystitis. The intestinal tract was normal. The spleen was large and soft and contained about four or five infarcts. The kidneys were rather large, soft. The capsules stripped easily, the stellate veins were injected. The cortices were rather pale and the medullae about normal in color. Upon section, the cut edges everted markedly.

Case 4. G. R., age 18 months, was seen by me in consultation with Dr. W. S. Yeager of Oakley, on July 6, 1915. The history was that the right ear had been discharging for about six weeks without causing the child any distress until the day before, when she had a chill, a high temperature, and seemed to the mother to be in a stupor. Upon examination I found the patient to be a well developed girl baby. She gave the impression of being very sick.

Ear examination: The canal of the right ear was filled with thick, creamy pus. The tympanic membrane and the posterior wall of the canal were both bulging. Upon pressure over the mastoid the child winced and cried. Temperature 102.5°, pulse 120. A free paracentesis was performed and the child ordered to the Bethesda Hospital. The following morning the patient had a paralysis of the right side of her face. Temperature, 103°. It was decided to operate at once. Simple mastoid operation, and the whole process was found necrotic and filled with pus and granulations. The sinus was exposed and found to be thrombosed. It was laid open, the clot turned out, and bled freely from both ends. Both ends were then packed with iodoform gauze saturated with alcohol and the mastoid cavity left entirely open and lightly packed. Care was taken to make the operation very complete around the antrum because of the facial paralysis. The case made an uninterrupted recovery and the facial paralysis completely recovered in three months.

Studying these four case reports, we find that three recovered and one died. The pathological report on the fatal case proves that he would have died regardless of any treatment that might have been instituted. Of the three cases that recovered, the
jugular was ligated in two cases, in both of which it was collapsed. From a personal study of the cases before, during and after the operations, I feel confident that the recovery would have been just as rapid in both cases had the jugular not been ligated.

A questionnaire was sent to one hundred of the leading otologists of the country and the following questions asked:

1. With the symptoms of sinus thrombosis which do you do first, expose the sinus or ligate the jugular?
2. Sinus exposed and thrombosed. Which would you do first, open it or ligate the jugular?
3. Sinus opened and no bleeding from the bulb. Would you ligate the jugular?
4. Thrombus removed and free bleeding from both ends. Do you ligate the jugular?
5. Do you treat the torcular end of the sinus?
6. Do you ever expose the bulb?
7. When do you excise the vein and when ligate it?

Out of the number only nineteen responded, due to the fact that so many were in military service. Their answers are tabulated in Chart II. (See Chart, Exhibition No. 2).

A study of this chart shows that ligation of the jugular in thrombosis of the lateral sinus is practised almost universally by otologists.

I believe that thrombus of a blood vessel is an attempt on the part of nature to prevent infection from entering the blood stream. How successful this attempt depends on the virulence of the infection and the resistance of the patient. When the infection is not arrested by the thrombus we have the severe cases of general septicemia, with local pyemic manifestations through the body. I think that usually the infection has been temporarily arrested by the thrombus, and all that is needed in a surgical way is the opening of the sinus walls permitting the contents to escape when the thrombus begins to disintegrate. After a thrombus has formed in the sinus and the blood clot obliterated, I believe that there is as much danger of systemic infection from the torcular end as from the jugular end. We must always remember that any operative interference is of value in so far as it assists nature and becomes an actual menace when it is so radical as to destroy any protective measures that she has instituted. In conclusion I wish to emphasize the following points:

1. All the statistics that I have collected indicate that the
<table>
<thead>
<tr>
<th>No.</th>
<th>Age</th>
<th>Operation performed on mastoid</th>
<th>Condition of the Sinus</th>
<th>Condition of the Jugular vein</th>
<th>Acute or Chronic Otitis</th>
<th>Operative procedure on Sinus</th>
<th>Operative procedure on Jugular</th>
<th>Result</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>38</td>
<td>Radical mastoid</td>
<td>Thrombosed</td>
<td>Collapsed</td>
<td>Chronic</td>
<td>Opened, curetted and bled from torcular end.</td>
<td>Ligated</td>
<td>Recovered</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>9</td>
<td>Radical mastoid</td>
<td>Thrombosed</td>
<td>Thrombosed</td>
<td>Chronic</td>
<td>Opened, curetted and bled from torcular end.</td>
<td>None</td>
<td>Recovered</td>
<td>Jugular ligated 2 days after sinus opened.</td>
</tr>
<tr>
<td>3</td>
<td>8</td>
<td>Radical mastoid</td>
<td>Thrombosed 10 days after mastoid</td>
<td>Not exposed.</td>
<td>Chronic</td>
<td>Sinus opened and thrombus removed.</td>
<td>None</td>
<td>Recovered</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>15</td>
<td>Radical mastoid</td>
<td>Thrombosed</td>
<td>Not exposed</td>
<td>Chronic</td>
<td>Opened, curetted and bled from both ends.</td>
<td>None</td>
<td>Recovered</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>12</td>
<td>Radical mastoid</td>
<td>Thrombosed 3 days after mastoid</td>
<td>Collapsed</td>
<td>Chronic</td>
<td>3 days later was opened after ligation of jugular.</td>
<td>Ligated</td>
<td>Recovered</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>13</td>
<td>Simple mastoid</td>
<td>Not exposed at operation</td>
<td>Not exposed</td>
<td>Acute</td>
<td>Opened, curetted, no bleeding from ends.</td>
<td>None</td>
<td>Recovered</td>
<td>Operation on sinus was 15 days after mastoid.</td>
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<tr>
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<td>17</td>
<td>Radical mastoid</td>
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<td>Collapsed</td>
<td>Chronic</td>
<td>Opened, curetted and bled from torcular end.</td>
<td>Ligated</td>
<td>Recovered</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>11</td>
<td>Radical mastoid</td>
<td>Not exposed at operation</td>
<td>Not exposed</td>
<td>Chronic</td>
<td>Sinus opened and thrombus removed.</td>
<td>Jugular ligated first.</td>
<td>Recovered</td>
<td>Operation on sinus was 10 days after mastoid.</td>
</tr>
<tr>
<td>9</td>
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<td>Chronic</td>
<td>Opened, curetted and bled from torcular end.</td>
<td>Ligated</td>
<td>Recovered</td>
<td></td>
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<td>40</td>
<td>Simple mastoid</td>
<td>Thrombosed</td>
<td>Thrombosed</td>
<td>Acute</td>
<td>Thrombus removed after resection of jugular.</td>
<td>Resected</td>
<td>Recovered</td>
<td></td>
</tr>
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<td>48</td>
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<td>Thrombosed</td>
<td>Thrombosed</td>
<td>Acute</td>
<td>Thrombus removed after resection of jugular.</td>
<td>Resected</td>
<td>Recovered</td>
<td></td>
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<tr>
<td>12</td>
<td>81</td>
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<td>Not exposed</td>
<td>Acute</td>
<td>Opened and bled from both ends.</td>
<td>Not treated</td>
<td>Recovered</td>
<td></td>
</tr>
<tr>
<td>Case</td>
<td>Treatment</td>
<td>Mastoid Type</td>
<td>Exposure Status</td>
<td>Acuteness</td>
<td>Lesion</td>
<td>Condition at Site</td>
<td>Lesion Removal</td>
<td>Outcome</td>
<td>Notes</td>
</tr>
<tr>
<td>------</td>
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<tr>
<td>13</td>
<td>13</td>
<td>Operation refused</td>
<td>Thrombose?</td>
<td>Acute</td>
<td>None</td>
<td>None</td>
<td>Recovered</td>
<td>Blood culture positive for Klebsiella.</td>
<td></td>
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<td>38</td>
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<td>Not exposed</td>
<td>Chronic</td>
<td>Thrombus removed and bled from both ends.</td>
<td>Resected</td>
<td>Recovered</td>
<td>Jugular was resected 4 days after sinus operation.</td>
</tr>
<tr>
<td>17</td>
<td>39</td>
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<td>Thrombose</td>
<td>Not exposed</td>
<td>Chronic</td>
<td>Opened, curedt and bled from both ends.</td>
<td>None</td>
<td>Recovered</td>
<td>A peri-jugular abscess drain 12 days later.</td>
</tr>
<tr>
<td>18</td>
<td>35</td>
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<td>Thrombose</td>
<td>Not exposed</td>
<td>Acute</td>
<td>Thrombus removed</td>
<td>Resected one day later.</td>
<td>Recovered</td>
<td></td>
</tr>
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<td>19</td>
<td>35</td>
<td>Radical mastoid</td>
<td>Thrombose</td>
<td>Not exposed</td>
<td>Chronic</td>
<td>Thrombus removed and bled from both ends.</td>
<td>None</td>
<td>Died</td>
<td></td>
</tr>
<tr>
<td>20</td>
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<td>Radical mastoid</td>
<td>Fluid blood</td>
<td>Thrombose removed</td>
<td>Chronic</td>
<td>Rejected</td>
<td>Recovered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>7</td>
<td>Simple mastoid</td>
<td>Thrombose</td>
<td>Collapsed</td>
<td>Acute</td>
<td>Thrombus removed.</td>
<td>Ligated</td>
<td>Died</td>
<td>18 days after operation blood culture positive.</td>
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<tr>
<td>23</td>
<td>18</td>
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<td>Thrombose</td>
<td>Not exposed</td>
<td>Acute</td>
<td>Thrombus removed and bled from both ends.</td>
<td>Ligated 18 days later.</td>
<td>Recovered</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>4</td>
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<td>Not exposed</td>
<td>Acute</td>
<td>Thrombus removed</td>
<td>Not treated</td>
<td>Died</td>
<td>Death due to toxemia of scarlet fever (Author).</td>
</tr>
<tr>
<td>24</td>
<td>Simple mastoid</td>
<td>Thrombose</td>
<td>Not exposed</td>
<td>Acute</td>
<td>Thrombus removed and bled from both ends.</td>
<td>Thrombosed jugular resected 9 days later.</td>
<td>Recovered</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>16</td>
<td>Radical mastoid</td>
<td>Accidentally opened during operation</td>
<td>Fluid blood</td>
<td>Chronic</td>
<td>Thrombus removed 5 days after mastoid operation.</td>
<td>Jugular resected</td>
<td>Died</td>
<td>Sinus infected accidentally during operation.</td>
</tr>
<tr>
<td>No.</td>
<td>Age</td>
<td>Operation performed</td>
<td>Condition of the Sinus</td>
<td>Condition of the Jugular Vein</td>
<td>Acute or Chronic Otitis</td>
<td>Operative procedure on Sinus</td>
<td>Operative procedure on Jugular</td>
<td>Result</td>
<td>Remarks</td>
</tr>
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<tr>
<td>26</td>
<td>30</td>
<td>Simple mastoid</td>
<td>Thrombosed</td>
<td>Fluid blood</td>
<td>Acute</td>
<td>Thrombus removed after ligation of jugular</td>
<td>Ligated</td>
<td>Died</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>1</td>
<td>Simple mastoid</td>
<td>Thrombosed</td>
<td>Not exposed</td>
<td>Acute</td>
<td>Thrombus removed and bled from both ends.</td>
<td>Not treated</td>
<td>Recovered</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>33</td>
<td>Simple mastoid</td>
<td>Thrombosed</td>
<td>Not exposed</td>
<td>Acute</td>
<td>Thrombus removed and free bleeding from both ends.</td>
<td>Not treated</td>
<td>Recovered</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>33</td>
<td>Simple mastoid</td>
<td>Thrombosed</td>
<td>Fluid blood</td>
<td>Acute</td>
<td>Thrombus removed after ligation of the jugular</td>
<td>Ligated</td>
<td>Recovered</td>
<td></td>
</tr>
<tr>
<td>30</td>
<td>15</td>
<td>Radical mastoid</td>
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<td>Fluid blood</td>
<td>Chronic</td>
<td>Thrombus removed after ligation of the jugular</td>
<td>Ligated</td>
<td>Recovered</td>
<td></td>
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<tr>
<td>31</td>
<td>2</td>
<td>Radical mastoid</td>
<td>Abscess of sinus ruptured externally</td>
<td>Not exposed</td>
<td>Chronic</td>
<td>Thrombus removed after ligation of the jugular</td>
<td>Ligated</td>
<td>Recovered</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>8</td>
<td>Radical mastoid</td>
<td>Abscess in torticul end of sinus</td>
<td>Not exposed</td>
<td>Chronic</td>
<td>Abscess drain</td>
<td>Not treated</td>
<td>Recovered</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td></td>
<td>Simple mastoid</td>
<td>Thrombosed</td>
<td>Collapsed</td>
<td>Acute</td>
<td>Thrombus removed after mastoid</td>
<td>Resected after sinus</td>
<td>Recovered</td>
<td>Sinus was not exposed at time of mastoid</td>
</tr>
<tr>
<td>34</td>
<td>10</td>
<td>Radical mastoid</td>
<td>Thrombosed</td>
<td>Fluid blood</td>
<td>Chronic</td>
<td>Thrombus removed bled from torticul end.</td>
<td>Resected after sinus opened.</td>
<td>Recovered</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td></td>
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<td>Thrombosed</td>
<td>Thrombosed</td>
<td>Acute</td>
<td>Thrombus removed</td>
<td>Resected and then sinus treated.</td>
<td>Died</td>
<td></td>
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<td>36</td>
<td>10</td>
<td>Simple mastoid</td>
<td>Not exposed until 13 days later</td>
<td>Not exposed</td>
<td>Acute</td>
<td>Thrombus removed after mastoid bled from both ends.</td>
<td>Not treated</td>
<td>Recovered</td>
<td>Infection due to Hieleloff.</td>
</tr>
<tr>
<td>37</td>
<td>13</td>
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<td>Exposed 4 days after operation</td>
<td>4 days later was collapsed</td>
<td>Acute</td>
<td>4 days later a clot removed.</td>
<td>Resected secondary to treatment of sinus.</td>
<td>Recovered</td>
<td>Developed retrotastic abscess in knee.</td>
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<tr>
<td></td>
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<td>Thrombosed</td>
<td>Thrombosed</td>
<td>Chronic</td>
<td>Sinus opened and bled from torcular end.</td>
<td>Resected to clavicle.</td>
<td>Died</td>
<td>43 days after operation</td>
</tr>
<tr>
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<tr>
<td>39</td>
<td>33</td>
<td>Single mastoid</td>
<td>Exposed and thrombosed 6 days later</td>
<td>Thrombosed</td>
<td>Acute</td>
<td>Sinus opened</td>
<td>Resected to clavicle.</td>
<td>Recovered</td>
<td></td>
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<td>Chronic</td>
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<td></td>
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<td>Not exposed</td>
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<td>Not treated</td>
<td>Recovered</td>
<td></td>
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<tr>
<td>42</td>
<td>16</td>
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<td>Collapsed</td>
<td>Acute</td>
<td>Sinus opened</td>
<td>Ligated before jugular opened.</td>
<td>Recovered</td>
<td></td>
</tr>
<tr>
<td>43</td>
<td>14</td>
<td>Single mastoid</td>
<td>Exposed and thrombosed 6 days later</td>
<td>Fluid blood</td>
<td>Acute</td>
<td>Thrombus removed, bled from torcular end.</td>
<td>Ligated before opening sinus.</td>
<td>Recovered</td>
<td></td>
</tr>
<tr>
<td>44</td>
<td>25</td>
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<td>Thrombosed</td>
<td>Fluid blood</td>
<td>Chronic</td>
<td>Thrombus removed, bled from torcular end.</td>
<td>Ligated before opening sinus.</td>
<td>Recovered</td>
<td></td>
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<tr>
<td>45</td>
<td></td>
<td>Single mastoid</td>
<td>Thrombosed</td>
<td>Fluid blood</td>
<td>Acute</td>
<td>Thrombus removed, bled from torcular end.</td>
<td>Jugular resected.</td>
<td>Recovered</td>
<td>Infection developed from measles.</td>
</tr>
<tr>
<td>46</td>
<td>8</td>
<td>Radical mastoid</td>
<td>Abscess</td>
<td>Fluid blood</td>
<td>Chronic</td>
<td>Thrombus removed, bled from torcular end.</td>
<td>Jugular resected.</td>
<td>Recovered</td>
<td></td>
</tr>
<tr>
<td>47</td>
<td></td>
<td>Radical mastoid</td>
<td>Exposed and thrombosed 9 days later</td>
<td>Fluid blood</td>
<td>Chronic</td>
<td>Thrombus removed, bled from torcular end.</td>
<td>Jugular tied.</td>
<td>Recovered</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>16</td>
<td>Radical mastoid</td>
<td>Periosteous abscess thrombosed.</td>
<td>Collapsed</td>
<td>Chronic</td>
<td>Thrombus removed, bled from torcular end.</td>
<td>Jugular tied</td>
<td>Recovered</td>
<td></td>
</tr>
<tr>
<td>49</td>
<td></td>
<td>Radical mastoid</td>
<td>Thrombosed</td>
<td>Not exposed</td>
<td>Chronic</td>
<td>Thrombus removed, bled from torcular end.</td>
<td>Not treated</td>
<td>Recovered</td>
<td></td>
</tr>
<tr>
<td>50</td>
<td>15</td>
<td>Single mastoid</td>
<td>Thrombosed</td>
<td>Not exposed</td>
<td>Acute</td>
<td>Thrombus removed, bled from torcular end.</td>
<td>Not treated</td>
<td>Recovered</td>
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mortality following sinus operations is as great where there is routine ligation of the jugular as it is where the ligation is reserved for the severe cases.

2. Sinus should always be exposed before ligation of jugular.

3. Ligation and resection of the jugular vein in thrombosis of the lateral sinus is a valuable procedure, but should be used only in those cases where there is undoubted evidence of septicaemia or a thrombosis of the vein itself.

4. In cases of mastoiditis where the temperature is high the sinus should be exposed.

5. In thrombosis of the lateral sinus, with absence of positive signs of septicaemia or thrombosis of the jugular, the thrombus should be removed, and await developments before ligating or resecting the jugular.

6. Thrombosis of the lateral sinus complicating mastoiditis is of comparatively frequent occurrence and every otologist should be able to treat it scientifically.

7. Thrombosis of the sinus is nature’s way of ligating, and all that is necessary in the majority of such cases is to open the sinus and remove the thrombus.

8. I am fully aware of the fact that the consensus of opinion among otologists is that in thrombosis of the lateral sinus the proper treatment is ligation of the jugular vein. But my own experience and a study of reported cases leads me to believe that this is radical and unnecessary except in selected cases.

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BONE CONDUCTION OF SOUND IN CETACEA AND ITS RELATION TO INCREASED BONE CONDUCTION IN HUMAN BEINGS.*

By JOHN D. KERNAN, Jr., M. D., New York City.

One of the most important symptoms of chronic middle ear catarrh is the relative and absolute increase of bone conduction found in that condition. Many of the tests on which the differential diagnosis depends, such as Weber's, Schwabach's, etc., are based upon it; yet nowhere is there agreement among otologists as to its cause. There appears moreover to have been done little experimental work with a view of explaining it.

Several theories are advanced concerning the phenomenon. First is that of Bezold, that in consequence of the changes within the middle ear, although the mobility of the conducting chain of ossicles may be interfered with, yet the tensioning of the fibres of the ligamentum annulare renders possible an easier conduction of sound waves coming through the bone to the foot plate of the stapes. A second explanation is that the sound waves coming through the bone are transmitted directly to the structures within the cochlea. Still another is that under conditions of closure of the external auditory meatus, the air within the tympanum receives the sound vibrations from the bony walls of the cavity and transmits them increased in force to the foot plate of the stapes, the closed cavity acting as a resonance box.

In making some studies on cetacea, it occurred to the writer that in the anatomical structure of the ears of these animals we might find an explanation of the increased bone conduction of sound at least under some circumstances. Lest any question of the fact of whales having hearing on account of our having no experimental proof, I shall here call attention to two evidences of it.

Whalers and others having to do with these animals all testify as to their ability to hear water borne sounds. In hunting the animals no precaution need be taken as to air borne sounds such as conversation. Sounds which would be carried through the

*Candidate's Thesis Recommended for Publication by the Council.
water, however, such as splashing of ears, or blows against the sides of the boat must in every way be avoided.

The second evidence of acuity of hearing in cetaceans lies in the structure of the ear itself. The cochlea, the organ of sound perception, is largely developed, presenting two and a half turns. If we contrast this condition with the complete disappearance of the olfactory organs and nerve in some cetaceans, the odontocetes, and their great reduction in others, the mystacocetes, we may fairly argue that as the lack of use of the sense has brought about disappearance of the organ in the one case, its continued use has caused its retention in the other.

Considering then the ability of cetaceans to hear as established, we may go on to consider the anatomical structure of the ear. The material on which this study is based consists of a fetus of Kogia breviceps at term and several specimens of Tursio tursiops for the odontocetes, and a fetus of Balaenoptera borealis, 108 cm. long, for the mystacocetes. I have also had at my disposal a considerable number of odontocete skulls.

The arrangement of the tympanic and periotic bones in cetaceans is so peculiar and unique among mammals that a few words must be devoted to them.

In odontocetes the periotic, corresponding to the petromastoid of human anatomy, consists of a centrally placed ball-like mass of bone, from which project, cranial and caudal, two solid masses. The first of these corresponds to the human tegmen tympani. The second has been named by Denker, the "processus tympanicus". The central mass itself contains a minute canalicular portion and a very well developed cochlea containing two and one-half turns. The usual foramina on tympanic and cranial surfaces can be made out.

The os tympanicum has the form of a semi-cylindrical sea shell, with a thin, irregular lateral border and a massive rolled over mesal border. The portion corresponding to the human tympanic ring is merely a small notch in the lateral border. To the cranial margin of this notch the long process of the malleus is firmly fused. Between the two bones is enclosed a comparatively small tympanic cavity, ventrad of which is a large space enclosed in the bulla. From the caudal region of the tympanicum projects a massive "processus perioticus" (Denker, op. cit.) which articulates with a corresponding process of the periotic, and in some forms synostoses with it. In adult animals this process
further develops into an enlargement known as the tympano-mastoid, which appears largely on the surface of the skull in a notch between the squamosal and exoccipital. The presence of this large mass, an outgrowth of one of the bones related to the organ of hearing, should be noted, as it had in all probability much to do with the ability of the animal to hear.

The two bones, tympanic and periotic, are united in one other place by bony union, a small area farther rostrad on the outer border of the bulla. Elsewhere they are separated by fissures of varying width. Together they lie entirely outside the skull in a space bounded by the basi-occipital, the exoccipital and the squamosal, and they are buried in a mass of cavernous tissue enclosing blood and air spaces.

In the mystacocetes the arrangement of the bones is much the same as described for the odontocetes. The tympanic forms a semi-cylindrical bulla, having a similar over-rolled internal and irregular external edge, in a deep groove of which is set the membrana tympani. To one marked difference attention should be called. That the process of the tympanic referred to as the tympano-mastoid is absent in the mystacocetes. Its place is taken by a true large* mastoid process, a portion of the periotic, which appears on the surface of the skull between exoccipital and squamosal bones just as in other mammals. Tympanic and periotic have two areas of bony union, slight in extent. The two together are only loosely joined to the other bones of the skull, and in dried preparations can be picked out without much difficulty. In the mystacocetes also the malleus forms a firm bony union with the tympanic.

To certain features which the two orders of cetacea have in common I should now like to call attention. Both expose on the surface of the skull a large bony process which is capable of receiving sound vibrations impinging on it through the water. In both we find fusion of the malleus to the external border of the tympanic bone. In both, the tympanic and periotic bones have a double bony union, their margins elsewhere allowing communication of the tympanic cavity and surrounding parts. Finally, in both, the conjoined bones of hearing are free from the other bones of the skull.

*According to Van Kampen, it is the os tympanicum which forms the main mass of the mastoid process in mystacocetes as in odontocetes. In this young specimen the true mastoid alone is present.
The following description of the auditory apparatus in Kogia is taken from a work on that subject previously published by the author:

The external auditory orifice is a minute orifice situated caudal and ventral of the eye. There is no trace of an auricle, nor in the specimen examined were any distinct muscles related to the margins of the orifice found (Hanke²). The meatus passes mesad and rostrad in a groove of the glenoid process of the squamosal, to terminate at its attachment to the os tympanum. The walls of this canal are firm, fibrous structure, of moderate thickness and without cartilage as far as could be ascertained. The month of the canal and at first its lumen are so minute as to forbid probing. Approaching the tympanum, the lumen expands in a trumpet-shaped manner, though still of insignificant size.

The tympanic membrane is an exceedingly thin sheet, faces dorso-mesad and is attached to the caudal and ventral borders of the notch it occupies. Rostrad, it passes beyond the border to find attachment in a groove on the ental surface of the sigmoid process in the manner described by Denker for Phocaena. Dorsoad it is attached to the fibrous band which bridges over the space between the anterior and posterior conical processes. As far as could be ascertained, the surface of the membrane is slightly concave ectad, as in other odontocetes and in young baleen whales. Its inner surface is connected to the malleus by a triangular fold of mucus membrane.

The tympanic cavity, lying between the periatic (dorsad) and the broad rolled-over mesal border of the os tympanicum (ventrad) is a comparatively limited space, owing its dorso-ventral extension chiefly to the hollowing of the tympanic surface of the periatic. It has, however, communications with extensive air spaces lying beyond the borders of the limiting bones.

The cavity, in its natural state, is occupied by a mass of thick tissue which lines its walls and nearly fills it, in this manner concealing the ossicles. Wherever the os tympanicum and periatic fail to meet it fills in the space between them, and is continuous with the mass of cavernous tissue in which the whole complex lies buried. So it, too, is undoubtedly of cavernous nature. It fills in the hollow of the bulla and extends into the excavation beneath the inverted mesal border of that structure, also into the excavation of the tympano-mastoid. This cavernous tissue
is probably of importance in regulating the pressure within the middle ear when the animal is submerged.

On the removal of the cavernous tissue the structures of the middle ear come into view. The inner wall (or dorsal wall as it is here) presents, caudad, a short rostro-caudal groove bordered by prominent ridges, the channel for the seventh nerve. Mesad of the groove is a ridge which is overlain by the stapedius muscle, and, just at its termination, the stapes is firmly secured, but not ankylosed, in the fenestra ovalis. Rostrad of this is a large depression occupying half the width of the tympanic surface of the bone. When the various parts are in their natural position this depression is occupied by the head of the malleus. Jutting underneath the orifice of the ductus Fallopian is a prominent spicule, against which rests the short process of the incus. No tensor tympani muscle was discovered, though a groove for one has been noted (Schulte\textsuperscript{3}) in the position in which we should expect to find that muscle. It is of interest to state here that in another odontocete (Tursiops) a distinct tensor tympani muscle has been found by the author—a fact not hitherto noted and by some specifically denied (Denker). It is here much less defined than in baleen whales.

The ossicles, in their general form, do not differ from the usual mammalian type. The malleus has a proportionally large head, which lies in the depression in the periostie already described. The manubrium mallei is fused to the os tympanicum along the border of a narrow cleft in its lateral margin. The usual saddle-shaped articulation unites malleus and incus. The latter bone is distinguished by the fact that the processes are of equal length, although the processus longus is the thicker. The processus brevis, at its tip, meets a small tubercle which juts out from the crista facialis dorsad to the fenestra ovalis. The stapes is not fenestrated and sits firmly in the oval window. The non-fenestrated condition is doubtless secondary, as Denker describes small depressions in the stapes of Phocaena, which indicate the existence of a fenestra, and the author has observed the same in other odontocetes, namely, Ziphius and Tursiops.

The tympanic opening of the facial nerve lies just above the oval window. At this point the nerve turns sharply dorsad and takes a straight course through the periostie. Thus the geniculate ganglion must lie within the tympanic cavity. This is due to the non-development of that portion of the tegmen tympani, which in other mammals (as for instance, man) covers
in the facial canal for the latter part of its course in the tympanum. A minute canal for the great superficial petrosal nerve passes rostrad between tegmen tympani and periotic, as it has been found in Tursiops and Balaenoptera. Since the periotic lies entirely without the cranial cavity, the great superficial petrosal nerve nowhere enters the skull.

There are two points of contact and fusion between the os tympanicum and periotic; the anterior is, in this animal, already a bony union; the posterior consists of an exceedingly firm fibrous union of the tympanic process of the periotic to the dorsal surface of the tympanomastoid. Except for these points, the bones are not in contact and the intervals are filled in by cavernous tissue.

At three places this tissue wall is broken and here the air space of the tympanum communicates with the system of air spaces without. These have been described by Denker for Phocaena as lying in three groups: laterad, caudad, and rostrad. A like arrangement is found in Kogia. The lateral group opens out through the space between membrana tympani and periotic. It here consists of a few small cells. The posterior group communicates with the tympanum by an opening laterad to the facial canal and lies in the space bounded by the tympanomastoid and the basi-occipital process of the occiput. These cells also are of insignificant size. The anterior group, opening through the gutter of the os tympanicum, contains only one cell, but this is of remarkable dimensions. It is an oval space, 3 cm. by 5 cm., which occupies the whole pterygoid fossa. Its mesal wall, as are the walls of all these air sinuses, is made up of a thick pad of cavernous tissue. Its thin outer wall is overlain by the internal pterygoid muscle. Ventrally in the angle of junction of the mesal and lateral walls, a minute opening allows a probe to pass through the pterygoid notch into the nasopharynx. Thus this large space is evidently an expansion of the Eustachian tube. It communicates with the nasopharynx and the intimate relation to its lateral wall of the pterygoid muscle evidently permits of its distension by air and the expulsion of the same.

In baleen whales, as represented by the Balaenoptera borealis examined by the author, the external orifice of the auditory canal is a minute slit caudad and dorsad of the eye. The meatus is very small as in the odontocetes, and at its inner end expands like a trumpet. The drum membrane is a thin oval membrane, slightly concave toward the inner surface, attached by its mar-
gin to the tympanic ring. It has relation to the mambrium mallei only through the triangular ligament, a fold of mucous membrane similar to that found in odontocetes.

It must be remembered that the above description applies only to an immature animal. In the adult, Bearegard has found that the drum membrane bulges outward into the external auditory meatus like the finger of a glove, and in large part loses its resemblance to the ordinary mammalian drum membrane. In adult Balaenoptera also, the inner end of the auditory canal was found by Lillie to be occupied by a ceruminous plug.

The cavum tympani is a bowl-shaped cavity having dorsal and ventral walls which meet in a sharp angle at their margins. The ventral wall contains in the lateral area the membrana tympani surrounded by the crescentic os tympanicum. The rest of the ventral wall is made up of the fibrous bulla which fills in the space between os tympanicum and the marginal attachment of the bulla.

The dorsal wall of the tympanic cavity is made up of the otic capsule centrally placed, and circumferentially of a ring of fibrous tissue which connects the petrosum to the surrounding bones. As it presents itself after removal of the os tympanicum and bulla, it is seen to be covered by a layer of thick tissue which completely conceals the underlying cartilages and almost fills the cavity. In the outer area of the cavity this structure throws folds about the ossicles and only on its removal can they be examined. The formation of this tissue shows it to be of a cavernous nature (Bearegard).

The tuba auditiva passes from the choana laterad between hamular and vaginal processes of the internal pterygoid and penetrates the wall of the bulla obliquely. Its entrance into the tympanic cavity is at the rostral circumference of the same in the angle formed by the meeting of ventral and dorsal walls. The opening is a crescentic slit capable of valve-like closure. The tube is very short, merely an oblique passage through the fibrous wall of the bulla. The expansion of its distal end into the scaphoid fossa is not yet indicated.

The ossicles are typically mammalian in their arrangement. Meckel's cartilage passes beneath the edge of the tympanic bulla, caudad and slightly dorso-laterad, closely roofed over by the tegmen tympani. Mesad to its shaft is the belly and tendon of the tensor tympani muscle. Within the tympanic cavity, the cartilage expands into a fairly large caput mallei, and forms
a mesad projection, the manubrium, to the base of which is attached the tensor tympani. A groove in its surface completely encircles the caput, close to the edge of the articulation with the incus. The border itself expands, thus increasing the depth of the groove.

The incus has a triradiate form. On the well-developed body is a saddle-shaped articular surface for the malleus. The processus brevis is stout and of large size. Its extremity is in contact with the crista parotica, to which it is firmly attached by a ligament. The processus longus, which actually is shorter than the brevis, is also bulky in form. It is directed ventrad to articulate through an os articulare with the apex of the arch of the stapes.

The stapes, which is lodged in a deep fossula, does not fill with its foot plate the large fenestra, but is united to its circumference by a rather wide annular ligament. The bone closely agrees with the adult form; its arch is high and narrow, the limbs thick, the foramen small.

Comparing these two forms of cetacea we see that in regard to the absence of the external ear and the small size of the external auditory canal, they agree. The odontocetes lack, to be sure, the plug of cerumen found in the canal of the mystacocetes, but even in their case it cannot be imagined that any sound can reach the drum membrane through that passage-way. In both alike the drum membrane is disassociated from the ossicles except for the prolonged "triangular ligament." Denker has satisfactorily demonstrated that no movement can be transmitted from drum membrane to ossicles, and also that movement of the ossicles independent of the os tympanicum is impossible.

The arrangement in the tympanum also shows properties in common. A typical mammalian chain of ossicles is found buried in a mass of cavernous tissue. The air space communicates with a series of surrounding air spaces through the intervals between os tympanicum and os petrosum. Of these air spaces, one, the cranial, is formed by a huge expansion of the Eustachian tube. All are capable of inflation from the pharynx. The comparatively loose attachment of the bones of hearing to the rest of the skull is a condition found in all whales. Finally attention is called to the presence on the surface of the skull of a large bony process coming off from the os tympanicum in the case of odontocetes, from the os petrosum in the mystacocetes.
What conclusions then can we draw from the anatomical structure as to hearing in cetaceans? We have presented to us an auditory apparatus, typically mammalian, designed to receive air-borne sounds modified to one designed to receive water-borne sounds. The external meatus has been practically closed, the drum membrane fixed and the ossicles rendered immovable through fusion of the malleus to the os tympanicum. Sounds are evidently transmitted to the cochlea through the solid tissues of the head. The possibility of this is increased because in both forms the auditory bones themselves present on the surface of the skull a considerable bony process. In both, however, the periotic and tympanic are but loosely connected to the other bones of the skull. Thus they can receive only such sound waves as impinge directly on themselves. Since the malleus is firmly fused to the tympanic it would share the vibrations of that bone, transmitting them through the other ossicles to the oval window. This is probably the explanation of hearing in cetacea, that sound waves impinging either on the tympano-mastoid in odontocetes, or the true mastoid in mystaeocetes, are transmitted through the chain of ossicles to the cochlea, the endolymph being put into motion through the foot plate of the stapes, as in other mammals.

Some authorities maintain that the sound waves reach the receptive organs in the cochlea directly through the walls of the periotic bone. In this connection it is important to recall that whereas such vibrations might provide for a vague perception of sound, they would hardly provide for the interpretation of sound which we are probably justified in thinking depends on an orderly succession of waves in the endolymph from fenestra ovalis to fenestra rotunda. This could be provided for only by vibrations coming through the foot plate of the stapes.

It will now be further recalled that the tympanic and periotic are surrounded by numerous cells capable of distension with air. This air is undoubtedly set into motion by the vibrations of the bones of hearing, and we may suppose that these air cavities form a kind of sounding box which increase the sound waves. The air cells then are an important aid in hearing.

We may now consider the light which the mode of hearing in cetacea throws on the clinical symptom of increased bone conduction in deafness due to disease of the middle ear. It will be seen at once that any change which would connect the ossicles more firmly to the tympanic ring, approaching the com-
plete fusion found in whales would increase bone conduction. A tense, thickened, rigid drum membrane would do this. We could also accept Bezold's idea that it is a thick, tense ligamentum annulare, transmitting vibrations to the foot plate of the stapes, which in some cases explains the phenomenon under discussion. This would be the condition following a radical mastoid operation. Another theory may now be mentioned. When the external canal is lightly blocked, bone conduction is increased. This is explained by conceiving the air-filled cavity with bony walls to be a sounding box. This is just what we have present in cetacea. In this connection it may be said that the variation in the size and number of the cells present in the human mastoid process may very well be an explanation of the variation in the response to tests of bone conduction found in seemingly similar cases of deafness.

We will see then that in cetacea we have all the elements normally present which have been advanced to explain the symptom of increased bone conduction in the diseased ear of human beings, and the anatomical arrangements there found would certainly support the explanations of the phenomenon advanced.

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PARAFFIN NASAL SPLINTS.

By W. W. CARTER, M. D., New York City.

These splints are cut out of gauze that has been repeatedly dipped in melted paraffin; they are about 1/16 of an inch in thickness and can be made any shape and size desired.

Paraffin is chemically inactive when brought in contact with the tissues and is unaltered by the secretions of the nose. These splints, therefore, make an ideal intranasal dressing which does not adhere to the wounded surfaces. It prevents adhesions and remains sweet and clean. More than one may be inserted if desired. In the submucous operation my plan is to insert one on either side of the septum and pack the nasal cavities with vaseline gauze, holding the paraffin splints in close contact with the septum this dressing is left undisturbed for the first twenty-four hours.

I have thoroughly tested these splints in the intranasal operations where I felt that a dressing was necessary, notably the submucous operation, and I feel that the advantages to be derived from their use are sufficiently important to warrant this presentation.
HOT WATER SPLINT FOR THE NOSE.

By William W. Carter, M. D., New York City.

In my opinion the application of heat for the purpose of preventing or reducing inflammation following operative and accidental injuries to the nose and other parts of the body have not been sufficiently emphasized. As is well known there is no expedient comparable to the application of continuous well regulated heat for the purpose of restoring to their normal state the capillaries after an injury. This device I have found very efficient after severe contusions of this organ. In my opinion it may be used advantageously in the early stages of rhinitis and other acute affections of the nasal passages.

It consists of a copper water jacket made to fit the nose. The intake tube is connected with a douch bag containing water at a temperature of about 110 degrees and held about one foot above the patient's head, while the outlet is connected with a tube which conducts the flow into a receptacle placed on the floor beside the bed. One or two layers of moist gauze are placed between the splint and the patient's nose. The application may be continued for several hours at a time if necessary. I have suggested that this splint be made of rubber and arrangements have been made with E. B. Meyrowitz for its manufacture.
NEW INSTRUMENTS FOR USE IN LARYNGEAL SURGERY.

By HENRY LOWNDES LYNCH, M.D., New York City.

Fig. 1. Laryngeal bougie for endoscopic bouginage in cicatricial web stenosis of the larynx. Made in sizes from 10 to 30 m.m.

Fig. 2. Retrograde laryngeal bougies for dilatation of tracheal strictures as well as the larynx from below. Made in sizes from 12 to 30 m.m. For use only after the larynx has been dilated thoroughly by endoscopic laryngeal bouginage.

Fig. 3. Laryngeal dilating and drainage tube. The soft rubber tube is adjusted over a small silver tube which holds it firmly in place. The introductory jointed post is attached to the small silver inner tube. The post is brought out of the tracheal fistula and anchored to the neck to prevent the laryngeal tube from becoming dislodged.
Fig. 4. Split cannula with obturator introduced from below, and used for passage of laryngeal tube. The obturator is removed as soon as the laryngeal cannula is in position, and then the rubber dilating drainage tube is introduced. The cannula is slotted for the passage of the introductory jointed post.

Fig. 5. Tracheotomy tube with slanting end. The slanting end is introduced into the tracheal fistula in the same manner as the introduction of a slanting end bronchoscope into the larynx. As these tubes are of extra length, a slide has been added which makes it easy to obtain the correct length best tolerated by the patient. In the neck piece the loop holders for the bars of the outer tube are made very large. This allows free movement of the cannula, and it can easily accommodate itself to the various degrees of angle of the trachea.
THE RECONSTRUCTION OF THE MASTOID WOUND CAVITY BY THE USE OF BONE GRAFTS AND CHIPS: WITH REPORT OF CASES; AND DISCUSSION OF THE PATHOLOGY OF REPAIR IN INFECTION; RECURRENCE OF INFECTION; AND SECONDARY INFECTION OCCURRING DURING THE HEALING OF MASTOID WOUNDS BY GRANULATION; WITH SUGGESTIONS IN OPERATIVE TECHNIQUE.

By Wells P. Eagleton, M. D., Newark, N. J.

CASE REPORTS.

Case 1*. Transplantation of bone graft and bone chips into operative cavity during primary mastoid operation.

On September 30, 1918, following a simple mastoid operation, the sinus not being uncovered or the dura exposed, a bone transplant, about one inch in length with its periosteum, was taken from the patient's tibia, and placed in the operative wound cavity. Not filling it, a number of small bone chips, with and without periosteum were placed in the cavity, making it level with the cortex. The periosteum and soft parts were then tightly sutured in layers.

At the first dressing there was a profuse discharge from the ear. A few days later a small swelling appeared above the ear; the removal of the upper stitch was followed by a small quantity of pus—which continued for three days. Later a probe liberated a few drops of pus from the lower angle of the wound, which continued to discharge for some time. The ear discharged for three weeks. From the beginning the wound was covered by a light dressing.

At the end of six weeks the mastoid area appeared normal, being perfectly flat, with an almost imperceptible scar. The patient's hearing was normal.

The comment of the nurse, who had been present at the dressings of all mastoid wounds for over a year, was, "That is the best mastoid that we have had; there have been no painful dressings."

Case 2. Transplantation of bone grafts and bone chips into mastoid cavity at secondary operation, following sterilization of mastoid wound cavity by Carrel Dakin method.

Oct. 10, 1918, admitted to hospital. History: Sore throat, headache and fever, followed by earache and discharge on the following day. The discharge had continued for several days without pain.


Oct. 23, 1918: Bulging of posterior wall. Conversational voices heard at five inches.

*Reported at Meeting of the New York Otological Society, Nov. 10, 1918.
Nov. 4. **Primary Operation**—Simple mastoid operation; at completion a small pin point area of granulation seen at bottom of mastoid, which led into a cavity, filled with pus, situated in the cancellous tissue within the bony capsule of the posterior surface of the petrous pyramid. In exposure of this infected area the jugular bulb below, the bony posterior semicircular canal in front, and the dura over the cerebellum behind, were exposed, leaving an unusually deep, mastoid cavity. Wound left widely open. Nov. 18, wound one and five-eighths inches deep. Carrel Dakin method of wound sterilization instituted. Dec. 4, bacterial count showed surgically sterile wound cavity.

Second Operation—Skin and granulations excised, the latter as far into the bone cavity as possible. One large bone graft and many bone chips placed into cavity—enough to fill it. Tight suturing in layers—periosteum, fascia and skin. Wound covered with light dressing.

Uninterrupted recovery. Upon discharge from hospital: flat mastoid area; almost imperceptible scar; normal hearing.

**Comment on Cases**—Following the usual mastoid operation, the constant packing of the wound is most disagreeable to the patient, as well as a danger of secondary infection.

The two reported cases demonstrate that, with a proper technic, the infection in the mastoid area can, in certain cases, be sufficiently eradicated to allow of the introduction of bone graft and chips filling the cavity with tight closure of the soft parts, thus reconstructing the mastoid area and eliminating subsequent painful dressings with the associated danger of secondary infection.

**Pathology of Repair in Infection of the Mastoid Cells.**

The mastoid infection which accompanies chronic suppurative otitis, when not eradicated by surgical intervention, is controlled by nature by the formation of granulation tissue within the mastoid cells and cavities; the granulations later undergo an osseous change, resulting in osteosclerosis, or an "ebonized-mastoid." The process never involves the mastoid antrum, however; an antrum always persists no matter how long the infection continues.

An operative-made mastoid cavity heals by granulation and ultimately becomes partially filled with bone again; but the bony replacement is always of the osteosclerotic type, especially prone to reinfection.

As in non-operative cases the ebonizing process never involves the antrum. Even if the antrum is destroyed during the operation, nature makes an effort to reconstruct an antrum by projecting backwards a cavity lined with mucous membrane; thus imitating the production of the antrum pouch or invagination from the middle ear in early fetal life.*

*Blake & Reik Surgical Pathology and Treatment of Disease of the Ear, 1906, P. 34.
Recurrence of Infection: Recurrence of the infection is a frequent sequellae of mastoid wounds, because of the liability of the granulation tissue to reinfection, (a "recrudescence of a local infection,) or a reinfection from the Eustachian tube and middle ear. How often, on reopening a mastoid wound do we find an enlarged antrum, filled with granulation tissue as yet unorganized?

Secondary Infection: Systematic bacteriological examination of healing mastoid wounds demonstrate that secondary infection of the granulation tissue of mastoid wounds is frequent during the dressings. The streptococcus is most frequently grafted on a granulating wound; and once grafted, it is very difficult to eradicate.

While the mastoid wound is still open a small but definite proportion of cases develop sinus thrombosis, brain abscess and meningitis; and while the usual explanation, that the serous complication "had no relation to the operation, and probably was present prior to the operation," may be correct, nevertheless there existed no clinical manifestations of the graver complications for some time after the operation, but appeared during the after treatment of the mastoid wound. In my opinion, a proportion of these complications is due to secondary infection during the repeated dressings of the mastoid cavity. Anything then, which will permit a complete closure of the skin, is a great gain, as it removes the liability of secondary infection.

Primary closure over a blood clot accomplished this. When first advocated blood was believed to have a distinct phagocytic action, which to a limited extent, and probably largely dependant on the kind of tissue into which it is infiltrated, it undoubtedly has. Blood clot once infected, is a most favorable media for the growth of bacteria, and as the middle ear remains infected, the infection of the blood clot was so frequent that, as a method of treatment of mastoid wounds, it has been largely abandoned.

Primary and Secondary Closure: During the war it was demonstrated that an infected wound can be converted into an aseptic wound, and then treated as a clean wound, closed and primary union obtained if: (a) the infection can be eradicated by excision of the infected tissues, or their sterilization; and (b) if all dead spaces into which blood may accumulate, be obliterated.

Surgically then, to follow nature’s method of repair to recon-
Reconstruction of the mastoid wound, and to allow of complete closure of the mastoid wound, there must be:

1. Eradication of the infection by a complete operation with a perfect aseptic technique at the time of operation.

2. The filling in of the cavity of the mastoid; so that no extensive vacant spaces will remain for the accumulation of blood in which the remaining bacteria and those from the neighboring middle ear may propagate.

3. The erecting of a barrier posterior to the iter tympani et antri; in order that while a cavity is left into which the mucous membrane of the middle ear can proliferate, this cavity must be a small one,—an antrum,—thus imitating nature's process of repair.

A bone graft, with enough bone transplants to fill the cavity, introduced either at the time of the original operation, or at a secondary operation after the wound has become bacterially free from tissue sterilization, fulfills the latter two requirements.

Bone transplants (1) can live in a limited infection, (2) the transplants act as a scaffolding on which bone grows; (3) the transplant is not a foreign body, although the transplant is absorbed, some bone cells remain alive for nearly a year; (Berg and Thalheimer). (4) A bone defect 4 c. m. in length, filled with bone chips, with suturing of the soft parts, will reproduce an apparently normal radius; (Bancroft). (5) Bone that has been formalized and so surely dead, and then placed in a skull defect, will reproduce a cranial vault (Weed).

As the result of these two cases, I am persuaded that in properly selected cases, reconstruction of the mastoid cavity either at the primary or a secondary operation, by bone grafts and transplants, with a tight closure is indicated; although the result in the second case was so much more satisfactory I am in doubt if the grafting should not be done at a second operation after the mastoid wound is known to be sterile.

*While absolutely complete eradication of all infection from a mastoid region is impossible, if the operative evisceration is carried well beyond the apparently infected area, the tissue will take care of the slight amount of infection which may remain.

Secondary infection of the mastoid wound during the primary operation is frequent from (a) contamination of the surgeon's and assistant's hands from handling the lobe of the ear, the recesses of which cannot properly be sterilized; and (b) contamination of instruments and sponges by their breaking through the membranous lining of the external auditory canal, which always contains numerous varieties of bacteria.


ADDITIONAL REFERENCES.


DISCUSSION.

Dr. F. L. Jack, Boston, Mass. My own experience in blood clot methods in closure of mastoid wounds is rather discouraging. There seems to be a desire on the part of a good many to improve the technique of the mastoid operation, and work in that direction is certainly to be commended. Research in that direction was started a few years ago, and it was enthusiastically urged by some at that time, but after experimenting with it—as this suggestion came from the institution with which I am connected, I established research on my own account and had a nice lot of cases in which I got very disastrous results, and therefore I was heard in public to speak against it, while it was being advocated, and I think that my position taken at that time has been verified, and I believe that most people now think that it is a very bad procedure, a very bad method. Transplanting bone into the mastoid cavity is a new idea to me. Of course we have used it in adjacent parts. However, I can speak from no experience whatever in that line. We know, of course, a loose piece of bone in the nose will very often stay there and live there, and is never heard from afterward. That the same thing might be possible—and Dr. Eagleton has shown that it is possible in the mastoid cavity—seems reasonable.

One thing I question is why we have to resort to these things? The blood clot method was proposed with the specific idea of shortening the convalescence and making the dressings comparatively easy, as no dressings were necessary, and also perhaps making a little better mastoid cavity, but as I look back upon my cases—I have always gone about it in the ordinary way—it seems to me I have had very few recurrences; the amount of deformity, of course, depending upon the amount of bone removed, but it is nothing remarkable in the way of deformity.

If the bone transplantation will make a better wound, improve the hearing, lessen the chances of recurrence, why of course it is a very welcome change in our methods of operating, and I shall try it, I think, next time I have a case at the hospital, provided I can get the bone.

I would like to ask Dr. Eagleton if there is any objection to using the bone that you chisel from the cortex, to put into the cavity? Perhaps that might be too diseased. Otherwise I don't see how you are going to keep the bone, unless you keep it in stock.

Dr. Thomas H. Halsted, Syracuse, N. Y. I have had no experience, of course, with bone grafting in mastoids, but am very much in sympathy with what Dr. Eagleton says, as a result of having seen some experiments in Paris during the past fall, not on mastoids, but in general surgery. Perhaps some of you know of the work that Dr. St. Cyr of Valde Grace Hospital, in collaboration with Professor Neigeolet, the Professor of Physiology in the University of Paris, is doing in the way of grafting in connective tissues, and perhaps it will be of interest if I tell you of just a few experiments which I saw him do.

I saw him first operate on the sciatic nerve of a soldier who had three or four inches of that nerve destroyed by shrapnel, and scar tissue filled in this space. Dr. St. Cyr cut the nerve out, sewed in three or four inches of nerve graft, taken six weeks before from a calf, and
which had been in alcohol during that period. That was three months before I left Paris, and I watched that patient during that time, more or less. While at the time I left no improvement was apparent, yet there was no deleterious effect. I did see a patient, however, on whom he had done exactly the same operation in the case of the median nerve, where the nerve was now functioning, and where the patient was getting good movement of his finger. In another patient, this man had had eight of his flexor tendons grafted, by using the tendons from a dog, which had been for six weeks in alcohol. When I saw the patient, the day before I left Paris, he was able to close his hand perfectly, showing that the graft had taken and was answering the purpose.

Now there seems to be no question at all about this being successful, and it appears to me that the work which Dr. Eagleton speaks of can very satisfactorily be carried on by us.

Dr. E. B. Dench, New York, N. Y. I have had no experience with this method of Dr. Eagleton’s, excepting in using a bone graft over the Eustachian tube. I have done that on one occasion. The graft took very nicely. It was a case where, in the radical operation, I had a large number of tubal cells very well developed, and it left a very wide tube. Therefore I took a little chipped bone from the mastoid, drove this plug down into the Eustachian tube, closed the tube in that way, and the result was very satisfactory; that is, the graft took and accomplished the purpose for which it was employed.

I think what Dr. Eagleton said is certainly very interesting and I shall try this method, as I have tried all of them.

It seems to me that the great difficulty of these various attempts to shorten the time of healing the mastoid cavity is that they result in a sort of combination method. I agree perfectly with Dr. Jack, that the blood clot method in itself was absolutely wrong, and my results in experimenting with that agree with his, but I believe as the result of the effort to close the mastoid cavity completely and obtain healing by blood clot, most of us decided not to leave our mastoid wounds quite as widely open as we did formerly, and in that way we brought about much more rapid healing, and a healing where we had less scar.

Ever since the meeting in Boston in 1912, I have followed the method which Dr. Christian Holmes brought out, in conjunction with the blood clot method—he called it the blood clot method; I don’t call it that, I simply call it obliteration of the cavity. The point that Dr. Holmes made here was the suture of the periosteum. In all of my acute cases I suture the periosteum below the level of the antrum, putting a small gauze wick into the antrum and bringing it out at the lower angle of the wound, and then I close the wound three-quarters. I find in that way the dressings are less painful, because simply at the end of ten days to two weeks, you can take out your drain completely and the wound closes. So that in ten days, in a favorable case, you will have the patient with the collodion dressing, with the small drain. Sometimes, in spite of your care, the wound still remains septic, and in that case you have to resort to the packing; but even if you do have pus there, the partial obliteration of the cavity for the first forty-eight hours certainly gives you a smaller cavity to pack, and I have found that to give very good results. I know that in the case of one mastoid which I did while I was on duty at Upton, we had the man back in service in three weeks after the operation was performed; a dry ear and a healed wound.

I believe this method of Dr. Eagleton’s, is a great addition to our technique in mastoid surgery.

Dr. W. W. Carter, New York, N. Y. I didn’t have the pleasure of hearing Dr. Eagleton’s paper, but I have had a great deal of experience in transplantation of bone in the nose, and as my oldest cases are of twelve years standing, I know by observation of these by X-ray plates,
about what has happened to the transplant, and I wish to speak in favor
of the use of live bone, periosteum covered at least on one side. I have
used the rib transplant, and I see no reason why this transplant should
not be used in the mastoid wound. It is very important that this
live transplant, periosteum covered on one side, should be brought in
vital contact with the live bone of the skull—and by vital contact I
mean that the bone itself should be wounded by either the chisel or
by cutting into it with the scalpel and placing the transplant in inti-
mate contact with the bone at that point, because we get the osteo-
genesis from the bone and not from the transplant, except to a cer-
tain extent, where the periosteum comes in contact with it; there are
a great many osteoblasts immediately beneath the periosteum and
also in the mouths of the diverting canals, and for these we rely upon
the osteogenesis into the transplant. I am in accord with the view
of McCurren, that the periosteum holds the osteoblasts in their normal
position on the transplants, and from these we may expect the osteo-
genesis. There is a certain amount of absorption in these transplants.
All of these transplants show a thin line of absorption in the center,
and the outside apparently remains and grows just as it did in its
normal position in the body.

I think that the use of transplants in filling in bone cavities is very
useful, and in my first communication on this subject some ten years
ago, I suggested at that time the use of the rib, which has been
found of great value in general surgery.

**Dr. Harold Hays,** New York, N. Y.  I just wanted to sound one note
of warning. Quite some time ago I advised calling the blood clot method
the primary suture of the mastoid wound, and I think the Chairman, as
well as some of the others, know in a great many cases I have been
able to sew them up, similar to the method which Dr. Dench spoke of.
That is in the simple mastoid cases. In one or two cases where I
have had a small exposure of the sinus and have attempted to sew
up the wound, I have met with unfortunate results. It seems to me,
although you might get your mastoid thoroughly cleaned, there are
times when your flap is infected, and in those cases if that flap comes
into contact with your exposed dura or sinus, you are liable to get
into trouble.

I don't think Dr. Eagleton brought out whether he would put a
bone graft in a mastoid cavity where there was an exposure of the
dura or sinus; and it seems to me the same argument would come up
in this case. If you are not going to put some bone graft in in those
cases, it seems to me the average case would heal up in a manner
which Dr. Dench described, and it is useless to go to all that trouble.

**Dr. Robert H. Craig,** Montreal, Canada:  I greatly appreciate the ex-
cellent and progressive work Dr. Eagleton has done, but would like
to ask him if he closes the mastoid wound completely? It seems to me
to fill up an abscess cavity in any part of the skull with a foreign
substance is an unusual procedure and defeats the purpose of the operation.

**Dr. George W. MacKenzie,** Philadelphia, Pa.  I know nothing about
bone grafting in the mastoid, so that I cannot speak authoritatively on
it, but what I have to say probably will help Dr. Eagleton bring out his
points.

He spoke, as far as I can recall, of the mastoid antrum not being
involved in acute suppuration of the mastoid process.

**Dr. Eagleton:**  I said it was always involved.

**Dr. MacKenzie:**  That is so much the better, then, we agree.

When you attempt to close the mastoid wound with a blood clot
or with bone, or what not, you are not draining the parts posteriorly
to the aditus ad antrum, and it is impossible to drain it through the
aditus; we must drain it for a certain length of time posteriorly, or
be dead-sure we have eliminated everything, and you cannot be dead-
sure unless you have curedt out the antrum itself.
I was glad to hear Dr. Hays bring forward his objection in regard to exposure of the sinus or the dura of either fossa. It has been long known that in all of such cases we must be careful in operating even for chronic mastoiditis, to allow for free drainage.

Dr. Eagleton spoke about the use of the bone graft in the presence of more or less infection. That is a very elastic term. It is up to the individual to determine what is permissible and what is not, and caution is very necessary.

Dr. Dench made one very valuable point, and that is the preservation of the periosteum in performing the mastoid operation. By the preservation of the periosteum and by suturing it together by means of catgut sutures before uniting the skin flaps a much quicker and a more perfect result is obtained.

The next question is, does the end in this case justify the means?

Dr. M. D. Lederman, New York City. I had the pleasure of being associated with Major Eagleton in Camp Dix, and one of his cases came under my observation, and I merely wish to state here that there was absolutely no reaction following this bone graft in this case, the patient made a remarkable recovery; and if it hadn't been for the fact that the bone graft had been taken from his leg, he would have been out of bed forty-eight hours after his operation. Of course, this was a secondary operation, and in this man's case, if I recall it correctly, the Dakin solution had been used for a while and his granulation tissue was in remarkably good condition for this transplant. It is a very remarkable fact that after the use of the Dakin solution in these cases, the tissue is firm and in better condition to receive transplants of this kind and the after-condition is more satisfactory.

Dr. Eagleton, Newark, N. J. There seems to be a misunderstanding in talking about drainage. Get away from drainage. The method I propose means eradication of the disease and then primary closure. This war has brought out the fact that if you cut out the infected area, you remove the infection; then sew it together tight. It is a primary wound, it is closed tightly. If you do that, you will never have any sepsis.

At Camp Dix we have had several cases of fracture of the skull. I have been doing skull work for a good many years. Since I have adopted this method which has been promulgated by Harvey Cushing, the results have been wonderful. If a man has a skull wound, make a generous incision, cut away a quarter of an inch from the edge of each flap, remove all the bone that is infected, sew your dura together and close your wound tightly, and in a few days the man is well.

Now when you talk about drainage, you don't want to drain. The idea is to eradicate the disease by thorough operation. We do not need to eradicate every particle of infected area. If we will carry the operation so far that we are apparently in normal healthy condition, it has been demonstrated during the war that nature will take care of some of the infection.

Now about the antrum, I think it is absolutely important that we should make some provision for an antrum, because nature always re-establishes an antrum; and that is why I say if you put the bone up against where the antrum would be, you leave a little space for the growth outward of the mucous membrane that reconstructs a new antrum. In all my secondary mastoids that I have opened, I found an antrum.

Dr. Dench spoke of something that is relative; that is, a bone graft in the middle ear. I don't think you would have success, because you are putting it on a mucous membrane that for some reason or other is not adapted to taking a graft. I think that is why it failed. It is on a tissue that has a tendency to propagate itself, the same as the mucous membrane of the antrum, that grows out.
DISCUSSION.

Personally, I have never been able to close the Eustachian tube, and I have endeavored to do so in a number of cases.

Now as to what is the use of this method, if you can get away from the packing of a wound for some time, it goes a long way towards making the mastoid operation tolerable. The patients all dread the constant putting in of gauze. You get away from another thing also; the secondary infection from your dressings. As I look back over my cases, there are a number that developed sinus thrombosis and meningitis, while everything apparently had been going along all right. We console ourselves by saying that it was there before we operated, but I believe many of these cases develop sinus thrombosis and meningitis because the infection has developed in granulous wounds.

The war has brought out this: that in a suppurating wound, if they keep on dressing it very long—they don’t have very much infection first of all—pretty soon they have an infection of streptococci that has been grafted on the wound. That is why the French and English have been contending as to whether they should sterilize the tissue by Dakin solution or whether they should excise and convert an infected wound into a clean wound that can be probed.

I do not know whether this method is going to be used primarily; that is, ultimately result in the doing of it primarily, or whether it will result in filling in that cavity after the use of the Dakin solution for several days. The case that we secondarily closed did much better than the other. If the man hadn’t had a sore leg, as the result of my taking the bone out of his leg, he would have gotten up the next day. Whether we are going to put in a graft at the primary operation and close then, or whether we are going to wait a few days and then put in a graft, I do not know. But as the result of one or two cases, it has certainly been a distinct gain in the treatment of mastoid wounds.

Dr. Carter said that I advocated the use of dead bone. I did not. I simply said that dead bone grows. I advocate live bone that is taken from the man’s shin at the time of the operation.
ACTIVITIES OF THE MEDICAL RESEARCH LABORATORY.

By Lt. Col. E. G. Seibert, Hazelhurst Field, Mineola, L. I.

In the early days of the war, before the entry of America, the foreign services had not fully appreciated the effects upon flying personnel of the peculiar conditions to which such personnel was subjected.

When man leaves the ground for flight into the air, he is immediately being subjected to conditions different in every aspect from anything previously experienced by him. In no aspect of life does he so change his environment.

From prehistoric ages man has been gathering and retaining impressions that have influenced his action, his mode of life, his physiologic and mental processes. All of these impressions have been obtained through contact with Mother Earth and have been so grounded in his mental activities that all forms of motor control have been correlated therewith.

It is, perhaps, not too much to say that ever since man has been able to preserve and record his thought, evidence shows up at intervals of his desire to fly. He has leaped from precipices and buildings with various supports in imitation of the wings of the bird. The results have been more or less disastrous. Not until the advent of the gasoline engine was the dream of Professor Langley brought to practical application. By this means, however, man has been able to produce a quickly manoeuvrable machine that enables him to penetrate the blue far beyond the soaring of the eagle.

I shall not attempt to analyze the reasons for this constant wish of man to fly, but a search for such reasons would make an interesting field for speculative philosophy.

It shall be more to the point for us to consider the effect upon man by the fulfillment of this long-desired wish. The student of ethnology can point out to you the changes in racial characteristics brought about by changes of environment. Effects which alter racial characteristics must be profound from a physical standpoint. Therefore, any pronounced alteration of physical environment must produce a decided alteration of physical and physiologic processes. Such decided alteration of physical and physiologic processes
coupled with conditions of prolonged stress and strain would seem to be the ideal combination to bring about mental and physical inefficiency, and no other combination of circumstance on God’s green earth could so efficiently produce such a result as the application of aeronautics to the needs of the military service in the present war.

In the suddenness with which war was forced upon the world by the Hun, the evolution of medical care of flying men had not begun. Many pioneers in the flying game had had their day of spectacular performances which ended by their no less spectacular death.

We all retain in our memories the men who gave up their lives that man might securely accomplish the hope of the ages. These pioneers were, however, relatively few in number.

The establishment of aviation corps by the British and French armies brought, necessarily, large numbers of men into the flying game. These men had to be taught the special knowledge necessary to man to fly. The cost has been enormous. The flying game soon came to be looked upon as the most hazardous in military service, and only the sporting man who took his gambler’s chance thought of the air service as the one of his selection.

The experience gained by the British and French services was accomplished at the expense of many wrecked lives and smashed aeroplanes. The onrush of the German hordes in 1914 gave no time for investigation. Every man was called upon to give his last ounce of energy to the service. At the end of the first year of the war, the results of the stress was shown in the appalling individual inefficiency developed in the Royal Flying Corps. Sixty-five percent. of the total strength of the corps was unfit for duty. Because of demands of other services, replacements were difficult to make. A remedy was sought and attention was attracted to medical efforts to conserve the efficiency of flying men. Concentrated effort was made during the following year to bring about changes in the care of these men and apply certain principles believed to be needful because of changed conditions. The end of this year showed the inefficiency of the corps reduced from sixty-five to twenty per cent, and the third year of the war, a further reduction to twelve per cent. To my mind this is a distinct triumph for reasoning logically developed from scientific medical principles.
In the study of these effects of change of environment, attention must be sharply directed to the magnification of insignificant ills.

The soldier on the ground is cared for by a medical personnel whose judgment in connection with these ills is based upon similar effects in relation to our existence on the ground. A headache from over indulgence in food or drink is a matter of small moment, maybe, to the foot soldier. It is easy to understand how such a condition might clear up under such activity as would be entailed in the daily duties of the foot soldier. In the air, however, such an apparent trivial condition may rapidly develop into one of such magnitude as to result in accident and death. This statement is not an assumption. It is proven to be so by the reports of accurate medical studies that became necessary by the havoc in the forces of our Allies in those early days of the great conflict.

It was the results of these studies by the British Air Medical Service, which came to us in the fall of 1917, that led to the formation of the Medical Research Board. In September of that year I was directed by the Chief Surgeon, A. S. S. C., to gather data upon the effects of altitude and confer with Prof. Yandell Henderson of Yale University and Major John B. Watson, S. C., U. S. A., relative to the formation of a group or board to consider the conditions that would have to be studied in order to work out a policy to be adopted for the care of the men forming our flying service. To the above named were added Major Wm. H. Wilmer of Washington, D. C., and Major E. R. Lewis of Dubuque, Iowa.

This group was created by orders as the Medical Research Board, Aviation Section, Signal Corps, U. S. A., and its principal functions were:

1. To study all conditions which affect the physical fitness of pilots.

2. To institute and carry out at flying schools or elsewhere, such experiments and tests as will determine the ability of pilots to fly in high altitudes.

3. To carry out experiments and tests, at flying schools, or elsewhere, to provide suitable apparatus for the supply of oxygen to pilots in high altitudes.

4. To act as a standing medical board for the consideration of all matters relating to the physical fitness of pilots.

At this time the most vital problem confronting the Board was the effects of altitude.
In the curriculum of West Point our young men are prepared by intensive study for the duties of the soldier. In this war, however, an important and novel military situation had arisen, and his training at West Point had not fitted him to meet it. The air fighting force was without military precedent to furnish instruction in all its details. The problems of this war on the ground, while new in many aspects, still could be met by the skill of the engineer and the tactician with fundamentals furnished by years of military experience and study.

The problems of the present war in the air lack the accumulated experience of previous wars to indicate their solution.

To the Air Medical Service the problems were presented of overcoming all those conditions affecting the physical fitness of the man, who, leaving his natural environment, the ground, straps wings to his body and soars to heights into which even the eagle dare not go.

Problems of physical fitness for the army in general had all been worked out and applied. There had been up to that time since the beginning of our entry into the war, many thousands of young men, the pick of the country, given the thorough and complete physical examination required for entry into the air service. With this examination many of you are entirely familiar.

Altitude problems, as applied to military aeronautics, however, were almost an unexplored field. It is true the British Air Medical Service had done a large amount of experimental work along this line, but there was yet a vast amount to be done. Fortunately we were able to study their work and begin from the point they had reached.

By the development of the re-breathing apparatus in general use by physiologists, data were secured which have formed the basis of a rating examination developed by the Board and which allows of a classification of the military duties of our Aviation Corps.

Military aviation in its infancy was restricted to observation of gunfire and photography. With the increase of efficiency of planes and pilots, new duties developed upon flying men, so that the third year of the war saw the service classified into scout and combat work, day bombing, artillery observation, night bombing, and later, "strafing" or attack on infantry, supply trains, etc.

This classification was brought about largely by the different altitudes at which these duties were performed. Scout and com-
bat work may take the pilot to any altitude. "Twenty-six thousand feet and the ceiling still going up" is the way one cable from General Pershing put it. Day bombing is commonly carried on at altitudes varying from 16,000 to 18,000 feet. Artillery observation usually ranges from 6,000 to 8,000 feet, and night bombing at the lower altitudes up to 1,000.

The results of the investigations by the Board into the effects of altitude upon man showed that physique was not a guide to the ability to withstand these effects. It is well to point here to a sharp distinction between physique and physical fitness. These results showed conclusively that there was a wide variation in men as to their ability to withstand altitudes. They did prove, however, that physical fitness was absolutely essential to avoid the dangers induced by altitude intoxication, and demonstrated beyond all doubt that altitude does produce such marked systemic effects as to be classed as an intoxication of so severe a type as to greatly depress vital function, destroy efficiency completely, and stand as the cause of many hitherto unexplained accidents. Also that repeated exposure to these intoxications rapidly induces the development of a chronic inefficiency, so aptly shown in the large number of washed-out aviators who were sent here by the British, French and Italian services during the war, to act as instructors to our men, and the most of whom were killed by aeroplane accident in such service.

The classification of pilots which forms the "rating" of aviators is based upon effects of "low oxygen" on different individuals. There may be a number of reasons given for these several degrees of rating, all based upon points of inefficiency developed as a result of deprivation of oxygen. By these means, however, it can be clearly shown that men may be divided into several groups. The groups adopted by the Board are as follows:

AA. Any altitude.
A. Any altitude below 25,000 feet.
B. Up to 15,000 feet.
C. Up to 8,000 feet.
D. Unfit to fly at any altitude.

As might be inferred from the rigid examinations for entry into the service, the "D" ratings were few in number, but the "B" and "C" ratings showed that this investigation is worth while.

This whole situation means that if a man with a "C" rating were sent into an altitude of 10,000 feet or over, he was liable
to be killed. An instance proving just this point is of official record. In August last, Captain ———— was sent into an altitude of 12,000 feet by his C. O. without the altitude test having been given him. He fainted, the plane made a vertical dive to the ground, and he was killed. (Bagby.)

When you consider that this man’s education as a flyer cost the government $50,000 and his plane $8,000 to $10,000, the work seems worth while purely from a money viewpoint.

Certain it is, then, the Board’s work has proven one fact; that so long as men fly they will need the supervision of medical men, who will have to be trained in the work developed by the Medical Research Board.

Aviation is a new field of man’s endeavor. The physiologic changes that are developed by the great changes in man’s environment have such profound effect upon his physical and mental efficiency that make it absolutely needful that he have this special supervision. When he has it, improved efficiency and prolongation of the flyer’s ability to make good have again and again been demonstrated as the result of its application. Where he does not have it, experience has shown that the ultimate result is disaster and death. A flying service demands it.
A STUDY OF THE EFFECTS OF MUSTARD GAS-POISONING UPON THE UPPER AIR TRACT.*

By GERHARD HUTCHISON COX, M. D., New York, N. Y.

This paper is based upon a series of 362 cases of mustard gas poisoning admitted to No. 1 General Hospital (Presbyterian Unit) British Expeditionary Force, during the Spring of 1918. There were probably some few patients who showed the combined action of mustard gas and phosgene.

There is always an appreciable interval between the time when the individual is gassed, and the onset of his symptoms. This latent period commonly varies from four to eight hours, sometimes it lasts for eight to ten hours or even longer.

The following tables shows the first symptoms complained of:

- Burning and smarting of the eyes: 47.6%
- Lachrymation: 18.6%
- Vomiting: 9.6%
- Nausea: 4.0%
- Irritation of the throat: 3.6%
- Cough: 1.6%
- Choking sensations in the throat: 1.3%
- Diarrhea: 0.6%
- Headache: 0.6%
- Sneezing: 0.3%

The following table gives the percentages of cases showing symptoms referable to the various organs:

Eye Symptoms—98.5% showed one or more of the following symptoms: Burning, photophobia, swelling of the lids, temporary loss of vision.

Ear Symptoms—5.2%.

Nose—Burning, sneezing, discharge, 71.1%.

Throat—Choking sensations, tickling, cough, hoarseness, partial or complete loss of voice, 93.3%.

Bronchi and Lungs—Cough, dyspnea, pain in chest, sputum, 8.6%.

*This subject is described more fully in the Transactions of the American Laryngological Association for 1918, under the title of "Gas Poisoning in Warfare."
Cutaneous Burns—First degree, 5.1%; second degree, 0.9%; other burns (degree not stated), 11.4%.

Gastro-Intestinal Tract—Anorexia, nausea, vomiting, diarrhea, 80.3%.

Smell—Of 92 men questioned as to the loss of smell and taste, 82 noted a loss of the sense of smell, 62 of their taste. The loss of smell and taste is apparently temporary, usually returning in a few days.

Examination of the Eyes.

Practically all cases showed a conjunctivitis, varying in intensity from a mild inflammation to a severe form, with redness and swelling of the lids, accompanied by a purulent secretion and excoriation of the skin at the inner and outer canthi. One severe eye inflammation had some elevation of the epithelium of the bulbar conjunctiva, while many cases exhibited photophobia out of proportion to the amount of inflammation present. Redness of the mucosa of the lower lids often persisted after the subsidence of the redness of the bulbar conjunctiva.

The average mild case was seen walking about on the streets with an eye shade seven or eight days after being gassed. In a couple of weeks many were almost normal, and able to dispense with their eye-shades.

No corneal lesions were seen in this series.

Other observers have noted superficial corneal ulcers in rare instances.

Examination of the Ears.

Ear complications are rare, about 5%. The most common is acute tubal catarrh with tinnitus, caused by the inflammation extending from the mucous membrane of the rhino-pharynx to the Eustachian tube. One man who presented a chronic purulent otitis media with a large central perforation and some pain in the ear, stated that the present exacerbation of his old ear trouble dated from the gas attack.

In cases of perforated ear drum, of course the gas enters directly into the tympanic cavity, where it produces an inflammatory reaction unless the ear is protected by cottonwool in the canal.

Another case of chronic purulent otitis media was admitted with considerable pain, and some mastoid tenderness, which cleared up with irrigations. A third case showed a myringitis, with a large bleb on the tympanic membrane.
The effects of mustard gas poisoning.

Nose, Pharynx, Larynx and Trachea.

The conditions found on examination of these organs were almost identical in the great majority of cases. There was redness and swelling of the mucous membrane of the nose, pharynx, epiglottis, larynx and trachea, varying in degree only, and associated with increased secretion. The mucosa in some cases was slightly reddened while in more severe cases it was fiery red.

In the nose the entire mucous membrane was involved, particularly that covering the inferior turbinates and nasal septum, which were often in contact. The nasal secretion was usually increased in quantity.

In the pharynx, the mild cases showed redness of the posterior pharyngeal wall, with swelling and redness of the follicles. The more severe cases exhibited, in addition, inflammation of the tonsils, tonsillar pillars and uvula. Lateral pharyngitis was common. The mouth and tongue were unaffected. One case showed swelling and reddening of the lingual tonsil. One man had a grayish slough on the posterior pillar of the tonsil.

In the larynx, as already stated, the majority of cases showed a mild or moderate degree of laryngitis, the entire larynx being uniformly reddened.

Reddening and inflammation of the epiglottis was quite uniform and seemed distinctive to this form of laryngitis, in contrast to the usual findings in acute catarrhal laryngitis as seen in civil life.

In some of the more severe forms, the redness and edema of the false vocal cords was considerable, and out of proportion to the amount of involvement exhibited by the true cords.

Four cases showed spots of superficial necrosis or ulceration of the laryngeal mucosa. In one patient these necrotic spots were seen on the false vocal cords, and on the right true cord. A second case had a superficial white necrosis involving the margin of the epiglottis for a considerable area. A third man showed a superficial small necrotic spot on the left arytenoid cartilage, of which no trace could be discovered on laryngeal examination one week later. In two other patients the margins of the true vocal cords were slightly irregular in outline, evidently due to a slight superficial ulceration of the epithelium.

In a number of men who developed "late aphonia"—four to six days after being gassed, the laryngeal examination showed a picture similar to that of many cases of early aphonia already
described, viz., more or less severe inflammation of the larynx. None of these late cases exhibited any areas of superficial necrosis.

*Examination of the Heart.*

The cases examined here did not show any heart lesions, with the exception of a patient of Captain Peter's who had a slightly dilated heart, accompanied by tachycardia and extra-systole.

In 100 cases, mostly from the medical wards, *bronchitis* was present in 30%. In the last convoy of about 340 cases admitted to this hospital there was not a single case of pneumonia. It is possible, of course, that the pneumonia cases may have been kept at the Casualty Clearing Stations.

Most of the cases of bronchitis clear up quickly, although the after effects on the lungs, such as dyspnea on exertion, are often protracted.

One man admitted to this hospital at an earlier date died from lobar pneumonia.

*Skin Lesions.*

As stated above, 20.9% of the cases presented cutaneous burns, and of these 5.1% were first degree burns and 0.9% second degree. In the remaining 11.4% the character of the burn was not stated.

When first seen at the Casualty Clearing Stations many cases are said to have a dull red rash, which disappears on pressure, and which tends to persist in patches. In the center of these reddened areas blisters are often observed.

The scrotum, back, inner sides of the thighs, and other moist surfaces are the usual sites for burns. Two of my patients had burns of the buttocks from sitting on latrines.

*Figure 1* shows a typical burn of the back. This man was admitted to Captain Cunningham's ward March 15th. He had been shelled with mustard gas shells off and on for six nights. When first observed he presented three small blebs on the back, surrounded by a small area of erythema. The burn was treated with 1% soda bicarbonate solution. On March 20th the erythematous area increased to about twice its original size, the margins became sharply defined, and the blisters broke down. The reddened area then assumed a slightly brownish tinge.

A late bronzing of the skin, particularly of the face, neck, forearms and hands was observed in a number of cases, coming on from four to five days after the gas attack. The appearance is not unlike the bronzing of Addison's disease.
Before leaving the symptomatology of mustard gas poisoning, let us consider for a moment a typical history of the type of case admitted to the base hospital, which is somewhat as follows:

The soldier was bombarded with gas shells during the night for several hours. Perhaps he was slow in putting on the gas mask, perhaps he took it off too soon. Or, again, he may have been shelled for several nights in succession, and the trenches, shell-

holes, bushes, etc. have a certain amount of gas lying about, particularly if there is very little wind.

Sometime after the bombardment ceases, the individual goes to sleep feeling perfectly well; the following morning, i. e., six to twelve hours later, he is seized with intense burning and watering of the eyes, accompanied by great photophobia and swelling of the lids. There is usually some irritation and discharge from the nose. Or, again, the first intimation that he has been gassed may
be an attack of nausea and vomiting. There is apt to be some irritation of the throat, with cough and dyspnea upon exertion. Twelve to thirty-six hours later a partial or almost complete aphonia ensues. Diarrhea is rare. Cutaneous blisters are fairly common about the moist surfaces of the skin, inner sides of the thighs, scrotum, back, etc.

Such is the usual picture presented by the ordinary mild case of mustard gas poisoning.

Temperature in Mustard Gas Poisoning.

In my own wards there was an occasional mouth temperature of 99° F. which quickly fell to normal. Most of my cases, however, had normal temperatures.

Post Mortem Findings in Mustard Gas Poisoning.

Colonel Brewer and Captain Allison of this unit both had opportunities of observing autopsies at British Casualty Clearing Stations in the vicinity of Ypres in the summer and fall of 1917.

The post mortems observed by Colonel Brewer were on two men of a group caught without their masks, and hence they were severely gassed. Both autopsies showed the following:

A grayish pseudo-membrane representing a superficial necrosis of the mucosa of the larynx, trachea and bronchi to their finest ramifications, making a veritable cast of the entire bronchial tree; an extreme broncho-pneumonia of both lungs was also present.

The three autopsies by Captain Allison were upon men who died within forty-eight hours after being gassed.

They presented practically the same findings, viz.;—all died of bronchopneumonia. All three had excessive cutaneous blisters.

The lungs presented diffuse bronchopneumonia with a few collapsed areas due to the bronchioles running to these areas being plugged by bronchial casts.

The trachea and larger bronchi showed practically complete casts of the tubes.

After Effects of Mustard Gas Poisoning.

The conjunctivitis, in the vast majority of cases, clears up fairly rapidly. In one to two weeks the eyes give very little trouble and the patients begin to enjoy life once more. One man observed recently had a severe conjunctivitis with considerable inflammation and photophobia three weeks after being gassed.

The laryngitis cases vary considerably. Some clear up rapidly, others are obstinate. In one patient with superficial necrosis of the mucosa of the arytenoid cartilage, there was no trace of the
neecrotic spot one week later, as already stated above, but he was still quite hoarse from his laryngitis.

We have not yet had an opportunity of examining the larynx, bronchi and lungs of these men after the lapse of a fairly long period, say several months. However, it certainly seems reasonable to suppose that where there has been an intense chemical irritation and inflammation of the larynx and bronchial tree, in some cases, at least, more or less permanent symptoms will persist, such as dyspnea upon exertion, with cough and hoarseness.

_Treatment:_

(1) **Prophylaxis.** Failure to carry the box respirator, and slowness and lack of practice in putting it on quickly, are responsible for many cases of gas poisoning. Then, too, it is self-evident that one should not wait to smell the gas before adjusting the mask, but should do so the moment the alarm is given, or a gas attack suspected.

Adequate protection of the mouths of dug-outs, and a good system of gas alarms are highly important.

_Immediate Treatment._

All severe cases of gas poisoning should be carried on stretchers and not allowed to walk to the dressing stations. As soon as the patient reaches a Field Hospital or Casualty Clearing Station, the clothing should be removed from the immediate vicinity of the patient and taken outdoors where it is hung on ropes in the air for two or three days.

The patient himself should be put in a bath of sodium bicarbonate solution, or if very sick bathed on a rubber blanket.

If there is much respiratory distress, ammonia ampules and oxygen followed by heart stimulants are used. Venesection may occasionally be of value. The eyes should be bathed with 1% sodium bicarbonate after which a bland liquid paraffin oil is dropped in, and a bandage applied.

The new American hospital trains are fitted with oxygen tanks and electric fans, to blow oxygen toward the patients.

_Treatment at the Base Hospital._

The cases treated by us have had the following:

- Rest in bed in a darkened room.
- Soft or liquid diet.
- No smoking.
- Bicarbonate of soda t. i. d. in thirty grain doses.
- Eye bandage or eye-shade.
Eye irritation with 1% sodium bicarbonate followed by liquid albolene. After two or three days substitute normal saline for the soda solution.

Cough is treated by the Robinson perforated zinc inhaler, on which is placed three or four drops of a solution containing equal parts of Chloroform, Alcohol and Creosote.

Maw's steam inhaler with compound tincture of Benzoin is used at regular intervals for laryngitis and bronchitis.

Codein is a useful drug in controlling the paroxysms of coughing.

Local treatment of the larynx and trachea was not tried during the acute stages.

Topical applications and other local treatment of the larynx and trachea were not used during the acute stages, owing to the nature of the lesion and the large number of casualties admitted at the same time.

Mortality.

Figures furnished by the British, state that the mortality from mustard gas poisoning, at some of the Casualty Clearing Stations was 12.5% in the serious cases.

At No. 1 General Hospital B. E. F. (Presbyterian Unit) we had but one death in almost 400 gas casualties, possibly due to the fact that many of those more seriously ill did not reach our base hospital.

DISCUSSION.

Dr. Chevalier Jackson: I would like to ask Dr. Cox to state whether there was any opportunity or justification for a laryngoscopy?

Dr. Harold Bays: Of course a discussion of this subject would take up too much time. The only reason I wish to say anything at all is because I was fortunate enough to continue Major Cox's work with the Presbyterian Unit, after he left; and at the same time I might answer Dr. Jackson's question. I was going to make the remark that perhaps the only man I know of, with the American Expeditionary forces, who had a bronchoscope was Dr. Sidney Yankauer. He did have his with him, and I am very sure when he gets back he will be able to give us a most illuminating report.

As far as Major Cox's cases are concerned, I saw a great many of these cases with him, and was intensely interested in the cases because I took over the service while the German drive was going on in a very thorough manner, and of course we had many gas cases down at the hospital. I felt that the general treatment given for gas cases was absolutely wrong—not that I want to say this in a derogatory way against Major Cox, because he was continuing the treatment that had been advocated, but I was absolutely convinced that it was necessary to get hold of these patients and treat them the same as you would treat a burn on the body. Some of these lesions we saw were extremely extensive, so I modified a medicine dropper on the plan of Major Yankauer's and had these men drop liquid
albolene into their own larynx and also into their nose; and then in order to get the proper effect of benzoin, I rigged up an inhalatorium and had them sit for two hours every afternoon in the steam vapor. As the result of that, we got some fair results. I wasn't in the Unit long enough to treat a number of cases that would compare very favorably with the number that Major Cox has reported, but when I got over there and saw the number of cases, I wrote to Major Gilchrist and he took up this matter with General Thayer, and I believe they used some of the suggestions which I gave them, and got fairly good results.

This is one point of extreme importance. We are going to see a great many so-called gas cases, when these men come back. It is extremely difficult to tell the difference between a real gas case and a malingerer. These cases are going to come up to us all the time, and we are going to have men complaining of chronic coughs, which they are going to say are attributable to the gas being inhaled on the front line, and it is a question as to whether a large number of those are not due to a great extent to the large amount of smoking that all soldiers indulge in.

I believe this paper of Major Cox's is invaluable and will add greatly to the literature on this subject.

Major H. H. Forbes: I wish to state that Dr. Yankauer was not the only doctor in France who had the laryngoscopic set. I had one also. It was impossible to use it, and anyone who has seen the p. m's. would realize the fact that the laryngoscopic examination would have been impossible.
CANCER OF THE TONSIL WITH A REPORT OF CASES.

By JOHN McCoy, M. D., New York, N. Y.

In this paper it is the writer's idea to report his observations on four cases of cancer of the tonsil, all of which have been treated by operative measures and a fifth case which is undergoing treatment preparatory to operation. In all of these cases the operative technique has been the same and is as follows:

At first a Wassermann is taken, also a section from the growth for microscopic examination. In the meantime the patient is referred to a dentist for a thorough sterilization of the mouth. The operation itself is performed as follows: An incision about two and one-half to three inches is made at the anterior border of the sternomastoid. The glands overlying the jugular are then dissected out. The facial vein is ligated in two places and then cut between the two ligatures. The external carotid artery is then tied off with a heavy ligature. The dissection is then continued on up in the neck until the posterior belly of the digastric comes into view. This muscle is then pushed aside as are also the stylo-hyoid and stylo-glossus when the superior pharyngeal constrictor comes into view. The field of operation is then changed to the throat and through the mouth the growth and tonsil are thoroughly dissected out and then an incision is made through the superior constrictor in the neck and a strong light is then thrown into the wound through the opening in the mouth and also through the opening in the neck, enabling us to thoroughly remove any portion of infiltrated tissue that may be seen. This is especially looked for at the base of the tonsils where it connects with the tongue. In the latter operations we have then resected two or three inches of the sternomastoid muscle and the tissues about it for the purpose of preventing recurrence in the neck. The wound in the neck is then partly closed by retaining sutures after packing with gauze and this wound is allowed to heal by granulation.

CASE REPORTS.

Case 1. Mr. Isaac W———, age 57, native of Hungary, cigar maker by occupation. Was first seen Nov. 19th, 1917. Gave history that he felt a soft lump in the left side of his throat for about three or four weeks. Exami-
nation showed a mass projecting into the throat from the left tonsil and posterior pillar about the size of a walnut. Three small glands could be felt in the neck. A Wassermann was taken, which proved negative and a section from the growth was taken which proved to be epithelioma. On Dec. 6th, 1917 operation was performed as described above. Twenty milligrams of radium were applied to the wound in the throat every four days. On Dec. 20th, the patient left the hospital with wounds all healed and there has been no recurrence to date.

Case 2. John M———, age 58, native of Ireland, laborer. First seen July 3rd, 1918. Gave the following history. He is a heavy drinker and smoker. Two months ago he noticed pains in the left side of his throat. Examination showed a cauliflower growth springing from the left tonsil and infiltrating the soft palate, gums and tongue. A large bunch of glands in the left side of the neck about the size of a lemon. A section was removed which showed epithelioma. June 12th, 1918 under local anesthesia the glands were dissected out and the external carotid artery tied. On June 19th, under rectal anesthesia the tonsil and surrounding infiltrated tissues were excised through the mouth and neck. Radium applied every four days after this to the wound in the mouth. On July 10th a hard growth reappeared on the left side of the tongue and there was a gradual recurrence of the growth in the tissues of the neck.

On Aug. 1st the external carotid on the right side was tied off and one-half of the tongue was dissected out. A dissection was also made of the tissues in the neck. In spite of this there was a recurrence in the tissues of the neck and when last seen there was a large infiltration in the tissues of the neck. This patient passed from the writer's observation and has undoubtedly succumbed to his malignancy.

Case 3. Mr. Caswell B———, age 75, native of United States. Was first seen July 3rd, 1918. At that time gave history of soreness and swelling for four months. Examination showed an ulcerating growth involving the left tonsil and pillars and slight infiltration of the tongue at the base of the tonsil. A few small glands could be felt in the neck. Section taken proved to be carcinoma. Operations July 11th under ether anesthesia. He was operated on as described above. Radium was applied to wound every four days and he left the hospital in two weeks. The writer has heard from this patient every few months and there has been no sign of recurrence to date.

Case 4. Mr. W. J. H., age 63, native of United States, watchman by occupation. Was first seen June 28th, 1918, and gave the following history. Soreness on swallowing for the past six months. Examination showed an ulcerating growth on the left tonsil, anterior pillar and posterior pillar. A bunch of glands, size of a horse chestnut, could be felt in the neck. Section from growth showed epithelioma. Operated July 2nd under rectal anesthesia as described above. The glands in the neck were very adherent to the jugular. He was discharged from the hospital on July 17th. Two months after he showed a recurrence in the tissues of the neck and a metastatic deposit in the glands in the opposite side of the neck. Further operation was not made, but he was placed under radium injections in capillary glass tubes directly into the infiltrated area and the operated side of the neck and also into the
glands of the opposite side. He has been making a slow but steady recovery in that that there has been a gradual diminution in the infiltration and a gradual subsidence of the metastatic gland on the opposite side. He is still undergoing treatment.

Case 5. Mr. Joseph B———, age 54, native of Russia. Was first seen Dec. 1, 1918, when he gave history of pain on swallowing beginning about five months ago. The examination revealed an ulcerating growth involving the left tonsil, posterior pillar and left half of palate, anterior pillar and gum, also the left half of the tongue extending forward about half way to the tip. Several small hard glands could be felt in the neck. A Wassermann was negative and a section from the growth proved it to be an epithelioma. This case was considered too extensive to warrant a successful result from operation at that time, so he was placed upon injections of radium emanations in capillary glass tubes. The growth is gradually subsiding and we feel that he will soon be in condition for a successful operation.

In conclusion the writer feels that an operation in the early stages of the growth by means of the above described technique will give a good prospect for ultimate recovery. In cases where the infiltration is extensive, it is better to have the patients first treated by means of radium injections through which the tumor seems to lose its malignancy and an operation after this offers a good prospect of recovery.

DISCUSSION.

Dr. Hurd, New York, N. Y.: I desire to report three cases: two cases of epithelioma and one of sarcoma. First case of epithelioma—no return of the growth one year after the operation. The second case, a large epithelioma, was operated on, and unfortunately the man died of pneumonia. The third case was a sarcoma. I removed the sarcoma and also the glands of the neck. There was a recurrence of the glands of the neck in about three months. I tied the external jugular, and exterpated the glands which should be done whenever they are involved, down to the constrictor muscle. Then I enucleated the tonsil and removed the growth down to the constrictor muscle. I don’t know whether I am right or wrong, but I have simply tried to keep the dirty mouth away from the clean neck.
THE IMPORTANCE OF BLOOD EXAMINATIONS IN THE
SURGERY OF THE NOSE AND THROAT.

By SEYMOUR OPPENHEIMER, M. D., New York City.

The more than occasional reference in the literature of cases of severe or even fatal hemorrhage following operations upon the nose and throat and particularly operations for the removal of the lymphoid tissue of the nasopharynx and faucial tonsils and the undoubted existence of a goodly number of fatalities which are unpublished and hidden away in the memory of the operator, leads to much thought as to why these procedures should be fraught with so many more complications of this nature than in other general surgical interventions. Is it due to a lack of pre-operative understanding of the individual, or to unusual abnormalities found with greater frequency in these regions?

Harmon Smith reports in an article many years ago, a series of over fifty cases compiled from the literature of alarming hemorrhage after tonsillotomy. I must, however, take exception to his statement as to the careful attention drawn to this subject in the text books. I have been unable to find anything more than the crudest casual reference in the works I have consulted.

May I be so bold as to say that it is a lamentable fact that of all those in the medical profession who would dare do any kind of a surgical operation, probably more have had the temerity to attempt operations on the nose and throat with less knowledge of their anatomy, than upon any other part of the human body.

I find constant explanation being mentioned in published cases of abnormal position of blood vessels and other lame excuses, for upon a critical analysis of the case in most instances, the resultant complication has been due to a lack of sufficient preliminary investigation of the patient to be operated or in some cases, a very decided error in technique.

The haphazard calling of a case a bleeder, as an explanation without warrantable facts, is as poor a diagnostic excuse as hysteria, they both cover a multitude of sins and have eased the conscience of a multitude of occasional surgeons and shielded the inability or futile efforts of the more experienced.
There is an old adage, "He who lives in a glass house, must pull down the blinds" and I myself must plead guilty in my earlier experiences to the very things which I am making this plea to correct. I have but to cite the following instance:

An opera singer under my care had a lymphoid mass at the base of the tongue, which interfered with her high note vocalization. Her history was that five years previous, a very celebrated laryngologist had removed her tonsils, and for a period of nearly a week following, there was a constant succession of secondary hemorrhages, which finally ceased after a ligation of the carotid artery. This history I accepted with due consideration for there had been nothing in my observation (non-surgical) of this patient which led me to any conclusion but that the bleeding had been due to anything other than poor surgical technique. I accordingly guillotined a mass from the base of her tongue. Four hours later a secondary hemorrhage took place and I spent the remaining thirty hours in attendance upon her. Can you imagine a more difficult place to control a hemorrhage in the nature of a steady ooze? Had I the knowledge of the value of blood examinations at that time, I would have determined in advance of the operation that which I subsequently ascertained, that this patient was a true hemophiliac.

It is not the purpose of this paper to take up the question of the type of operative procedure, but I must make reference to the universal diversity of the plan of attack. Each operator seems to have a particular pet method. For example: In recently observing six different men in the course of one afternoon operate at one of our prominent clinics, each operated by a different method, and while I grant that every road may lead to Rome, yet some have pitfalls and are headed straight for the cemetery.

Upon close inquiry, I found that of the large number of these cases, some twenty-six which I saw operated at that particular clinic, had either entered the hospital the previous night, or the day of the operation and that only a local examination of these children's noses and throats had been made. I am satisfied that some of these cases had had a very recent acute infection of the upper respiratory tract and probably were still running temperature or having considerable bronchial cough or a nasal secretion suggestive of an ethmoidal infection.

In one, the character of the nasal discharge with the excoriated condition of the muco-cutaneous juncture of the nose would to my mind have suggested a possible nasal diphtheria. In not a
single instance was a blood examination made to determine whether or not a hemophiliac or purpuric tendency was present. Three of these manifested a sufficiently troublesome amount of bleeding to have suggested very strongly to my mind that such a dyscrasia was underlying, although in one case I could not help but reflect that the use of the bistoury was rather an antiquated method of operation and one attendant with the possibilities of inviting disaster.

The invariable practice of controlling the bleeding was by compression. Only one operator of this group resorted to the use of the hemostatic forceps. Many of these cases left the operating table oozing and I am satisfied subsequently vomited up large quantities of swallowed blood. Observations of this kind raise the thought as to why should throat surgeons perform surgical procedures differently than the general surgeons. Would the abdominal surgeon rely upon compression and close the wound without securely ligating every bleeding surface? If not, why should throat surgery be performed along such indifferent and careless lines?

It is not, however, the object of these remarks to dwell upon this phase of the subject, but rather to take up some consideration of the subject of the blood under normal and hemorrhagic conditions and to make reference to the great importance and preoperative value of blood examinations preliminary to operative work upon these parts, for to be forewarned is to be forearmed, and the safeguarding of the patient is the safeguarding of our own reputation.

Under normal conditions, when blood escapes from the blood vessels either into the tissues or outside of the body, coagulation takes place in from three to ten minutes. If the blood were to be removed from one of the blood vessels without first coming into contact with the tissues it would require a long time to become jellied throughout. The same blood that coagulates in between three and ten minutes, when removed directly from the blood vessels may require thirty to forty minutes for coagulation. Almost all of the methods suggested for the determination of coagulation time fail to recognize what physiologists demonstrated long ago, that contact with the tissues markedly accelerates the coagulation time of the blood.

After the coagulated blood has stood for a short time the fibrin in the clot contracts, holding in it the enmeshed blood cells, and a straw colored fluid is expressed which is known as serum.
Numerous theories have been advanced concerning the reason for the coagulation of blood and the one of Howell is probably most generally accepted, because each step is supported by experimental evidence. We may briefly summarize as follows: The final product, fibrin, does not exist as such in the blood, but is formed from its precursor, fibrinogen, by the action of thrombin upon it. Thrombin is a protein substance. It does not exist in the circulating blood, but is formed by the inter-reaction of prothrombin and calcium salts. The activation of prothrombin does not occur normally while the blood is still in the blood vessels; it occurs only after the bleeding has taken place for the reason that in the blood there is a substance which prevents the formation of thrombin and has been called anti-thrombin. The blood platelets and blood cells, when they undergo disintegration, and the lacerated tissues produce a substance which neutralizes anti-thrombin and allows thrombin to be formed by the combination of calcium salts and pro-thrombin. "Thromboplastic substances" is the term given to those materials which nullify the action of anti-thrombin. Howell has isolated a phosphatid which he calls "kephalin", which substance has the power to counteract the action of anti-thrombin.

Many methods have been devised for the estimation of coagulation time. Some have involved the removing of blood from a vein; others with the obtaining of blood by puncturing the skin. The removal of blood directly from the vein necessarily must exclude the action of thromboplastic substances derived from lacerated tissues and the blood will not coagulate as quickly as the blood removed by puncturing the skin.

Of course, this method does not give us a fair index of the coagulability of the blood comparable with that which is obtained after an operation. After a surgical procedure, the blood exudes over cut or lacerated tissues and gains the action of the thromboplastic substances from the cut or lacerated tissues in addition to the substances produced by the disintegration of the blood platelets and blood cells. We have adopted a method which is most serviceable in relation to nose and throat surgery. The skin is punctured with a needle having a knife edge and the blood is sucked into a 0.2C.c. pipette, such as is used in serological work. The blood is then allowed to flow to about the centre of the pipette and it is then placed in the thermostat at 37° C., and observed every two minutes. From time to time a small drop of blood is blown on to a glass slide to determine
whether coagulation has started. When coagulation is complete it is very difficult to blow the blood from the pipette. Very often the blood, after having coagulated, does not contract and does not attach itself to the sides of the pipette and flows readily upon holding the pipette in an upright position. For this reason it is always necessary to blow a drop on to a glass slide to determine the presence of a clot. By allowing the blood to flow to about the centre of the pipette, we avoid as much as possible any action on the blood which may occur as the result of drying while in the thermostat. With this method the coagulation time was estimated in over 400 cases, the average time being 6.3 minutes; the most prolonged coagulation time was 29 minutes, and the shortest was 1.2 minutes. This phase of the work was conducted by my associate, Dr. Mark J. Gottlieb, to whom I am much indebted for his careful observation and accurate technique.

In connection with this work, it is always necessary to determine the bleeding time for the reasons that will be mentioned later. The bleeding time is determined by noting the time when the skin is pierced and observing how long it will bleed by gently squeezing the part from time to time. The bleeding time was determined in nearly 200 of the cases above cited; the average time was 5 minutes, the longest bleeding time 29 minutes and the shortest 2 minutes. The coagulation time may be prolonged and the bleeding time may be short, or vice versa, or both may be prolonged.

Two conditions, namely hemophilia and purpura, demand especial attention in connection with this work, for if they are not recognized before an operation is performed, they may give rise to complicating conditions which may even jeopardize the patient’s life.

In no case where either the bleeding time or coagulation time varied much beyond the limits of normality, was operation undertaken without preliminary preparation to improve the altered blood condition. If this was not successfully accomplished, as occurred in a few instances, a refusal to operate was emphatically made. I have often wondered what occurred in one particular case where I had refused to operate, that had subsequently been operated by another physician, for in questioning him on the subject he has been singularly reticent. I do know, however, of some very uncharitable remarks made of him and which have reached my ears from lay sources.
Hemophilia is a hereditary disease transmitted through the female to the male offspring. It is characterized by greatly increased coagulation time, and as the result of an individual receiving a slight wound, it may prove the cause of his death. The true etiology of hemophilia is not yet known. It was presumed, at one time, that the delayed coagulation time due to an increased amount of anti-thrombin, but subsequent investigation has proven the falsity of this supposition. It was then thought that there was in the blood of these patients a smaller quantity of calcium salts than normally exists.

A series of several cases having a delayed coagulation time were prepared successfully for operation by the administration over a period of time of large doses of calcium lactate. In some of these cases the hereditary influence could be demonstrated. From time to time, cases of hemophilia calcipriva are found, but the great majority of them have apparently a normal amount of calcium salts. Thus far we have been unable to unravel the mystery.

Purpura is a condition in which the bleeding time is prolonged, and the coagulation time is normal although the clot does not contract. There is a diminution in the number of blood platelets and the erythrocytes are easily lacked by hypotonic salt solutions. Hess has recently shown that this diminution in blood platelets is only apparent, but not real. There is a diminution in the visible blood platelets and the remaining number are in solution in the plasma. This observer believes that purpura hemorrhagiea is caused by some toxin which dissolves blood platelets and injures the blood vessel walls. The poison in some hemolytic diseases is thought to be assoicated with a disease of the spleen, as the number of blood platelets increases after the spleen has been removed, and it is suggested that splenectomy should be taken into consideration in the course of the treatment of such a disease.

Lee and Robertson have been able to produce experimental purpura in guinea pigs by injecting the serum of a rabbit that had been given immunizing doses of guinea pigs' blood platelets. They found the identical conditions the same as observed in a patient suffering from purpura. We are at present repeating this experiment with the view of producing an anti antiplatelet serum and if possible applying it to human beings.

The purpuras constitute a great variety of cases differing only in details. Purpura is not a hereditary disease although in
exceptional instances several cases have been found in one family. In one of our cases now under observation, a child with a normal coagulation time and an intensely prolonged bleeding time, the blood platelets were markedly reduced, and it was found upon further investigation that a similar condition of delayed bleeding time and blood platelet reduction existed in the mother as well as the father.

In this case there is a probability of the cause being an impairment of the nutrition of the blood vessel wall as the result of the influence of heredity from a syphilitic parent. Calcium administration in this case was of no avail nor is this remedy expected to be of value in purpuric cases. Unless improvement follows the administration of human serum, this patient will not be operated.

A number of cases have been reported in which the coagulation time and the bleeding time are prolonged and there is a diminution of blood platelets. These cases are very rare, and seem to be a combination of the two diseases.

In anaphylactic conditions the coagulation time is prolonged and very often the bleeding time is also prolonged. We have been confronted with this problem in several cases suffering from anaphylaxis due to asthma or pollinosis where there existed in addition a disease which required operative interference.

R. W. A young woman with a markedly delayed coagulation time, suffers from asthma due to horse dander. This was successfully treated by immunization methods. In addition there is a complicating ethmoiditis. An unusual degree of secondary oozing for five days took place after the local nasal operation.

It has also been observed that the children of individuals who have an anaphylaxis, who themselves show no symptoms of a disease such as asthma or pollinosis, manifest however, a decided alteration in the blood coagulability, the same as the parent.

Hemorrhage may be divided, from the therapeutic standpoint, into two classes: continuous, slow, oozing of blood and active bleeding from a severed or lacerated blood vessel. It should not be a great problem to effectually check the latter variety even though its site may be difficult of access. The treatment of the former condition depends upon a great many factors. Is the bleeding due to hemophilia, the purpuras, leukemia, anaphylaxis or any other condition in which the coagulation of the blood is prolonged, or is there a disturbance in the nutrition of the lining of the blood vessels, or is there some subtle toxin which produces
a destruction of the blood platelets, or destroys the red blood cells or is there a combination of one or more of these factors?

Therapy, human blood serum, or in the absence of that, diphtheria antitoxin may be administered either subcutaneously or intravenously. We have given transfusions of whole blood with exceptionally good results in several cases. Of course, in the cases of hemophilia or purpura, the effect of these treatments is only temporary, insofar as it checks only the momentary tendency to bleed or the hemorrhage after operation; it does not cure the primary condition. Many substances have been used which have been found effectual in checking the slow, continuous oozing which has occurred either spontaneously or following operation.

Among these we may mention coagulcn, which consists of blood platelets of the horse, thrombokinase made from the pig’s lung, and thromboplastin, which is macerated brain tissue suspended in saline solution. This last preparation was originated by Hess, and has for its object the counteraction of the antithrombin in the blood; it is efficacious in stopping capillary oozing of moderate severity.

Lowenberg and Rubenstone have recently conducted an experimental research on the effect of glycerinized extracts of visceral tissues on the coagulation time of the blood.

They found that the normal tissue extracts uniformly accelerate the coagulation time of the calcium plasma, and that most of the hemophilic tissues with exception of thyroid and liver seem to exert almost the same influence on coagulation. Thyroid gland and liver not only caused a prolonged coagulation time, amounting to two and one-half times the corresponding normal tissues, but actually inhibited the action of the calcium added to the plasma, so that the coagulation of the calcium plasma was prolonged almost two minutes.

These observations were repeated with uniform results, and though admittedly limited to the tissues of one hemophilic, yet they are strikingly significant, in that there is a possibility that the thyroid and the liver may secrete an antithrombic substance or enzyme which may be in part, if not principally, the cause of the deranged coagulative mechanism of hemophilic blood.

There are various other biological products which are more or less efficacious but are too numerous to mention and hear very little relation to the ultimate object of this paper. Calcium salts have been found to be occasionally successful in reducing the coagulation time in those cases in which it is prolonged. When
the coagulation time is normal, calcium salts have no effect. This was demonstrated in a series of fifty children having normal coagulation time, who were fed with calcium lactate with no influence.

One of the most difficult conditions to combat is when the bleeding time is prolonged. We have no means at present of absolute counteracting the substance in the blood which destroys the blood platelets, lessens the resistance of the blood cells or causes a disturbance in the nutrition of the lining of the blood vessel. Occasionally however, the bleeding time may be shortened by administration of large doses of human serum as the following case among a series demonstrates.

A brother and sister were advised to have their tonsils and adenoids removed. In the girl the bleeding and coagulation time was over fifteen minutes, and in the case of the boy the bleeding time, was eight minutes and the coagulation time fifteen minutes.

Unfortunately at the time, owing to war conditions, we were unable to procure brilliant cresyl blue which is used in counting blood platelets, and this phase of the case was necessarily neglected. The proposition which presented itself was therefore, one in which the bleeding time and coagulation time were inordinately prolonged, and the other in which the bleeding time was within range of the normal but the coagulation time was prolonged. Both children were given calcium lactate in large doses over a period of a number of days without appreciable effect.

Ten c.c. of the serum obtained from the father’s blood was injected intramuscularly into each of the children. One day later, the coagulation and bleeding times of the girl were found to be twelve minutes and sixteen minutes respectively and in the case of the boy nine minutes and ten minutes respectively. It was decided to remove the tonsils and adenoids of the boy. He bled considerably during the operation but not sufficient to be disturbing. Five days after the first serum injection the girl was again given 10 c.e. of her father’s blood serum. The bleeding and coagulation time two days later was found to be seventeen and nine minutes respectively. Because the bleeding time still remained prolonged it was decided to defer the operation. Four months later the girl was again tested and her bleeding time was found to be fifteen minutes and the coagulation time twelve and one-half minutes. Again 10 c.e. of her father’s blood was injected intramuscularly, and two days later the coagulation time was seven
minutes and the bleeding time six. Tonsillectomy was then performed without any undue bleeding taking place.

In conclusion, let me say that these observations are recorded for the purpose of showing the importance of a little more care in not rushing our patients into operation without sufficient preliminary examinations, and of stimulating farther investigation along similar lines, hoping to localize the offending principle causing these idiopathic diseases.
MEETING OF THE MIDDLE SECTION, HELD IN CHICAGO, FEBRUARY 22, 1919, UNDER THE CHAIRMANSHIP OF DR. OTTO J. STEIN OF CHICAGO.

SURGERY OF THE TRIFACIAL NERVE.

By JOHN F. BARNHILL, M. D., Indianapolis, Ind.

Surgical relief from trifacial neuralgia, or tic, usually is not sought until medicinal and other means of cure have long been tried and found but temporary or useless. Often the patient then is worn and wasted from the long suffering; the physical state is shattered, and not infrequently he is an addict to morphine. Frequently, but by no means always the sufferer is past middle life, and not infrequently is old. These patients are therefore usually not the best surgical risks.

Many reasons are assigned by the patient for delay in seeking surgical relief. In those of esthetic taste objection is raised to possible scars resulting from the necessary facial operations in nerve resection. Since it is a fact that the gratitude of the patient for surgical relief is often modified in proportion to the amount of scar or facial deformity, one essential is to choose a plan of operating, and to adopt a technic that will insure the minimum of deformity.

Fortunately surgical technic is at present so perfected that scars and deformities from facial operations may be reduced to great insignificance. In the sense that these cases are free from the presence of pus they are clean, and therefore if a perfectly sterile technic is carried out inflammation and suppuration do not follow. It would seem unnecessary to state that the several operations for the relief of trifacial neuralgia should be done only in a hospital where the strictest asepsis is carried out, were it not that such operations are yet sometimes indifferently performed.

Many of these patients come with foul skins due to prolonged application of numerous and often strange remedies; also to the fact that the pain resulting from the use of soap and water is so intolerable that no cleansing of the affected area has been done perhaps for months. Men often have foul, unkempt beards for the same reason. Unusual care is necessary in the sterilization of the field of operation in such cases.

The exact nature and extent of surgical procedures for the cure of facial neuralgia should be governed by the nature and extent of the disease. The seat of the affection may be in the brain, in the Gasserian ganglion, in any one of the three trunks, or, appar-
ently, it may be solely in any one branch of one of the trunks. The difficulty or even impossibility of accurately determining the actual seat of the disease makes it impossible in many cases to determine the essential point and necessary extent of surgical attack. Failure to accurately diagnose the seat of the lesion, no doubt, also accounts for failure to cure by surgical methods. Few clear data are at hand to enable the surgeon with certainty to say that the disease in one instance is in the Gasserian ganglion while in another it is solely in the superior maxillary or other division. Clinical experience has been helpful in determining. The longer the duration and the greater the violence of the paroxysms of pain the more apt is the affection to approach or be located in the ganglion. When the nerve trunks have been excised previously without permanent relief it would seem proof positive that the disease is solely in the ganglion were it always certain that the trunks and their branches actually had been entirely removed. It is undoubtedly a fact that a portion of a nerve trunk may remain intact, and its branches continue actively neuralgic after apparently extensive operations by an able surgeon who failed to resect to sufficient depth. It would, therefore, not be entirely proper to conclude that because a given case had been operated one or more times, as evidenced by numerous scars and more or less facial palsy, that the nerve trunks had been adequately removed, and that the seat of the disease must, therefore, be entirely in the ganglion.

**Extracranial Operations.**

Operations on the several branches of the trifacial nerve varying in extent from most trivial to major procedures have long been practiced. The procedures may be classed as extracranial and intracranial, depending of course upon whether the disease is attacked from without, or from within the skull. Extracranial procedures vary from attacks that are trivial and useless to operations that follow the nerve trunks to their exit from the skull, and therefore, judged by their magnitude and difficulty of performance, are of major significance.

An intimate knowledge of the origin, course and distribution of the trifacial nerve is entirely essential to successful surgery directed toward the cure of facial neuralgia. The branches of adjacent trunks of the trifacial apparently overlap and anastomose with each other in certain of their terminals, much to the confusion of the surgeon in determining which trunk is primarily affected,
and which, therefore should be subjected to excision. Thus cer-
tain of the terminal branches of the infraorbital, nasal and in-
fratrochlear nerves terminate in and about the ala of the nose, 
the adjacent face and upper lip with such intimacy that it often 
is extremely difficult to determine whether or not the neuralgic
pain in this region is due to involvement of the ophthalmic or 
superior maxillary branch. It is not strange, therefore, that in-
stances are recorded in which the pain continued unabated after 
the removal of the infraorbital, when in reality the diseased nerve 
was the nasal, which was left untouched by the operation, or vice 
versa. A case in point is one which I recently operated in which 
resection of the infraorbital nerve had been performed when it 
was proven later by the operation that the infratrochlear and 
nasal nerves were the offenders.

Before any surgery of the nerves, nerve trunks or ganglion is 
undertaken it is presumed in this article that all pathologic con-
ditions present that may be regarded as causative factors of the 
neuritis or tie dolouroux have previously been removed. It must 
therefore be presupposed that any diseased teeth have been re-
paired or extracted; that all the nasal sinuses have been investi-
gated by every method known to the rhinologist, corrected surgic-
ally, and that any other causes of neuritis have been surgically 
dealt with.

Of the three trifacial branches, I favor surgery on the ophthal-
mic and its divisions at a much earlier period of the neuralgia 
than on the remaining divisions. The reasons for earlier surgi-
cal attack are: 1st, the greater probability of failure to relieve 
or cure by injection methods. 2nd, almost no scar or deformity 
should result, and 3rd the comparative ease with which the sev-
eral branches may be dealt with surgically, provided the anatomi-
cal relations are mastered, and thoroughness in the execution of 
a well considered plan is carried out. It is true that if the dis-
ease is limited to the supraorbital branch only, injection may be 
made successfully at the supraorbital notch and operative meas-
ures thus temporarily avoided, but it is a fact, I believe, that 
the trochlear and nasal branches are more often involved, and 
that neuralgia of these can be relieved only by surgical methods.

If all branches of the ophthalmic nerve are involved the incision 
should follow the supraorbital margin from the junction of the 
outer and middle thirds well down upon the bridge of the nose. 
The bleeding vessels are clamped and the orbital structures are 
loosened and held downward by means of a flat retractor. The
supraorbital and supratrochlear branches are readily isolated for a distance into the orbit; the deepest portion of the respective nerves are then caught in artery forceps and are twisted out by the Thiersch method.

In my own earlier cases, as well as in the uncured cases of others following operation, I have sometimes noted the continuance of a nagging and at times unbearable neuralgia of the ala of the nose and the adjacent upper lip, which indicated that the nasal nerve had not been extracted. I know of no description of any method for the easy, successful surgical avulsion of the nasal nerve. I have therefore devised the following plan which is both simple and effective: In the incision above described, cut through the periosteum from the root of the nose to the lower end of the nasal bone and cautiously detach the periosteum toward the apex of the orbit until the anterior ethmoidal foramen is reached. The nasal nerve will readily be found entering this foramen. With a wide retractor the orbital contents are dislocates outwardly and downwardly putting the nerve on the stretch and exposing its trunk sufficiently to enable one to grasp it with an artery clamp. The periosteum at the point of penetration of the nerve is incised, the nerve loosened, and the whole is then easily twisted out deeply enough within the orbit to include the infratrochlear branch. All divisions of the ophthalmic may therefore be successfully extracted.

**The Superior Maxillary Nerve.**

Operations for the resection of the infraorbital branch at its exit from the infraorbital canal have been described, and have often been performed. When the neuralgia is recent, and the disease is limited to the terminal branches of this nerve, neurectomy at the foramen with twisting the nerve from the foramen as far as possible, may have some use. It is not always easy to determine that the disease lies solely in the terminal branches, even when the pain is limited to the face, lip and nose, for the reason that the infratrochlear and nasal nerves are intimately associated with the infraorbital in supplying sensation to the same areas. I have seen cases improved but little or not at all from neurectomy at the infraorbital foramen when later extraction of the infratrochlear and nasal nerves gave complete relief.

If the upper teeth, roof of the mouth and soft palate are, in addition, involved, neurectomy at the infraorbital foramen has no surgical value. Twisting the nerve away external to the
foramen by the Thiersch method is not helpful. I have again and again demonstrated on the cadaver that the nerve can not thus be removed deeply enough to include even the anterior dental branch. Favorable results can be expected only when enough of the trunk has been extracted to include the anterior and posterior dental branches, and the branches to the sphenopalatine ganglion. This means, of course, that, to be curative of the neuralgia, the trunk must be severed at, near or in the round foramen.

The operations devised by Carnochan, Lücke—Lessen—Braun, and by Kocher are designed to extract the nerve down to the foramen rotundum by routes which differ from each other somewhat, but which involve the temporary removal of part of the malar and zygoma, and of opening the antrum of Highmore. These operations were all devised by general surgeons who presumably were not skilled in the use of reflected light and therefore possibly not as dextrous in deep cavity work as should be the rhinologist. Believing that a method should be followed which is both less in extent and less deforming than those of the eminent surgeons mentioned, and yet equally efficacious, I some years ago devised a plan which I called the "transorbital route" and which I have performed many times with gratifying results. I first did the operation in 1906 and believed that I had devised something new. Later, however, I learned that Dr. A. Cook, of Hartford, Conn., had performed a somewhat similar operation in 1903, and that his preceptor, Dr. M. Storrss, had for several years previously employed a similar route in the extraction of the infraorbital nerve. I am so much impressed with the superiority of the supraorbital route over other methods that I shall describe the plan in some detail. The Kocher incision for the exposure of the infraorbital foramen is used, only it is not extended quite so far upon the malar bone externally. The soft structures are retracted upwardly to the sharp edge of the orbit and the periosteum is incised along the entire length of the sharp infraorbital margin. The periosteum of the entire orbital floor is lifted by a blunt periosteotome, when the orbital contents are then retracted upwardly upon a long handled, broad bladed spatula. Gauze packing is placed between the periosteum and orbital floor to arrest the oozing of blood from the several bone puncta. While waiting for the bleeding to cease the infraorbital nerve is loosened external to the foramen, a stout silk thread is tied about it at the exit, which thread is to be held by an assistant until the nerve trunk is finally extracted. The nerve, with the thread attached, furnish-
es a most valuable guide throughout all subsequent steps of securing it to a sufficient depth. The terminal branches are cut upon the face, and the roof of the infraorbital canal is chipped away by means of a V-shaped chisel throughout its entire length, thus permitting the nerve to be lifted free from the canal back into sphenomaxillary fissure. Since the nerve often follows a curved course from the foramen rotundum to the infraorbital foramen, the convexity looking outwardly, it is frequently necessary in order to secure the nerve trunk deeply, to chisel away the sharp lip of the inner or maxillary boundary of the fissure. The nerve is more firmly attached at the infraorbital foramen, and along the margins of the sphenomaxillary fissure than in the infraorbital canal, and hence the necessity of free dissection at the adherent points, after which the nerve may easily be lifted out of the canal once the osseous roof has been removed. A darkened room, a good reflected light and trained assistance are all essential. With the nerve held taut as a guide and with the apex of the orbit lighted from the head mirror, it may be followed through the fissure, grasped deeply by an artery forceps and twisted away to the foramen rotundum. Examination of the nerve trunk thus removed in most of my cases has shown the fragments of the several branches of the nerve, thus demonstrating their successful extraction. In several patients who previously had been operated by the Kocher or other method but who were uncured, it was my extreme good fortune to find the stump of the nerve trunk by the transorbital route, to remove it deeply, and to demonstrate the removal of the remaining neuralgic branches.

The transorbital operation has the very great advantage of not opening the maxillary antrum, an event which is almost certain to be followed by troublesome infection of the antrum. Usually the roof of the infraorbital canal can be chiselled away and the nerve completely exposed without disturbing the osseous floor. Occasionally the floor of the canal is lost but this without injury to the mucous lining of the antrum. With the exercise of reasonable care this operation can be performed without risk of infection, and, therefore, with but slight after pain, little scar or deformity, but with reasonably certain relief from the neuralgia.

The Inframaxillary Division: I have seen fewer cases of neuralgia of this nerve than of the others. In the earlier history of the pain it is easier to differentiate any affected branch and consequently at this time satisfactory relief is more likely to follow the extraction of the nerve superficially. Later when the neuralgia
is widely distributed superficial attack has no value and methods contemplating the removal of the trunk down to the foramen ovale, or the removal of the ganglion itself must be considered. Most methods for deep removal of the trunk result in moderate scar and varying degrees of facial palsy. When the inferior dental branch is solely involved the nerve is best extracted per orum through an incision over the infradental foramen. This is not easy of performance but laryngologists with surgical training and surgical instinct should be able best to do it. Of course, no scar and no deformity results from this plan. External methods are necessary if the foramen ovale is to be reached. Because of the certainty of more or less facial palsy operations that require incisions to the bone over the external surface of the mandible should not be considered, except in extreme cases. Incisions which follow the lower and posterior margin of the jaw result in less deformity and are preferable provided all the tissues down to the bone can be sufficiently retracted to expose the mandibular notch. This is entirely possible in lean patients, but in the robust the operations of Kocher or Krönlein are necessary. Avulsion of a sufficient length of the nerve from the infradental canal is not possible except the canal be first opened by chiseling, and then loosening the trunk throughout its length between the infradental and mental foramen. I have made many experiments at avulsion of nerves from their canals, on the cadaver, especially of the infraorbital and infradental nerves without first having opened the canal, loosened the nerve at the foramen, and have found that the nerve almost invariably snaps at its entrance into the foramen, or a short way in the canal, owing to the large amount of connective tissue which binds it at the entrance to or just within the canal. Hence in all operations on nerves which traverse osseous canals it is entirely essential to uncover and loosen the nerve throughout its course before any effort is made at avulsion.

**Intracranial Operations.**—Surgery of the Gasserian Ganglion.

Keene and others have reported the return of the former neuralgia after resection of the infraorbital and infradental nerves for long distances. In one of Keene's cases 25 mm. of the infraorbital nerve was removed. Reunion of the nerve took place and the former pain returned. Since the infraorbital nerve is 35 mm. to 40 mm. in length between the foramen rotondum and the infraorbital foramen, it is evident that the removal of 25 mm. of the trunk would not include all the branches likely
to be neuralgic. I have seen a number of cases in which it was alleged that the nerves had been removed down to the foramen of exit from the skull, yet who continued to suffer from the former pain. In several of these I undertook further operative measures and found that much of the nerve was still intact, having been overlooked in former operations, or possibly its complete removal was considered unnecessary. The final removal of the nerve with its branches gave satisfactory relief. Knowledge of these facts has led me to suspect that intracranial surgery of the trigeminal nerve is sometimes not as complete as it should be, and that, were it complete, surgery of the ganglion would be less frequently necessary. However, many of the world's best surgeons of the last quarter century have believed that often the ganglion is the sole seat of the pathology, and this belief has grown rather than lessened, until now many, as Frazier, believe that the surgery of the trigeminal nerve should be wholly intracranial. Among those who have developed the surgery of the ganglion should be mentioned Mears, Rose, Hartley, Krause, Abbe, Cushing and Frazier. The earlier operations of Mears and Rose are now obsolete, while those of Hartley and Krause have been superseded by the simpler and safer plans of Abbe, Cushing and Frazier. I prefer the technic of Frazier which has been published, and needs no detailed repetition. A few points should, however, be discussed. The great mortality of the earlier operators was due to attempts at removal of the ganglion itself, with its attendant hemorrhage, shock and sepsis. Much was gained when Spiller discovered that section of the sensory root of the ganglion gave complete and permanent relief from the neuralgia as Frazier has proven by cases remaining cured after a period of 15 years. Abbe, also simplified the operation by contenting himself with the division of the second and third branches of the trigeminal at the foramina of exit. This operator maintains that since the neuralgia is practically always in these two divisions of the nerve, it is not necessary to consider the ophthalmic nerve. Cushing and Frazier adopted certain proven points of safety in the methods of Spiller and Abbe, and then simplified the method of approach to the ganglion, all to the end that a low mortality is now the rule. The aim of the operator now is seldom to remove the Gasserian ganglion, and hence many of the unfortunate surgical possibilities of the former operation are now obviated. The plan of section of the sensory root of the ganglion, as advocated by Spiller, and extensively practiced by Frazier is no doubt the best procedure. The intracranial operation of section of the sensory
root while requiring an extensive surgical training for its performance, and a clear knowledge of the structures dealt with, is but slightly more difficult than some radical mastoid operations, especially when the latter operation deals with labyrinth complications.

When the dura has been sufficiently exposed by the method of Frazier the first difficulty met with by the operator is hemorrhage. The bleeding may not be severe, but is nevertheless troublesome and requires time and patience to control. Much of it arises from the venous plexus resulting from the separation of the dura from the skull and requires gauze packing on either side while the operator continues to work through a narrowed channel under the spatula which elevates the brain. As the foramen ovale is approached the middle meningeal artery may be found directly in the necessary path of procedure. If it can be hooked up at the foramen spinosum and sufficiently isolated it is best disposed of by ligation. Every care should be taken not to tear it off unless first ligated. The vessel may be compressed in the foramen by surgical wax. Johnson, who reports 13 operations on the ganglion without a death, advocates ligation of the common carotid artery as a preliminary measure. This is usually unnecessary if caution and skill are used in dealing with the middle meningeal. Because of anomalies in the location of the middle meningeal artery the operator never knows where he may find it since it may be anterior, external or posterior to the foramen rotundum.

The plan of section of the sensory root, and the avoidance of attempts to remove all or a greater portion of the ganglion has lessened the danger from injury to the cavernous sinus, an accident formerly common, distressing and often fatal.

The next greatest difficulty lies in sufficiently exposing the region of the ganglion by lifting the brain from the adjacent floor. The first requisite to overcome this difficulty is to loosen the dura from the bone around the entire periphery of the opening into the skull for a distance of one-half to three-quarters of an inch. This releases a large area of dura and brain to freedom of movement required in spatula retraction. With the area of dura thus loosened the broad spatula of Cushing is effective in exposing the operative field if held by an intelligent assistant. The considerable depth of the ganglion requires artificial illumination, and in this the trained laryngologist should feel at home.
With a dry field, a good exposure and the depth of the wound well lighted the dura is cut around the 3rd division of the nerve at the foramen, is then slit backwardly over the ganglion, the outer surface of which lies exposed. The sensory root lies most superficial, is largest, and when freed from dura may be isolated and severed. The wound is closed exactly as in other extra dural brain operations. Since the field of operation is clear if no infection is introduced, the wound heals almost painlessly, quickly and without noticeable scar or deformity.
SOME OBSERVATIONS ON THE EAR COMPLICATIONS OF THE INFLUENZA EPIDEMIC AT CAMP GRANT.

By GEO. E. SHAMBAUGH, M. D., Chicago, Ill.

The epidemic of influenza which swept through Camp Grant this autumn caused a great many cases of acute otitis media. Like the less severe epidemics which we observe almost every winter in Chicago and which are usually designated influenza epidemics, the virulence of the otitis media did not compare with that usually following either scarlet-fever or measles. In most of the cases there was a rupture of the drum-membrane often within a few hours of the onset of the earache and before the patient could be seen by the otologist. Most of the cases ran the typical short course, the discharge stopping within one or two weeks.

One fact stands out conspicuously in these cases; that is that an early spontaneous rupture of the membrana tympani is altogether as effective as is an early incision of the membrane. This disproves an idea more or less prevalent that an incision of the drum-membrane should be hastened, in order to prevent the spontaneous rupture, as the latter is likely to result in a larger perforation from destruction of the membrane, which in turn interferes with the prompt healing of the perforation and constitutes a greater menace to the hearing function.

When a spontaneous rupture of the drum-membrane takes place within a reasonably short time, that is within twenty-four—forty-eight hours after the onset of the otitis media, the result is altogether as favorable for the prompt recovery of the middle-ear infection as when the membrane has been opened by incision. On the other hand, the harmful effect from the failure to secure early drainage through the drum-membrane bears a direct relation to the duration of the infection before the drainage is established. It does not seem to matter at all whether this drainage is accomplished by a spontaneous rupture or by the paracentesis. This fact gives a very clear answer to the question of the kind of incision of the drum-membrane which is required in order to secure adequate drainage in cases of acute otitis media. In some quarters the idea has arisen that to be most effective the incision of the drum-membrane should be as extensive as possible; some
otologists insisting even that the incision should be carried well out along the upper posterior wall of the external canal. Our conclusion is that these extensive incisions are not at all necessary and are in no way more effective than either the spontaneous rupture of the drum-head or an artificial opening, say a couple mm. long, through the membrane.

Prompt drainage is the key to the whole problem of drainage and the actual size of the opening is of little moment. Additional proof of the correctness of this view is to be found in the way in which an extensive opening of the membrana tympani promptly closes down to the typical pin-head perforation. This rarely requires more than 28-48 hours after the most extensive incision.

The danger of a surgical mastoid developing in these acute cases often bears a close relation to the length of time elapsing between the onset of the otitis media and the securing of proper drainage through an opening of the drum-membrane. It appears often to be just those less severe cases where the spontaneous rupture fails to take place, or where the discomfort is so slight as to fail to call attention to the middle-ear infection and where, therefore, the infection continues for a week or longer before drainage is established, that a softening of the bone in the mastoid process takes place, necessitating an eventual mastoid operation.

Another important clinical fact stands out in these cases and that is the distinction which we should always be careful to make between the cases where the clinical diagnosis of an acute mastoiditis can be made and those cases which require an operation on the mastoid. This distinction cannot always be made from the severity of the reaction over the mastoid process. This reaction may often be quite severe in the early days of an acute otitis media and yet the process may go on to a prompt recovery. This is especially true in cases where this reaction takes place in the early stages of the otitis media and especially where it develops before the drainage through the membrana tympani has been established. These cases go on, as a rule, to a spontaneous recovery and when no alarming symptoms present themselves we may safely refrain from operating on the mastoid for several days or a whole week after proper drainage has been established. If at the end of that time the reaction in the mastoid shows no marked sign of subsiding, an operation on the mastoid should be resorted to.
There is a type of mastoiditis, of which we have seen a rather large number of cases at Camp Grant, where the diagnosis of mastoiditis can easily be overlooked. These are the cases where a softening has taken place, with the formation of an abscess cavity in a part of the process more or less remote from the cortex. In such cases no local symptoms may appear for a long time over the surface of the process, and where the drainage of the abscess cavity into the antrum is not greatly impaired, there may be no subjective symptoms and little if any rise in temperature, often not over 96° occurring, not every day, but at intervals of several days. Unless the abscess ruptures internally, there will develop sooner or later, but often not until the lapse of a month or more, a reaction over the surface of the mastoid. This appears as a rule, below or behind the tip of the process. The existence of a mastoid cavity should always be suspected where there persists a rather profuse purulent discharge from the external canal for several weeks after the onset of the otitis media. The character of the discharge is of greater significance than the amount. When an actual softening of the bone is taking place, the discharge is distinctly purulent and not of the mucopurulent character which often persists in rather profuse quantity for an indefinite time in some of the cases of simple otitis media not associated with the disease of the bone.

The skiagraph is of special value in just this type of case. The assistance one gets from the skiagraph in a good many cases of acute mastoiditis is, I believe, quite problematic. The shadow shown over the mastoid process in the skiagraph in a good many cases of mastoiditis often does not give us any information of which we are not already aware from an examination of the case. This shadow signifies that the pneumatic spaces in the process are filled with pus, but this we already know in the case of all cases of acute otitis media, where there are local symptoms of mastoiditis. But as I have already stated, most of these cases recover spontaneously. What the skiagraph does show with unerring accuracy is the development of a softening of the bone, with an actual abscess cavity formation. It is particularly in these cases of more or less latent abscess formation in the mastoid, where the clinical evidences of mastoiditis, that is alteration in the soft structure over the process, are often entirely wanting where the skiagraph is of most assistance.

In operating on the latter type of mastoiditis we make no effort to open into the antrum unless, as is rarely the case, there is found
to be softening bone in the region of the antrum. The operation is completed when the abscess cavity is discovered and drained, care being taken to remove all the softened bone about the walls of the abscess cavity.

In conclusion I would emphasize a few clinical facts which stand often more or less confused in the mind, especially of the younger otologist, with rather limited clinical experience. The first is that the most important part of any treatment of an acute otitis media is to secure early drainage through the opening of the membra na tympani. The second is that the clinical evidence of an acute mastoiditis is not by any means an indication that the mastoid process should be operated. Third, the absence of reaction in the soft structure over the mastoid does not exclude the possibility of extensive softening in the process which requires surgical interference. Fourth, the shadow seen in the skiagraph of the mastoid is not in itself an indication for an operation any more than is the finding of pus in a mastoid cell on opening the mastoid an evidence that the operation was necessary. Fifth, the skiagraph is often a most valuable aid in diagnosing the existence of changes in the bony structure of the mastoid which require surgical interference, especially in those cases where the clinical evidence of such a condition may be almost entirely absent, and finally, when operating on these cases of abscess cavity formation in the mastoid process it is not at all necessary to make an opening into the antrum except in those cases where there is a softening of the bone in this region.
A CASE OF FULMINATING ETHMOIDITIS WITH METASTASIS.

By IRA FRANK, M. D., Chicago, Ill.

Though the literature on the diseases of the accessory sinuses of the nose abounds with frequent references and case reports of acute suppurative disease of the ethmoidal labyrinth complicated with orbital abscess or subperiosteal empyema of the orbit, I have been unable to find recorded a case in which the course of the process was as short as in the present instance. Moreover, I am unable to find reference to remote metastatic abscess occurring in the course of the acute disease. It is for these reasons which I believe to be of interest, that I take the liberty of presenting the following history.

Mr. A. B., a youth of nineteen years, came under medical attention twenty-four hours after the onset of an attack of grippe, occurring some time previous to the recent pandemic. His complaint at the time consisted of malaise and moderate cough, and physical examination substantiated a diagnosis of a very mild bronchitis. The temperature record showed an elevation of a fraction of a degree. The following day an additional symptom of general frontal headache was complained of, though not sufficiently to suspect the discomfort to be other than an ordinary grippe manifestation. During the next twenty-four hours the cough and malaise remained unchanged but the headache was no longer complained of. On the fourth day of the illness the headache returned, locating in the right frontal region, this time more severely, and the patient complained of a moderate coryza. By the next morning the frontal pain was sufficiently intense to suspect sinus disease, and the physician in charge put the patient on a treatment consisting of an adrenalin nasal spray and urotropin internally. There was no discharge from the nose other than small amounts of clear mucus, and this character did not change until the next day when the secretion became more serious and slightly blood-tinged. By this time the severity of the headache was greatly increased and the patient was quite miserable. He was unable to breathe through the right nostril and complained bitterly of a pain and sense of fullness around the right eye. Tenderness was very acute. About eleven o'clock in the morning an edema was apparent in the upper and lower lids, with some redness, and this continued to increase rapidly until the patient was unable, in a few hours, to open the right eye. I was called in consultation at this time.

I found the patient to have a temperature of 99.6°, with normal pulse and respiration. The right eye was completely closed by the intensely red swelling of the lids. The swelling was quite firm and tender, and definite fluctuation was not apparent. Intranasal examination revealed an almost total occlusion of the right nares, due to a tremendous edema of the lateral wall and turbinate bodies, which practically eliminated all landmarks. No pus was visible, but there was an ooze of pinkish serum from the swollen turbinates.
Unable to have an X-ray picture without considerable delay, the patient was immediately moved to a hospital operating room, where after careful application of cocaine and adrenalin I was finally able to remove the anterior third of the right middle turbinate. This procedure freed a large quantity of pus which was apparently released from the region of the infundibulum and posteriorly. The patient was returned to bed with sufficient nasal packing to control hemorrhage, the packing being removed in a few hours.

On the following day the temperature reached 104.2° by 10 A.M., and though there was a rather free discharge of pus from the right nostril there was no diminution in the patient's discomfort, and no change in the character of the external swelling.

An X-ray picture taken during the morning revealed a very small frontal sinus, a cavity so small that it was impossible to absolutely differentiate it from an ethmoid cell. The ethmoidal labyrinth was distinctly cloudy on the right side.

The patient was again taken to the operating room, anesthetized with ether, and a Killian incision made over the right eye. After retraction of the periosteum an attempt was made to open the frontal sinus at a point corresponding to its probable position according to the X-ray plate. This attempt was unsuccessful; the lips of the incision were more widely separated and the orbital contents were retracted laterally. In the process of raising the periosteum from the orbital plate of the ethmoid bone there was a sudden escape of pus from beneath the membrane. With good exposure of the entire orbital plate, the ethmoid cells were thoroughly curetted from without. A large quantity of thick white pus was liberated from the labyrinth. A gauze drain was inserted externally and the incision partially closed.

Following this operation the expected return to normal temperature failed to occur. Relief from the headache was almost immediate, and the patient was able to open his eye with ease in a very short time. The thermometer, however, continued to register an irregular temperature varying between 100° and 104°.

The first hint of further trouble was a severe pain located in the left shoulder, complained of on the day following the second operation. This pain became rapidly so severe that opiates were necessary to control it. A blood culture was taken and a general surgeon was called in consultation. For two days there was no change in the situation, the temperature continuing to rise and fall irregularly and the pain in the shoulder remaining intense. The blood culture proved to be sterile.

On the third day the shoulder was explored with a needle, but no pus was found. The arm was dressed with large hot moist applications, and on the following day a swelling was noted externally below the deltoid muscle. The dressings were continued another twenty-four hours when the patient was again anesthetized and a large submuscular abscess opened and drained. The pus contained a pure culture of streptococcus.

For a very short time after this operation there was a continuation of the temperature, but within forty-eight hours there was a noticeable improvement in all symptoms, which, once started, was uninterrupted and the patient left the hospital entirely well.
"FOREIGN BODIES IN THE BRONCHI OF VERY YOUNG CHILDREN."

By J. W. Murphy, M. D., Cincinnati, Ohio.

Having recently passed through a very tragic experience with the case of a twenty-two months old child with a foreign body in the bronchus, I thought it well to report this failure, together with several successful cases. I know of no class of cases that cause so much anxiety as that of a foreign body in the bronchus of a young child. Since the advent of the bronchoscope, we are loathe to do a tracheotomy in these cases and I sometimes wonder if we do not wait too long before resorting to this method of removal. Those of us doing upper bronchoscopy are apt to think that it is a confession of failure to have to resort to a tracheotomy in these cases. They are naturally always emergency cases and often require immediate relief. The sooner we can see these cases, the easier the diagnosis, as, after the foreign body has been in situ for some days, the mucous secretions are so abundant, that the physical signs are masked, and, if the foreign body is of a soft character such as a peanut kernel, grain of corn, or some such substance that soon disintegrates in the secretions, it sets up a very violent bronchitis. The secretion in these cases is very tenacious and renders all operative procedure exceedingly difficult. Doctor Ellen Patterson has recently reported in the New York Medical Journal, six cases of peanut bronchitis in her experience that illustrates very clearly the serious character of these cases. It is surprising what a small amount of foreign substance will set up serious bronchial symptoms, and in several of my cases, the small amount of peanut kernel removed, seems altogether out of proportion to the serious symptoms that were present, but the prompt recovery of the child following removal was positive proof that the foreign body was the cause of the marked symptoms present. I feel that the family physician should be impressed with the importance of doing a tracheotomy in these cases unless the child can be promptly brought under the care of one experienced in this line of work. To illustrate this point, last July I received a telephone message from an adjoining town in Indiana, that a child was being sent in with a foreign body in the lungs. This child lived some seven
miles in the country from the small town where it was first taken, and the symptoms were quite urgent when the family physician was first called. He immediately sent the child to Cincinnati, but the child died on the train from asphyxiation.

In August, 1918, I was called over the phone to be prepared to take care of an emergency case of a child with a foreign body in the bronchus, which was being sent to the hospital from a neighboring town some 15 or 20 miles distant. This child also succumbed before reaching the city. Had a tracheotomy been performed in these two cases, the probabilities are both children would have been alive today.

I feel that we cannot be too careful in instructing the physician who first sees the case, that if the symptoms are at all alarming, a tracheotomy is the safest course to pursue.

Having had a number of successful foreign body cases in the past year or eighteen months, I had almost come to the conclusion that these cases could all be handled without a preliminary tracheotomy. However, my recent experience has somewhat changed my opinion on this subject and I would like to know what is the experience of other men doing this class of work.

CASE REPORTS.

Case No. 1. Baby K., age 22 mos., came to the hospital with the history of having choked four days before on a grain of common field corn. The child had come several hundred miles and was naturally somewhat worn out from the travel and the difficulty in breathing, yet the symptoms were not at all alarming, and, as the child arrived about eight o’clock in the evening, we decided to do nothing until the following morning. Physical examination showed the right lung was not getting its portion of air and the probabilities were that a foreign body was blocking or partially blocking the right bronchus. The next morning, without an anesthetic, the 4 mm bronchoscope was passed and several pieces of broken corn were removed, possibly sufficient to make a half grain of corn. The child’s symptoms were improved, and, as we had had the child on the operating table nearly an hour during this extraction, we decided to wait and see what the child’s condition would be after a night’s rest. The following morning the child presented symptoms of still some blocking of the right lung, but dyspneic symptoms were not present. At eleven o’clock the child suddenly collapsed, and in spite of a rapid tracheotomy and the removal of a large grain of corn from the right bronchus through the tracheotomy wound, the child died on the operating table. When the trachea was opened, quite a lot of purulent mucus was expelled, and no doubt this thick tenacious mucus had added very materially to the sudden collapse of this case. I am sure had we performed the tracheotomy sooner, the child would have had a better chance for recovery. The mistake made here was in waiting too long. We were in hopes that the
foreign body that we had removed through the four millimeter bronchoscope was possibly all that was present. We were not able to see any more at the time, however, through the tracheotomy wound a large grain of field corn was removed from the right bronchus.

Case No. 2. Marion O., age five, was referred by Doctor T. W. Moore of Huntington, W. Va., with the history of having choked, while eating peanut candy several days before. A marked bronchitis was present and the lungs were full of rales, so that it was difficult to decide where the foreign body was located. I was fortunate in having Capt. Iglauer, who was home on a few days furlough, assist in this case. Without an anesthetic, the five millimeter bronchoscope was passed and several small pieces of peanut were removed. The lungs were very full of mucus and required considerable aspirating and sponging in order to see the foreign body. The child was on the operating table an hour. Twenty-four hours later the child suddenly collapsed from edema of the larynx and a rapid tracheotomy was necessary. When the trachea was opened, a great quantity of thick, viscid pus-like secretion was expelled. Through the tracheotomy wound several more small pieces of peanut were removed. The child collapsed several times as the secretion was so tenacious that it had to be removed by means of the bronchoscope. At times some of the secretion removed was almost as hard as the peanut kernel, and in the weakened condition of the child, the dried secretion caused symptoms as serious as the foreign body itself.

If we had not resorted to a tracheotomy in this case, I am sure we would have lost the case, as the child was in imminent danger of drowning in its own secretions.

The child remained in the hospital for two weeks, but eventually made a perfect recovery.

Case No. 3. January 26th, 1919, I was called to Middletown, Ohio, to see an eighteen months old baby with a peanut kernel in the lungs. I was fortunate again in getting Doctor Iglauer to go with me. We made a rapid run in the automobile of forty miles. We found the child had choked on a mouthful of peanut kernels the day before, on Saturday, and a neighbor woman, who found the child choking, ran her finger down the child's throat and succeeded in removing a number of pieces of peanut kernel. However, the child showed symptoms of bronchial obstruction and I was asked to see the case. The breathing was quite labored and there was no question but what a very serious obstruction was present in the lungs. It was a very serious question whether it would not be safer to do a tracheotomy at once rather than to delay in passing the bronchoscope. With everything ready for an immediate tracheotomy, Doctor Iglauer passed the bronchoscope and quickly removed the half of a peanut kernel, which was found lying at the bottom of the trachea, in such a position as to obstruct the breathing in both lungs, lying over the bifurcation. In this situation the child was able to expel air from the lung but the peanut acted as a ball valve when inspiration was attempted.

Upon the removal of the peanut the child made a rapid recovery.

Case No. 4. In November, 1918, a thirteen months old child was brought to the hospital with the history of having choked while the mother was feeding it milk and scrambled eggs. The symptoms were quite alarming for a time, but by the time the child reached the office, the alarming symp-
toms had largely subsided. Asthmatoic breathing was present and there was not much doubt but what a foreign body was present in the lung. However, as the symptoms were not alarming and the child arrived in the night, we decided it would be well to wait until morning and watch the case. A very small dose of morphin and atropine was administered and the child placed in a crib with the foot elevated, so as to favor by gravitation any effort at expelling the foreign substance. The following morning the child was very much improved and the mother said the improvement seemed to come on after a very violent coughing spell. An examination of the lungs showed that they were getting air better and we inferred that possibly during this coughing and vomiting spell the foreign substance was expelled. We kept the child under observation for several days, and, as no unfavorable symptoms developed, the child was allowed to return to its home.

Case No. 5. A fifteen months old child was brought in the hospital in January, 1919, with the history of having choked the day before, while eating candied peanuts. This child was not in a serious condition and we advised the mother to place the child in a recumbent position with the foot elevated and see what the condition of the child would be the following morning. We also prescribed a small dose of morphin and atropine. The child did not return the following day. I called up the family physician to know what the conditions were and he said after a coughing spell in the night, the child seemed to improve and the symptoms had largely disappeared.

Both of these cases illustrate the wisdom of not being too hasty in passing the bronchoscope, as I consider the possibility of passing the bronchoscope, even the small four millimeter size as not without danger of edema of the larynx.

These recent cases have tended to impress upon me several points where I think we might improve our technique in this class of work. The difficulty in making a physical examination with the child in a frightened and partially asphyxiated condition can be partially overcome by the administration of a small amount of morphin and atropine, which, first tends to dry up the secretion in the bronchi and second to slow up the respirations and conserve the strength of the child and also tends to lessen any shock connected with the necessary operative procedure. The morphin tends to quiet the child and also protects it from attacks of traumatic asthma. I also like to give these cases a hypodermic of camphor in oil, as I think it also tends to lessen the shock, and stimulates the child.

If the foreign body in the lung is soft material, such as scrambled eggs, it is better to be conservative and not do a tracheotomy immediately, but to wait and put the child in a position with the head down. Frequently such cases will cough up the soft material within twenty-four hours and then go on to a perfect
Foreign Bodies in the Bronchi.

Recovery. After a tracheotomy has been performed it is well to keep the patient on iodides for the purpose of liquifying the bronchial secretions, so as not to allow them to become hard and dry. If the air in the room is not kept moist and the tracheotomy tube has been inserted, the secretion in the bronchial tube will sometimes become very decidedly inspissated and form a crust, which is almost identical to a foreign body.
TYPES OF ORBITAL ABSCESSES AND EXOPHTHALMOS DUE TO INTRANASAL SUPPURATIVE PROCESSES.

By DERRICK T. VAIL, M. D., Cincinnati, Ohio.

Twenty-five or thirty years ago nearly all abscess formations of the orbit were diagnosed as either primary or metastatic. The primary form was idiopathic. The metastatic was due to a septic embolus lodging in a capillary of the orbit behind the eyeball carried there by the arterial blood stream and followed by abscess formation with all the classical symptoms: "tumor, rubor and dolor."

The process was variously denominated "abscess of the orbit," "phlegmon of the orbit," "orbital cellulitis" or "pyemic abscess." About that time the pathogenesis underwent a slight change of view and "septic thrombosis" of the orbital veins or "orbital thrombosis" occupied the stage. The pathological process was then thought to be due to infection of the venous blood of one of the orbital veins from pathogenic bacteria which had gained access to the venous current draining some contiguously infected accessory nasal sinus or from some remote septic process elsewhere in the body and this view is still held to be the case by many today.

The cases reported in this short paper and others of like nature encountered by the essayist argue that neither of these views is correct. In each of the following cases it will be noted a hole was demonstrated to exist in the periosteum of the orbit at the time of operation demonstrating that the pus had broken through from under it. If septic embolism or septic thrombosis was the causa morbi no such hole or laceration of the resisting periosteum would be present. The true conception therefore seems to be that the abscess process first begins in a locked-up accessory nasal sinus, that as swelling takes place the least resisting wall of that sinus gives way either by necrosis of its thin bony shell or from increased tension within the affected sinus and the pus finds a way out of its sinus-confining into the adjacent space wherever that happens to be. If the wall of the cerebral fossa gives way there is a localized pachymeningitis and an extra-dural abscess produced causing the same train of symptoms we note when extra-dural abscess occurs in mastoid disease: languor, head-
ache, aprosexia, etc. If this extra-dural abscess is of the fulminating type or if the dura ulcerates and gives way the pus will flood the brain causing general septic leptomeningitis or more often abscess of the frontal lobe. If the pus from the primarily affected accessory nasal sinus breaks through the orbital wall of the sinus the same pathological process results, viz., first, elevation of the periosteum of the orbit and later on the periosteum bursts and the pus is free to flood the tissues of the orbit resulting in orbital abscess. The chill and rise of temperature announce that a new area is invaded and about to be abscessed. Nature’s usual program is to evacuate the pus of an acute sinus abscess through the wall of the nasal chamber and a spontaneous cure results. We often hear a patient recite how he had a violent headache on one side or pain about his eye and temple during or after a severe cold or attack of influenza and that all at once there was a gush of pus from his nose. “Some thing broke” he says, and the relief was immediate. A search in the nose of such a patient after recovery will reveal very often a perfectly normal structure throughout.

Here is a case in point:

A medical man aged 40 was taken with the grippe in 1914. Middle ear and mastoid complications set in on the right side. Two myringotomies and finally a mastoidectomy brought about a cure. During this siege I ordered X-Ray pictures showing his anterior accessory nasal sinuses as he complained of much pain over the right eye corresponding to the floor of the frontal sinus at the upper inner angle of the right orbit. The plates came back showing the large right frontal sinus totally dark while that of the left was very bright and clear. Diagnosis of acute empyema of the right frontal was very positive but patient was too sick with his mastoid trouble to have any nasal surgery. In five days there was a gush of bloody pus from his right nostril and his symptoms were immediately relieved. X-Ray plates taken later showed a perfectly clear sinus on the right side as well as on the left. Five years have passed since then and he has never had a recurrence of the slightest symptom of further trouble.

If the pus from the storm-brewing sinuses breaks through the orbital wall creating orbital abscess there may be a speedy recovery from the swollen nasal mucosa for the pus then has unloaded itself in the orbit and the turbinated regions as viewed with the rhinoscope are in such cases not very abnormal in appearance. This finding will throw the examiner off the track for he natur-
ally expects evidence of sinus disease by intranasal inspection. The fact is he is too late in his examination for the pus has already escaped into the orbit and the turbinals relieved of pressure and congestion speedily resume a normal or near-normal appearance. Much of the pus that in this way floods the loose tissue of the orbit behind the eyeball is carried away by rapid absorption into the veins and lymphatics, but invariably and in a few hours there occurs the deep boring pain, the chill, the prostration, the high temperature and the exophthalmos with edematous eyelids, altogether producing a striking clinical picture. The position of the proptosed eyeball usually declares which sinus in the nose was the seat of the primary abscess.

In this paper I shall report four cases of exophthalmos from abscess of nasal accessory sinuses each being a type for a different sinus. They are:

I. Exophthalmos and thrombosis of cavernous sinus, right eye from sphenoid abscess.

II. Exophthalmos from abscess of the posterior ethmoid sinus in which the eyeball was pushed straight forward.

III. Exophthalmos from abscess of the anterior ethmoid sinuses in which the eyeball was extruded forward and towards the temple.

IV. Exophthalmos from abscess of the frontal sinus in which the eyeball was extruded to less extent and pushed downward.

It so happens that in each of these four cases the right eye was affected and it is a curious fact that in my practice the right eye was involved in every instance excepting one among twelve cases that I can recall.

*Patient,* Miss E. W., age 27. *History:* Always had pain over right eye during menstrual period but the eye never was inflamed before.

*Present Illness:* On September 9, 1915, headache set in so severely that the patient became prostrated; had a severe chill which was repeated on the following day. Twelve hours after the chill of September 16, the family physician brought her to my office because of exophthalmos and chemosis of right eye. Patient never had suppuration from nose or ear.

*Examination:* Temperature 101.2°. Pulse 104. Pale and anxious expression. Rhinoscopic examination entirely negative. Slight ulcerative tonsillitis. Right eyeball is pushed straight forward at least 15 mm. and fixed. Right pupil dilated two-thirds and very sluggish in reaction. Vision, counts fingers at two feet; field of vision dull and very limited. Fundus much congested, veins dark and distended. Optic disc very hyperemic. Left eye negative, vision 20/20.

September 18: Swollen eyelids; cornea almost hidden under chemosis; tissues very tense and tender; eye blind. Severe chill followed by temperature 104.5°; beginning edema of left orbital tissues; patient in a very bad way,
unconscious and moaning. Deep incision at upper inner angle of right orbit evacuated half-ounce ill-smelling dark liquid. Vertical external canthotomy was performed to relieve pressure; probing of the ethmoid region through the incision failed to encounter rough bone; deep probing encountered bone at nasal side of orbital apex proving that pus had broken through the periosteum from beneath. Patient rallied after operation and became partly conscious but soon sank in a state of coma and died four hours afterwards.

The post mortem was conducted the next day by my son, H. H. Vail, at that time a student from Harvard Medical who was home on a visit. I first desired to see if it were possible to drill into the cavernous sinus through the nose as suggested by Langworthy of Dubuque (see Wood's Encyclopedia of Ophthalmology, Vol. III, pp. 1807-1809). I had no trouble to bore right into the right cavernous by following the directions laid down by Langworthy (l.c.) but at the post mortem we saw the futility of such a procedure being effective in vivo for the picture was that of solid septic thrombosis. The venous blood of both cavernous sinuses together with that of the community sinuses, in fact of all of the large venous channels of the anterior and middle cerebral fossa was stagnant with ropey clots shot with pus. Moreover there was a general anterior septic leptomeningitis involving the membranes of both frontal and temporosphenoidal lobes. The orbital wall of the right sphenoidal cavity was black with foul necrosis; pus had burrowed from this sinus into the apex of the orbit from whence the ophthalmic vein was infected, soon followed by thrombosis of the right cavernous sinus and extending to the other venous channels as reported. The picture (Fig. I) was taken during life just before operating.

Patient, Mrs. E. C., aged 26. Patient of my partner, Dr. F. W. Lamb.

History: August 31, 1917: Has had purulent discharge from right nares for five years. Five days ago took "cold" in the head and two days ago right eye became swollen.
Examination: Marked edema of right eyelids and conjunctiva. Exophthalmos present; movements of right eyeball restricted in all directions. Vision: Finger movements only. The eyeball is pushed straight forward.

Operation: by Dr. Lamb August 31. General anesthetic. Deep incision made through the eyelid above and below internal rectus muscle. Probing encountered exposed bone through a periosteal rent corresponding to the posterior ethmoid cells. Pus flowed from these incisions and from the nose in considerable quantity for twenty-four hours. Syringing through the incisions permitted the water to pass freely into the nose.

September 3rd: Large baggy abscess of septum narium on the right side. Incision rewarded by free discharge of yellow offensive pus which by microscopic examination showed offending organism to be an encapsulated diplococcus (pneumococcus). The posterior ethmoid cells being adjacent to the vomer evidently furnished an outlet of pus under the periosteum of the septum. (Query: Is not abscess of the septum due to sphenoidal or posterior ethmoidal empyema?)

FIG II.

Case 2. Acute orbital abscess and exophthalmos right eye and abscess of septum narium with complete sloughing of cartilaginous septum due to abscess of right posterior ethmoidal sinus; enucleation final recovery.

September 25: Operation by F. W. Lamb: Ethmoid cells right side excertated; necrosis of bone encountered; exophthalmos still marked; cornea has sloughed; discharge continues unabated. Left eye normal. Vision 20/20.

October 6th: Operation by D. T. Vail. Right eye enucleated; probing the depths of the wound on nasal side permitted the probe to pass freely in the posterior ethmoidal cell region near the apex of the orbit.

The cartilaginous septum came away leaving the mucosa and no perforation but the patient has a marked nasal deformity (see picture Fig. 2). The discharge from the orbit and nose continued for several months and there were repeated light curettements performed both by Dr. Lamb and me and finally in January, 1918, the parts healed.

March 28, 1918. There is marked shrinking of the orbital tissues so much so that an artificial eye cannot be worn. Dr. Lamb performed a successful plastic operation for reception of a glass eye which patient wears now with great...
improvement to her looks and considerable satisfaction. The appearance of
the eye during the height of her trouble is shown in the photo-cut, Fig. 2.

Patient, Dr. J. W. C., aged 56. History: Jan. 8, 1918. A week ago
noticed pain in the right side of the face and region of the right ethmoid.
Throat was inflamed and tonsils were swollen. The home physician performed
uvulectomy for relief of edema of the soft palate. Two days ago right eye-
ball became bulged forward and toward the temple. The vision was soon
blotted out.

Examination: Jan. 9. Temperature 99°, pulse 100. The right eye is pro-
truded forward and outward and is fixed; pupil is dilated and fixed; vision
nil; cornea clear; optic disc swollen and vessels tortuous and distended;
nose reveals crust formation and the right middle nasal fossa obliterated by
swollen ethmoid body.

Operation. Jan. 10. Extension of right ethmoidal cells under cocaine;
probing demonstrated the os planum absent and probe passed into the orbital
cavity. Some bloody pus escaped but patient was not relieved and so on the

FIG.III.

Case 3. Acute exophthalmos from abscess of right orbit
due to recrudescence of a chronic empyema of the anterior
ethmoidal cells in atrophic rhinitis, death from supposed
abscess of the brain.

following day, January 11, under general anesthetic the orbit was entered
by incisions carried through the upper and lower eyelids above and below the
internal rectus muscle. Probe passed through a rent in the periosteum into
nasal cavity; syringing after the operation daily for two weeks after per-
mitted the fluid to pass freely through the orbital incision into the nose. The
convalescence was slow and stormy, much prostration and headache with transi-
tory paralysis of left arm and numbness and weakness of this member com-
plained of at all times: The clinical picture was that of extradural or frontal
lobe abscess. Consultation with two physicians, one a neurologist, failed to
locate any definite cerebral lesion.

February 12: After slow but positive improvement patient suddenly de-
volved a backset. The orbital tissues were again swollen and the eye was
extruded nearly out of the socket. Curetting through the old incision evacu-
ated large masses of necrotic tissue. Evidently all the muscles of the orbit
had necrosed. Patient begged to be sent home and soon after his arrival
there he sank in a comatose state and died. The appearance of his eye at the height of his trouble is shown in Fig. 3.

Patient, J. L., age 52. History: On August 25, 1917, was seized with severe pain in the right eye and eyebrow. Fifteen years ago had a similar attack of pain and it subsided spontaneously. Patient thought this attack would subside too but was brought to my office on September 14, 1917, with pain still a prominent symptom and swelling of the upper eyelid.

Examination: There is much edema of the right side of the forehead and also of the right upper eyelid. Some chemosis present and some exophthalmos, but not marked. The eyeball is displaced forward, downward and laterally away from the upper inner angle of the orbit; Vision unaffected; ophthalmoscopic examination negative. There is fluctuation over the right superciliary ridge. The upper straits of the nose contains creamy pus and a trail of the same is seen on the back wall of the pharynx on the right side.

Operation: September 14. Incision below inner end of the right eye-brow under novocain liberated an ounce or so of thick pus. The periosteum had been stripped up and perforated by pus burrowing. Search with a probe disclosed a bone fistula leading from the external abscess into the frontal sinus.

September 16. The right ethmoidal labyrinth was exenterated and Good's rasp used to enlarge the frontonasal duct. I was able after the operation to pass a large eustachian catheter into the right frontal sinus and to wash out this cavity, the outflow taking place through the incision under the brow. I was able also to pack a long strip of gauze into the frontal sinus through the nose route. The case is uninteresting from this on because of the slow and at times stormy progress. He stoutly refused anesthetic operation. I had designs on him for a Lathrop operation but he answered me nay. After several apparent cures and a repetition of the symptoms in milder degree he finally ceased coming. His vision in the affected eye was at all times normal. The appearance of his eye is shown in Fig. 4.
Concluding Remarks: The Wassermann was negative in each of these cases. The urine was free from sugar and albumen in each. Each of them carried a chronic bone disease of an accessory sinus of the right side of the nose for months and years before the eye storm. Two of them died. Three were blind in the affected eye within seventy-two hours after the onset.

Comment: It would seem that the rational surgical procedure in all cases of acute exophthalmos from abscess arising from accessory nasal sinuses would be to evacuate the pus by intranasal operation and desist from the deep incisions into the orbit through the eyelids. This was done in Case III but failed and I very much doubt that any operation will reveal pus until after three days at least have elapsed and usually five or six, during which time the eye is usually destroyed. In the days before the modern ethmoid or sphenoid operation I incised orbital abscess externally in seven cases and six of them recovered with normal vision; one died from brain abscess. Six of the seven were young subjects, adolescents who had developed the abscesses during or following attacks of tonsillitis, measles or scarlet fever.
MEETING OF THE MID-WESTERN SECTION, HELD IN DENVER, COLORADO, MARCH 1, 1919, UNDER THE CHAIRMANSHIP OF DR. CLAUDE E. COOPER, OF DENVER, COLO.

EAR COMPLICATIONS SEEN IN THE RECENT "INFLUENZA" EPIDEMIC.

By WILLIAM C. BANE, M. D., Denver, Colo.

The manifestation of otitis media as a complication in influenza is usually quite common. Generally the otitis is severe, characterized by excruciating pain in and about the ear. Bullae in the bony portion of the canal and on the drum-head, filled with bloody serum, are frequently present. Early rupture of one or more bullae is followed by temporary relief or modification of the pain in the ear.

During the recent epidemic of influenza there were a greater number of persons ill with the disease than at any previous period since 1890. The almost complete absence of ear complications in the early months of the recent epidemic caused me to make inquiry of some of our general practitioners as to the percentage of influenza patients in which otitis media was observed. The number of influenza patients treated by six practitioners of whom I made inquiry was 1818. The number of these patients with ear complications was 34 or 1.9 per cent. These cases varied in severity from the mild type that recovered without incision or rupture of the drum-head to the severe type requiring free incision of the membrana tympani and prolonged drainage. None of these cases came to operation on the mastoid. During the past three months, as the number of patients having influenza diminished, those with otitis media have been more in evidence.

My service in the City and County Hospital ended yesterday. During this service of three months we had five cases of otitis media. Two of these cases had mastoiditis. One developed during pneumonia and involved both ears and mastoids and resulted in operation upon both mastoids at the same time. The other case had mastoiditis well advanced before he entered the hospital. Both cases were dressed by the so-called blood clot method and recovered rapidly.
During the epidemic twenty-four cases of otitis media came under my care. Six of these developed mastoiditis and two came to operation, the ones above referred to in the City Hospital cases. In four cases a bacteriological examination of the discharge was made by Dr. Burdiek. In four cases the staphylocoecus prevailed, but in one of these cases streptococci were also present. In three cases autogenous vaccine was used, but whether of benefit I was unable to decide. In one case the microorganism was staphylocoecus hemolyticus. Both ears were involved. A peculiar condition was manifested in one ear of this patient. On the third day following incision the drum-head began to break down and within two days there was a large perforation where the membrane had been incised. This perforation was slow in healing, requiring nearly one month. In two of the patients the mastoiditis disappeared rather rapidly under local application of the “ice poultice.” It is remarkable to me that there was such a small percentage of patients with ear complications in the recent epidemic of influenza as indicated by the statistics furnished.
TIGHT STRICTURES OF THE ESOPHAGUS DUE TO LYE BURNS.

By GEORGE F. KEIPER, M. D., Lafayette, Indiana.

Permit me at the outset to qualify the title of this paper to refer to those strictures of the esophagus which the general practitioner or surgeon is unable to dilate with the ordinary instrument at his command and blindly too. Because of failure to dilate the stricture it is referred to the laryngologist as a last resort before attempt is made to perform gastrostomy to relieve the patient of water hunger, which is always more to be feared than food hunger, for a man may go forty days without food but he cannot survive three days of water hunger. In this connection I reiterate all that I wrote in the paper read before the 1912 session of this Society and the subsequent papers of Mosher and Jackson.

The etiology of strictures of this sort lies primarily in gross carelessness. Too often concentrated lye in solution is left within the reach of small children after cleaning the kitchen sink. The inquisitive child proceeds to investigate the contents of the vessel containing the lye and too often proceeds to drink the solution with the usual distressing results too commonly seen by us. A thimble full of lye in solution thus is sufficient to produce a very tight stricture of the esophagus as in the case which I report and illustrate. These lyes and cleansers are corrosive poisons and if sold by a druggist the poison label with the skull and cross bones must be affixed as well as directions for administering the antidote required in case of poisoning. But the grocer next door sells them without these precautions, and with impunity.

In the barn on the farm is usually found a medicine chest containing the common remedies used for treating the live stock. In it is usually found a bottle of hydrochloric acid, which is used to burn warts off the legs of the horses and cattle. It is usually within reach of small children and in two instances in my own practice the acid had been ingested by small children with marked resultant inanition. But for a wonder in neither instance was a stricture of the esophagus found. However the mucosa of the stomach was in a large measure destroyed in each instance.
Haste in dilating strictures of the esophagus after ingestion of the corrosive fluid is to be deprecated, in the great majority of cases for fear of perforation of the softened esophagus rendered thus by the chemical reaction of the corrosive poison on its tissues. In fact the stricture does not form immediately after the accident. It may take several weeks of cicatrization to form it, before it is noticeable in the inability of the patient to swallow well.

Again no attempt should ever be made at bouginage until two sets of X-ray plates are made to locate accurately the site extent and character of the stricture, one set laterally and one set anterior-posteriorly, after the patient has swallowed the usual bismuth mixture. These are absolutely necessary in order to give the information needed. Moreover no bougie should ever be passed except under direct inspection through the esophagoscope, illuminated in the usual fashion. Blind bouginage is too dangerous a procedure. In thirty-four cases of cicatrical stricture examined postmortem in the Pathologic-Anatomic Institute in Vienna between the years 1877 to 1886, death was due to perforation by the bougie in no less than fourteen.

As large an esophagoscope as possible should be gently passed in order to dilate the esophagus and thus render as easily as possible the location of oftentimes the very narrow opening into the stricture. In all manipulations the utmost care and gentleness is to be observed. Above all things we must avoid sandpapering the esophagus, to paraphrase a saying of the genitourinary surgeons. All instruments should be carefully annointed before introduction.

The great majority of these strictures occur in small children. Shall we give an anesthetic each time we introduce our instruments of dilatation, is the question asked often in preparing the patient for the operation, Personally I believe the frequent anesthesias needed for the as frequent dilatations to be dangerous. The normal esophagus has but little sensation. What shall we say of the damaged esophagus in which whatever nerve endings it possessed before the accident were destroyed by the corrosive action of the ingested poison. We may need to make from thirty to sixty dilatations before the child will be able to swallow with ease.

The child is pinned in a sheet or blanket in such a fashion that it will be unable to use hands or feet in resistance to the nurse holding the child for the introduction of our instruments. The child is laid flat on the operating table while the assistant holds
the head over the end of the table where the operator sits. If the
little one refuses to open the mouth for the introduction of the
mouth gag, tickling the fauces with a probe introduced between
the teeth will quickly cause the mouth to open.

These strictures are often multiple and very tortuous. For
dilating the former, I have found the two prong dilator of Jackson
quite valuable because it can pick up the first one, dilate it and
then take the next one thus and the rest in order.

In dilating these tight strictures I also like to use the Jackson
modification of the Guisez instrument, the flexible filiform on the
long steel staff. These are made in different sizes graduated from
the very smallest to a fairly large size, there being ten in the set.
If the steel staff be perforated just where the flexible woven end
is attached to the steel shaft, a string can be passed and a string
cutting esophagatome made, better than the original model of
Jackson, which I have not been able to use well in this class of
cases because it is a rigid instrument and will not pass a long and
tortuous stricture.

The report of the following case is rather typical of the usual
run of these cases, pronounced impermeable by the general
practitioner and surgeon, but which to us offer abundant oppor-
tunity for doing great good to these unfortunate little sufferers.

CASE REPORTS.

June 10th, 1917, Marshall D. age 3, of Pine Village, Indiana, was brought
to my office, because he regurgitated his food and was losing flesh. Four
months prior to this visit he swallowed just a thimble full of concentrated lye
solution carelessly left in its container by his mother after she had cleaned
the kitchen sink. Steps were taken forthwith to neutralize the poison and
seemingly were successful. However for one month prior to his visit to me
it was noticed that swallowing was becoming increasingly difficult. Regurgita-
tion of food was more and more frequent.

I sent him immediately to St. Elizabeth Hospital for X-ray examination and
two sets of plates were made as suggested above. The plate anterior-posterior
I show. The other was lost but it is the more valuable of the two because it
shows the stricture to taper towards the backbone. With the information thus
secured the child was pinned tightly into a sheet and laid on the operating
table, an held by one of our sisters, while my assistant held his head over the
head of the table. In this position I passed a fairly large esophagogoscope,
possible because of the dilated esophagus above the stricture, right down to
the stricture. On looking down the illuminated tube I was able to locate the
entrance into the stricture and was able to pass the smallest size of the
Jackson-Guisez instrument, clear into the stomach. The child was not an-
esthetized at all, locally or generally. Then larger and larger sizes were
TIGHT STRICTURES OF THE ESOPHAGUS.

passed at subsequent settings until after thirty such seances extending over a period of six months, I was able to pass the largest of the series giving the child ability to swallow as well as before the accident. Infrequent dilatations were continued three months more and the child was dismissed with the injunction however to return with the least sign of recurring trouble for many such must return occasionally for extra help. To date the child has had no further trouble. At the second seance I attempted to pass Jackson's string cutting esophagotome, but failed. Then it occurred to me to perforate the

smallest size of the filiform mounted on the stiff steel staff just above the point of juncture of the filiform to the staff and use it thus as a string cutting esophagotome and we succeeded admirably. Of course not much is gained thus in working the string back and forth but every little counts. At the last report received recently the child is able to swallow every variety of food, of course masticated as food ought to be before being swallowed.

Such a result is possible in nearly every case of tight stricture of the esophagus. The prognosis in these cases is very poor and the mortality is very high if the patient is left untreated, or even if gastrostomy is made to secure retrograde dilatation, which by the way is a much more difficult procedure than what it seems to be from its description.
A REPORT OF SOME INTERESTING CASES.

By JOHN M. FOSTER, M. D., Denver, Colo.

In presenting these cases to you, I am more impressed with the idea of the sequence of them as they have occurred in private practice within the last few weeks, rather than their extraordinary infrequency or unusual character; and I must suggest that the short length of time since these cases have come under observation and operation, that we are unable to know definitely what the final outcome will be. The first case presents some points that seem unusual to me.

CASE REPORTS.

F. O. B. Age 50. Came to me on the 7th of February, 1919, giving the following history: Perfectly well until December, 1916, when he went to bed one night feeling well and was found unconscious in his room next morning. Was taken to the County Hospital. Remained unconscious for three weeks after which time he was totally blind for perhaps another week and was unable to walk without assistance. Had the tendency to fall towards the right always. Some hemiplegia on the left side. Temperature ran up as high as 104° to 106°. Had pain and discharge from left ear following puncture of drum. Discharge continued for ten months. Remained in hospital until about the middle of February, 1917. Was in fairly good health after that with the exception of feeling drowsy and some loss of memory, until February, 1918, when he again went to sleep feeling very good and was found unconscious next morning. Was unconscious at this time several days during which time he had very severe convulsions. Remained in hospital until about the middle of April, 1918. In January, 1919, the third attack came on in the same manner as the two previous ones. Was taken to hospital unconscious, again had convulsions but no blindness following. However, did have the hemiplegia on the left side and tendency to fall to right. He had been out of the hospital two weeks when I first saw him, February 19, 1919. At this time the left ear was discharging, earache and dizziness. During this last attack the pain had been more or less diffuse over the entire head and he had been unconscious for twenty-four hours. Patient said he had suffered marked loss of hearing. Examination of the left ear showed canal free and open, perforation of the drum membrane in the attic; some collection of dried pus and scales but only small amount of discharge at that time. Hearing, voice loud minus, whisper 0/20, watch 0/40, Rinne negative. On the right side, the drum moderately retracted, lusterless, no light reflex. Hearing, voice ordinary, whisper 10,20, watch 10,40, Rinne positive. Dr. Childs reports X-Ray shows chronic mastoiditis on the left side. The general appearance of the patient was good, the temperature was normal and the caloric test failed to show any indication of semicircular canal affection. February 12, 1919, at St. Joseph's Hospital did a
radical mastoid operation with Panse flap. Evacuated about three tablespoonfuls of serum when the dura was exposed over the attic and antrum. Apparently the dura was not injured. The flow of the serum filled the excavated cavity several times, apparently not turbid, but I was unable to say definitely in regard to this because there was more or less flow of blood into the cavity at the same time. Dr. Howell T. Pershing was present at the time of the operation and after a large area of the dura was exposed, extending from the lateral sinus up and forward over the antrum and attic, without any evidence of disease, we felt that the exposure of the dura seemed sufficient and as no further evidence of disease appeared. The ossicles were still in place but necrosed so were removed. On February 23, thirteen days after the operation, we found the external wound had healed entirely, the Panse opening was quite patent and there was very little discharge from the cavity. The ophthalmoscopic examination of both eyes showed the media clear and the fundus normal in each eye, vision on the right side was 20/20 minus on the left 20/10 minus, which corrected to 20/30. Blood pressure was 110 systolic, and perimenter showed practically normal fields. Of course the time is too short after operation to say just what the ultimate outcome in this case is going to be, as this man has gone some months without an attack before; the point which strikes me as being the most interesting is the large flow of serum when the dura was exposed. Probably, at least it so occurred to me, that this was a beginning epidural abscess, and I would be very much obliged to hear the consensus of opinion as to how this thing strikes the other members present. I have in the course of my professional experience exposed the dura in a great many cases and this is the first instance, in which I have seen a decided, marked flow of serum, especially when I felt sure no communication had been made into any of the large brain spaces. At present this man seems in good condition. No pain, dizziness nor inclination to stagger and seems physically and mentally well.

The next case is that of a young Japanese boy, aged 17, apparently in fair health who came to our office on January 24th, 1919, giving a history of some deafness but never a discharging ear. He was examined carefully as to the appearance of the ears at the time and while his hearing was reduced, the drum membranes were normal, slightly congested and the hearing about one-half of normal. He had had a great many attacks of tonsilitis and sore throat and at the time his tonsils were found to contain liquid pus and were quite markedly diseased and hypertrophied. He was sent to Children’s Hospital on February 3rd, and his tonsils were removed under ether anesthesia. He made what appeared to be, an uninterrupted recovery and left the hospital the next day feeling comparatively comfortable. On February 9th, however, he was returned to the hospital complaining of pain in the right ear. His temperature was 103.4°, pulse 88, respiration 30, and at this time he was having a slight chill. Two hours afterward his temperature had dropped to 99° and be was then having a free sweat. By midnight his temperature had gone up to 101°, pulse 88 and respiration 20. An ice cap was ordered to the head as he was complaining of considerable headache. The temperature was then taken every three hours gradually dropped at noon to 97.8°, pulse 64 and respiration 20. The patient was not complaining of anything special except that he had some pain in the left side of the neck, besides a headache. No violent fluctua-
tions in temperature were occurring at this time, running from 97° up to 101° and on the 12th inst, his temperature was running about normal and patient had a good night and his physician was feeling fairly comfortable about him. The right drum was slightly congested, but not bulging and no tenderness over mastoid. He commenced having, however, a good many liquid brown stools which were quite offensive, but February 13th, his temperature was running from 100° to 99.8°, staying fairly regular. There were no chills nor sweats at this time. On the 14th, his temperature at noon ran up to 103.8°, and the boy commenced complaining more of pain in the right ear. The membrane was moderately congested and slightly bulging. At this time a free incision was made, followed immediately by a fair quantity of thick yellow pus. At four o'cloak that same day, his temperature was 104°, pulse 100 and respiration 32. His temperature remained up that day pretty constantly around 104°. The discharge from the ear was slight. He was given urotropin and his ear was washed with lysol solution. Including the 15th, these large soft stools continued, but he was having little or no rigors or sweats. His temperature during the 15th, remained pretty constantly at 104°, pulse 102 and respiration 34. The washing and urotropin were continued with very slight purulent discharge from the ear. No saggity of the canal wall nor mastoid tenderness.

On the 16th he had liquid yellow defecation, strong odor and his temperature at noon was 101° and then he had a slight chill which was followed by a sweat and his temperature ran up to 104.6° in the evening. By 4 o'cloak the next morning, his temperature had dropped to 97.4° at 4:30 it then went up to 102°, but dropped back again at 7:30 on the morning of the 17th to 97.8°. At noon it was 101°, pulse 108, respiration 30. At 4 o'cloak in the afternoon it was 102.2°, pulse 90, respiration 28. He had another slight chill then and continued liquid defecation, very strong odor. The urotropin and lysol had been continued during this time. On February 18th, at 7.30 in the morning his temperature was 99°, pulse 88, respiration 30 and by 10:30, his temperature was 103.6°, pulse 92 and respiration 34. No local ear symptoms except moderate purulent discharge. He was sent to the operating room and a Schwartz mastoid operation was done on the right side, and when exposing the lateral sinuses it was found plugged with a more or less organized purulent mass, extending back well towards the torcula and down to the bulb before free bleeding was gotten at all. The bleeding was so unsatisfactory from below that it was decided to excise the internal jugular vein, which was done. The condition did not improve after operation and the temperature remained up as high as 104.5° up to 105.8° and the patient died with a temperature shortly before death of 107.1° by rectum. The thing that strikes one in regard to this case particularly is the very slight ear symptoms that preceded and accompanied this grave condition. The discharge from the ear was very slight at all times and the pain was practically negligible. No saggity of the posterior superior canal wall and no tenderness over the mastoid and no special pain, and it was rather a surprise to find how seriously the lateral sinuses was implicated considering the ear symptoms along. Of course the temperature, the rigors and the sweats and the defecation showed there was a general septicemia taking place but the symptoms in the ear seemed so trivial that it was with a good deal of reluctance that we could feel all the trouble could originate in this area with so few symptoms. Did the lack of
resistance in the Japanese boy have anything to do with it or not? The secretion from the ear was not examined at any time but a blood culture was taken and showed a pure strain of streptococcus hemolyticus.

The next case is that of a little tot aged three, who came to me on the 15th of February, 1919, giving a history of having had scarlet fever last June and since that time has had a discharge from both ears. In July there was a mastoid abscess formed on left side and a small piece of necrosed bone came away at this time. On examination of the right ear I found a purulent discharge and a perforation of the drum posteriorly and superiorly. The left side showed where a mastoid abscess had broken through and had healed nicely. The child’s general appearance was good, was well nourished but there was a very offensive discharge from the left ear and a moderate amount of fairly offensive discharge from the right. Upon looking into the canal on the left side, I found quite a large sequestrum, which upon removal appeared to be part of the inner ear. This came away in two pieces and was large enough to wedge itself tightly in the canal and was broken in attempt to remove it. In doing a radical mastoid operation on February 18, 1919, at Children’s Hospital, I found that the inner ear had sloughed out entirely, the ossicles were gone an there were no details of the semicircular canals or cochlea to be made out. The necrotic condition had extended up to and including the bony plate next to the dura which was exposed and there was quite a large mass of necrotic tissue extending down towards the tip in the mastoid although the mastoid itself naturally was small, on account of the child’s age, but there was no extensive ebonization of bone present in this case. The child now is apparently making an uninterrupted recovery, comes to the office for dressing and is not running any temperature. I report this case simply as a demonstration to show how extensive the destruction can be from scarlet fever. I suppose all of you have seen cases of absolute deafness caused by scarlet fever where the inner ear has been destroyed as it has been in this case, fortunately in the left ear only. On the right side, while there is a destruction of tissues and probably loss of the incus bone, the hearing is quite good, only slight reduction from normal. On the left side, however, there is complete deafness.

This case is a man, aged 36, F. C. F., who came December 20, 1918, giving a history of having had an attack of influenza which was accompanied by bronchopneumonia which left him very weak. A few days before, about the 18th of December, 1918, he began to have pain in the left ear. The drum membrane at the time he was seen was congested and bulging and under local anesthesia a free myringotomy was made. There was a fair amount of purulent discharge following immediately and for a day or two he had a great deal of pain and tenderness over the mastoid and on December 27, 1918, there was sagging of the posterior superior canal wall and the temperature was up to 102°. His lungs were gone over carefully by Dr. J. M. Perkins, and he found them free from inflammation. A mastoid operation was thought advisable. A Schwartzte operation was done on that afternoon which was December 27, 1918.

During the operation the lateral sinus was exposed freely and found to be healthy in appearance. Three days after operation on the 1st of January, his temperature dropped as low as 100.4° but next morning it ran up again to 105.6°. It was taken then every three hours but did not get lower at any time than 103° for the next four days. On the 4th, however, it dropped
down as low as 102.4°, but soon came up again to 105.6° at which time there was noted to be quite a marked erysipelatous area about the left side of the face and left temple. Dr. Perkins again saw the patient and felt that there was no question but what it was a erysipelatous inflammation and the smear from the ear showed streptococi. Streptococcic serum was given at this time and repeated again on the second day. The temperature remained as high as 102° up to 105° until the 9th at which time it was 102.2°, but on the evening of the 9th, it ran up again as high as 105.6° and at that time Dr. Arndt was called in consultation and the complex of symptoms was pronounced to be meningitis. At this time he was having pain and swelling in the joints, but at no time had he had rigors or sweats and at no time had there been sudden drops or elevations in temperature. It ran along as high as 102° rather constantly and then up as high as 105.5°. The erysipelatous swelling was at all times anterior to the ear, involving the tragus as well as the skin of the cheek but at no time was there much swelling over the mastoid itself nor did the stitches pull out. On the 11th the mastoid wound was looking about as usual after this length of time. On the afternoon of the 11th, the temperature dropped to 102°. On the 8th instant the patient became delirious and remained so until his death on the 12th, at which time his temperature was above 107°, by axilla. Two days before the patient's death when he was unconscious, shortly after receiving the antistreptococcic vaccine, he became conscious for an hour or two. He had involuntary movements from his bowels and ordinary symptoms of meningitis. This case is especially interesting inasmuch as the long duration and serious illness, first the influenza, followed by double pneumonia, then acute earache with purulent discharge followed by mastoiditis, then a erysipelatous inflammation of the same side of the head and face and at last a meningitis which finished the case. This is another puzzling instance of the influenza which has rather baffled all of us as to causation and treatment.
MEETING OF THE SOUTHERN SECTION, HELD IN
RICHMOND, VIRGINIA, MARCH 1, 1919, UNDER THE
CHAIRMANSHIP OF DR. CLIFTON M. MILLER, OF RICH-
MOND, VA.

MALIGNANT TUMOR OF THE LARYNX; OPERATION BY
DIRECT LARYNGOSCOPY.

By J. W. JERVEY, M. D., Greenville, S. C.

In a paper read at the annual meeting of the Medical Society
of the State of New York at Albany, in May, 1918, and published
in the New York-State Journal of Medicine in September of the
same year, Hubert Arrowsmith, of Brooklyn, in a postulate as
modest as himself, has this to say: "I think it may be stated as an
aphorism that the cure of laryngeal malignancy by internal
surgery is decidedly more a matter of good luck than good or
prudent management."

Let me remark, in passing, and at the outset, that I may not be
misunderstood: Frumentum Confiteor, I am willing, for many
reasons, and I think most of us are, to subscribe to the aphorism
above. But did I not have recent and excellent precedent for
my method—and my good luck? For did not the also modest Har-
on Smith of New York, at a meeting of the Throat Section of the
New York Academy of Medicine, in October, 1917, relate of his re-
moval of a laryngeal carcinoma by the internal method, with no
recurrence after eighteen months? And did he not afterward
naively say: "Of course, had I known that this tumor was malig-
nant, I would have not removed it except by more radical mea-
ures." He had mistaken it for a papilloma. I mistook mine for a
fibroma. Yet who amongst you is without sin and can cast a stone;
and who amongst you can say that Smith's patient and mine are not
better off by reason of what might be termed the accidental astute-
ness of the error?

But our good and able friend Arrowsmith does not content
himself with the simple statement quoted above. He winds up
his altogether admirable paper by ramming his point home, and
with a characteristically energetic twist breaks it off with these
words: "He is a temerarious operator who intra-laryngeally
starts anything with a malignant neoplasm. He may in rare
instances not have cause for regret—that, assuredly, will be his
good fortune—nothing more." Again, let me hasten to endorse
the sentiment, at the same time asking your indulgence for a brief
relation of a case, which, being accepted as an exception, will
thereby prove the rule.
On June 23rd, 1918, P. T., male, aged 50 years, cotton mill worker, was referred to me by Dr. R. R. Berry, of Buffalo, S. C. For eight or ten years he has been troubled with an obstruction in his throat which interfered with free breathing. This has very gradually become more pronounced. He has had in past few years some soreness and difficulty in deglutition, but recently this has been better. The patient is a man of average size and general appearance, and his health has been generally good save for the nervousness and worry caused by the trouble in his throat. He is convinced that he has some form of heart disease, because on lying down to sleep the obstruction is more marked. For several years he has had a curious squeaky phonation and almost complete aphony.

Indirect laryngoscopy readily reveals the source of the trouble as being a deep red, slightly lobular tumor of dense formation, the size of the distal joint of the thumb, attached to the left posterior border and ventricular surface of the epiglottis from about the aryepiglottic fold to the ventricular fold. An opinion as to malignancy was withheld pending microscopical examination of the specimen, but privately, after due consideration of the history (long period of growth, absence of pain and hemorrhage, apparent firmness, smoothness and integrity of neoplasm, etc.) I concluded that the growth was benign and advised removal under local anesthesia. This I did with forceps and snare, with little difficulty, using a Jackson direct laryngoscope, with the patient in the Johnston position.

Immediately following the operation the patient arose from the table, with practically complete restoration of normal phonation. Recovery was prompt and without incident, and there has been no recurrence—eight months having elapsed.

Macroscopically (and while in situ) I regarded the tumor as a fibroma, though there was but little hemorrhage (which I feared) following the operation, and I made a note to this effect on my case record. The tumor was sent to Dr. K. M. Lynch, of Charleston, S. C., chief of the pathological department of the Medical College of the State of South Carolina, who reported that the tumor was "apparently endotheliomatous and therefore malignant and likely to recur." I realize that a sufficient time has not yet elapsed for the hope of safety to be indulged in.
THE MANAGEMENT OF INFECTIONS OF THE AIRWAYS.

By IRVING WILSON VOORHEES, M. D., New York City.

I have prepared no set paper, but have jotted down a few ideas on a very large subject which if gone into exhaustively might fill several sizable volumes. I merely wish to call attention to some salient facts in the treatment of respiratory infections which have either been overlooked or have not been sufficiently emphasized.

It is going to be recognized more and more that the majority of acute infectious diseases find a site of origin somewhere along the tortuous path of the airways. Recent studies of carriers have shown that a great number of people in a fair state of health are harboring in their systems enormous numbers of pathogenic bacteria which are capable of starting a new and severe infection when transferred through ordinary contacts of social customs to new and favorable soil. The diphtheria bacillus, the bacillus typhosus, the pneumococcus, streptococcus, meningococcus and many others may exist in the nose and throat without giving any signs of their presence. Physicians and nurses in the wards of hospitals frequently carry all of these bacteria at various times in their airways but go about their work unconscious of any danger to themselves or their charges. Such are for the most part temporary carriers and, once they are away from the contagious atmosphere or source of supply for a few days, the bacteria are no longer to be found. An acute carrier is one who has recovered from an attack of a disease and who through convalescence and for a few days thereafter shows the organisms to be still present. If the bacteria persist in the cultures taken for some months or years, the infected person is said to be a chronic carrier. The study of carriers in this war period has shed new light on the spread of communicable disease and has emphasized the necessity of taking at least two negative cultures from all cases before discharging them from quarantine.

The difficulty of sterilizing any mucous membrane tract after infection is obvious but it must be done if public health is to be safeguarded, and the newer science of medicine must see that it
is done. This is especially true regarding the so-called "missed" case where the patient suffers only a slight indisposition and no one thinks it worth while to examine the discharges bacteriologically.

The experience of Great Britain in the outbreak of cerebrospinal meningitis in the camps has been of great help in working out the problem of the carrier in this country. The findings of the British Commission which studied this matter exhaustively have been of aid to us in working out our own infectious epidemics. It is too extensive to be more than mentioned, but will well repay a careful reading. This commission came to the conclusion that every case of cerebrospinal fever was an instance of an overlooked carrier. When a man reported sick, cultures from the nasopharynx enabled one to make a positive diagnosis within forty-eight hours. The British tried a number of antiseptics in their efforts to sterilize the respiratory mucous membrane, but finally chose chloramine solution as the most effective and least injurious to normal body cells. They adapted an apparatus originally designed for room disinfection by the spraying of impregnated steam, to the atomization of solutions of dichloramine. The Rockefeller Institute in New York rigged up such an affair and had very good results with it, but it is heavy, cumbersome, heats up the room 20 degrees above what is desirable, and cannot be turned on and shut off promptly. Such a massive contrivance is entirely unnecessary as the ordinary power spray of the rhinologist's office is quite as effective. The patient may lie on his back with the head well extended over the edge of the table when any mixture may be sprayed into the nasopharynx or may be dropped in with a very thin pipette.

In reality the exanthemata are all examples of acute local infections of the nose and throat which quickly become generalized and offer the well known signs which lead to a diagnosis of constitutional disorder. Of these scarlet fever is the type, and it would seem that very much could be done to shorten the course of this infection and prevent imminent and dangerous complications by cutting off the supply of the infective agent in the nose and throat. The respiratory tract has always been gravely concerned in such diseases as measles, diphtheria, whooping cough and parotitis but it would seem that no concerted effort has been made to attack these from the nose and throat viewpoint. Tuberculosis is doubtless in many instances an inhaled infection, although primary tuberculosis of the upper air
tract is looked upon as a rarity. The bacillus of leprosy has frequently been found in the nasal secretions and its incidence in the upper air tract has been the cause of heated discussion in various learned societies from time to time.

We need to know a great deal more than we do at present about the causes of diminished resistance to disease. Exposure to cold, wet and fatigue have been often set down as predisposing causes, but no one has explained the mechanism of their working. Acidosis has been receiving some attention of late as favoring the action of bacteria in the system, and it has been rather a constant factor in the influenza epidemic,—so much so that the use of acid fruits to form tartrates, malates, etc., has been strongly indicated and the exhibition of such drugs as sodium citrate in large doses has had enthusiastic supporters.

The principles of treatment in every respiratory infection are as follows: (1) A culture should be taken on nutrient or blood agar. (2) The nose should be opened by means of astringents. (3) From a pint to a quart of irrigating fluid (normal saline) should be applied at stated intervals. (4) A sufficient quantity of a non-irritating antiseptic should be dropped or sprayed on the diseased surface to kill as many of the specific bacteria as possible. (5) This procedure should be repeated twice a day or every two hours if the need be urgent.

These principles vary in detail only according as one is working with the nose, pharynx, larynx, trachea or bronchi. As to the culture, one must be sure that no antiseptic has been applied for at least three hours preceding the taking. Irrigation is best carried out by a process of combined irrigation and suction as exemplified in the Nichols nasal syphon. This the patient can learn to use at home and it seems safer with respect to the ears than any other method.

The successful use of respiratory antiseptics is based upon the following protocols: (1) The antiseptic must be sufficiently lethal for the bacteria with which we have to deal in a given instance. (2) The antiseptic must not injure the mucous membrane either through its chemical or mechanical action. (3) There must be thorough contact with all infected areas, and care must be taken to see that the antiseptic action be not vitiated through dilution by the normal secretions. (4) Concentration of the antiseptic must be sufficient but not excessive in amount. (5) All conditions necessary to thorough bactericidal effect must be maintained for a sufficient length of time. Some commonly
used antiseptics are argyrol 5 to 10 per cent; silvol 5 per cent; silver nitrate 2 per cent. in a DeVilbiss atomizer No. 52, fitted with a hard rubber bottle stem. Menthol in oil, 5 to 25 per cent. is excellent in acute laryngitis, if dropped (one half to one c. c.) directly into the larynx. For the larynx, trachea and bronchi dichloramine—T in chlorozene oil is a very effective germicide. In the nose it cannot be used in acute cases because of the great reaction it sometimes engenders. It can be used with impunity in chronic nasal infection (atrophic rhinitis.) The details of its preparation cannot be entered into here, but it must be fresh every day, made up without heat, and neutral to litmus paper. If acid, it will do more harm than good.

In chronic bronchitis the bronchoscope is of aid in making applications and in following up results. No case of chronic bronchitis should be treated without a good X-ray picture of the thorax, for one may by such means find that a foreign body is the cause of all the symptoms that have so long troubled the patient. It almost goes without saying that cultures from the bronchial mucous membrane taken through the bronchoscope are a sine qua non. From such cultures autogenous vaccines may be made which in many cases are a very great adjuvant to the local antisepsis. Every chronic case is an individual problem and it may require a great deal of study in various directions before an entirely satisfactory line of treatment can be helpfully pursued. In any case it is going to be recognized more and more that any attempt at non-surgical treatment of the respiratory tract must be associated with an intensive study of the bacteriology of the airways. We must know our enemy intimately before we can hope to overcome the defenses which he sets up against our efforts to dislodge and destroy him. Every rhinologist should associate himself intimately with a bacteriologist.
BONE AND CARTILAGE GRAFTING, IN THE CORRECTION OF EXTERNAL DEFORMITIES OF THE NOSE.

(Lantern Slide Demonstration.

By LEE COHEN, M. D., Baltimore, Md.

Feeling certain that members of the Society are quite familiar with literature attesting the great strides made in this branch of surgery in recent years, it is the purpose of your essayist to confine himself to the discussion of the practical side of bone and cartilage grafting in nasal surgery, and at the same time, without desire to create an impression of originality, to make mention of experiences and observations which have proven serviceable in work done by him. A discussion of this subject, however, would be incomplete were mention not made of Merrem, Walther, Ollier, Macewen, Frangenheim, McWilliams, Carter, Murphy and last but not least, Albee, all of whose labors have so materially aided the scientific and practical development of this subject. It goes without saying that, through the wonderful opportunities afforded in the reconstruction of wounded in the great world war, now so happily ended, we may expect remarkable disclosures of improved technique and results attained.
The question whether it is better to use the bone or cartilage transplant is still a mooted one, some authorities claiming better results from bone and others from cartilage. Doubtless good results may be obtained with either, but it is the belief of the essayist that bone should always be used in situations where bone formerly existed, and cartilage employed, whenever possible, where the supporting framework had consisted of cartilage.

Following this principle, in placing a graft over the dorsum nasi, the upper two-thirds to rest upon the nasal bones is removed from the bony rib adjacent to the costal cartilage, whereas the lower third is of the cartilage itself, all to be removed in one section. A graft so constructed has two advantages: first, to furnish a more or less elastic and mobile substance for the lower end of the nose, less liable to fracture; second, the ease with which cartilage may be cut with the knife enables us to shape it as desired for the tip of the nose.

It is evident from the foregoing remarks that rib transplant is given preference. Results obtained in use of the tibia have not been so satisfactory to me, although preferred by some operators. In several instances where the tibia has been employed it has not grown fast to the underlying bone, whereas the rib after a few months became so fixed that it appeared to have actually become a
part of the nasal bones. These results have been verified clinically by several years observation and by the X-ray, which readily demonstrates new bone formation.

A word as to the method employed in obtaining graft and placing it. After exposing the seventh or eighth rib, by the usual incision, a section three sixteenths to one-fourth inch wide, and of the necessary length, is taken from the center of the outer table down to the diploic structure with a sharp narrow chisel, and a strip of cartilage slightly wider and thicker from the adjoining costal cartilage, care being exercised not to break the connection between the two portions. Thus but a small part of the rib shaft is removed, weakening in no wise the support of the chest. Further, in taking a section from the center in this manner, injury to the intercostal vessels and nerves is obviated, thus reducing hemorrhage during and pain following the operation to a minimum.

Although asserted by some that periosteum is not necessary to insure life of the graft, the consensus of opinion, I believe, is to
the contrary, and it is my inviolable custom to leave periostea
and perichondrium on at least one side of the graft, generally
that in contact with the skin.

The placing of all nasal grafts, where skin of the nose remains
intact, is done subcutaneously through incisions within the
vestibule, through which the necessary undermining of the skin
has also been done. A detailed account of this technique may be
found in the monograph "External Nasal Deformities. Correc-
tion by Subcutaneous Method," published in A. M. A. Journal,

The following conditions should be carefully adhered to:
Prevent infection by careful asepsis of the field from which the
graft is taken and that to which it is transferred, never allowing the graft to touch the skin edges during manipulation. Avoid handling implants with the fingers, gloved or ungloved, but hold with sterile forceps or some other suitable instrument which has not been used during the operation for any other purpose. The recipient wound should be freed from all blood clots, and active bleeding should be stopped before planting the graft. Finally, one must be certain that the under surface of the graft is in contact with bone freed entirely of periosteum. With a small periosteal elevator the removal of this membrane from the top of the nasal bones, as well as from the frontal notch above, is easily accomplished.

Sterile salt solution to prevent drying of the graft, though advocated, is not essential. By preparing the field for receiving graft before taking it from the site of supply, the operation can
be done so expeditiously as to obviate harmful desication, at the same time preventing a possible infection, however remote, from the use of a solution which may have become contaminated. Deformities for which grafting is required may be either congenital or acquired. A comparatively small proportion coming to me are of congenital origin, most of them being of the saddle-nose type, and in these cases, unless due to lues, the skin covering of the nose and the septal cartilage are usually found intact.

Acquired deformities frequently follow accidents such as falls, blows, etc., and here the overlying skin and septal support may have been involved. In many instances an injury, insufficient in itself to cause deformity, may be followed by a septal abscess which destroys the cartilaginous septum, with a subsequent sinking in the nose. Not a few cases are the result of a too liberal removal of the septum in the performance of the submucous resection.
How soon after septal abscess should one operate? It is my opinion that no attempt at grafting should be made until three months after all active suppuration has ceased.

The presence or absence of septal support is a most important consideration in placing a dorsal graft upon the nose. In the absence of such support, it is always necessary to furnish some substitute at the lower end of the dorsal graft. With septal mucous membrane intact, it is my custom, before etherizing the patient, to separate these membranes, under local anesthesia, as if for a submucous resection, thus preparing a bed for a thin
section of rib cartilage to extend from the anterior nasal spine up to the dorsal graft. The patient is then at once etherized and the grafting operation completed. This septal implant, if properly shaped, will also give support to a flaccid columna. Should, however, a perforation in the mucous membrane make the septal graft impossible, a narrow strip of cartilage placed in each ala nasi, one end resting on the superior maxilla and the other against the dorsal graft, will furnish satisfactory support. (See Figs. 1 & 2.)

Any suspicion of lues, it goes without saying, calls for a blood test and cure of this disease, if present, before attempting these operations.

Deformities resulting from gunshot wounds, or from any other cause which destroys a large amount of skin over the nose, require, in addition to the graft, a skin covering. This is obtained either from the forehead or arm. Much interesting work along
these lines is now being done in all countries in consequence of war injuries. Limited time, however, will not permit a discussion of this phase of the work in the present paper.

I have selected pictures of a few cases which show results of these nose transplants.

CASE REPORTS.

Case I. D., age 21. Saddle nose of congenial origin. You will at once notice that the nose is also very short and the bridge flattened to an unusual extent. Owing to thickness of the bone needed it was decided that a

![Case 4—Side View](image)

*Before operation | After operation*

graft from the tibia would be better than rib. The picture here, taken three months after operation, shows the result. This patient was observed for a year and a half following the implantation of the bone. When last seen, the graft was still movable, though adherent to the skin, and absorption of the bone to a considerable extent had taken place. (X-ray 3 months after operation.)

Case II. Miss K., age 25. Deformity, sinking of nose and retraction of columna, after submucous resection in neighboring city. Graft from the tibia had been inserted by a general surgeon, through incision over the bridge, leaving a long adherent scar. The result, substitution of a hump for the
depression, the deformity of the columna remaining. Operated by me about a year ago. Under cocaine, the septal mucous membrane was separated to receive necessary cartilage. Ether then given. Undermined skin over dorsum, and removed piece of tibia through incision within nose. Rib graft taken in manner before mentioned and placed over dorsum. A triangular strip of cartilage extending from the bridge above to the anterior nasal spine below was put in the septal pocket, supporting the dorsal graft above and holding the flaccid columna into proper position below. This patient was seen on Feb., 10th last, in excellent condition.

Case 111. Mrs. F., age 27. Sinking of nose after septal abscess, following a novel osteopathic treatment for cure of hay fever, which consisted in massaging the interior of nose with index finger, under ether. Suppuration, which nearly ended fatally, ensued. Seen by me one month later, when there was still purulent discharge from fistula of septum just back of anterior nasal spine. A small sequestrum was removed. Dorsal and septal implant inserted about three months afterward. (X-ray four months after operation.)
Case IV. Master L., age 15. Depression and lateral displacement, following trauma. First corrected lateral deformity. Later grafted rib.

Case V. John, age 20. Hump removed subcutaneously. Lower turbinate bone implanted in septum instead of rib cartilage. Dorsal graft in usual manner, using cartilage only, as lower portion of nose was most deformed.

Case 5

X-ray taken ten days after transplanting bone in septum.

This case has been discussed in a previous paper, but being of unusual interest it is brought to you for further discussion. It was one of my early cases and at that time the work was divided into three stages. In the light of further experience, I am quite certain the same result could be accomplished in one operation. It is of further interest because lower turbinate bone was
used in the septum instead of rib cartilage, and still remains as planted, there being but little evidence of absorption. This is the only instance with which I am familiar where turbinate was so used. Today I would not sacrifice the

Case 5

X-ray taken sixteen months after transplanting bone in septum.

lower turbinate when rib cartilage gives such excellent results. X-ray pictures ten days, three months and fifteen months after operation show the septal graft in excellent state of preservation.
OPERATION FOR SHELL WOUND OF HEAD.

By JOSEPH B. GREENE, M. D., Asheville, N. C.

The following case would seem of sufficient interest to merit its reporting. Patient X., age 20, private in the United States Marine Corps, enlisted at New York in January 1918, and was sent to Paris Island, S. C. for training. Here his marksmanship was high, and he qualified as a sharp shooter or sniper. He landed in France in May (1918), and was soon sent to the front.

Fig. I.
Note fragment of shrapnel imbedded in right antrum.

It was at midnight on June the 25th in the battle of Belleau Woods, now named for the American Marines, that our patient received his wound from a high explosive shell. Three Marines occupied a shallow dug-out when the shell exploded over them killing one and seriously wounding the other two. Patient was transferred to Base Hospital No. 6, where he was unconscious
until July 3. While in this hospital the patient had his left eye enucleated resulting from shell injury. He left France October 27, arriving at the Norfolk Naval Hospital November 9, 1918.

Examination showed total loss of left eye with a linear discharging sinus of left cheek over the malar bone three-quarters inch in length. There was noted a decided deviation of the nasal septum to the right. With a probe there was felt, after cocaineization, a hard unyielding substance in the region of the attachment of the right middle turbinate. There was very slight discharge from the right nostril. Transillumination showed a slight difference in the two antra, the right slightly darker than the left. The X-ray examination showed a foreign body lying in the upper back part of the right antrum just under the floor of the orbit. This was quite surprising for we had expected the fragment to be near the sinus on the left cheek, the point of entrance. There was another surprise in store for us, and the

![Fig. II.](image)

*Note fragment of shrapnel or bullet in muscles of neck.*
patient as well, when we discovered the shadow of a bullet in patient's neck, slightly to the left side. The point of entrance was directly over the tip of the mastoid. The only symptom complained of was slight pain in the region of the left orbit. The patient's general condition was good and he was up and about enjoying his rest in the hospital. There was no fever.

On December 12, the operation for removal of the foreign body was performed under ether anesthesia, supplemented by

![Fig. III.
Note fragment of shrapnel in right antrum and fragment of bullet in neck showing through left antrum.](image)

injection of two per cent cocaine with a few drops of adrenalin at the point of incision. The cheek was well retracted and a transverse incision was made through the mucous membrane over the right antrum (Caldwell-Luc) avoiding carefully the roots of the teeth. The bone was removed with a mastoid chisel, and the antrum was entered. The hemorrhage was slight due to the injection of the cocaine-adrenalin solution. The foreign body was soon located largely in the antrum, though the end protruded
into the right nasal cavity. It was so firmly embedded that its removal required the use of a curet to facilitate its extraction. Its weight was 17 grams, slightly more than a half ounce. The mucous membrane of the antrum seemed surprisingly healthy. The cavity was packed with iodoform gauze and one suture was placed in the wound. As the bullet in the neck was embedded in the deep muscles and was giving no symptoms, it was not deemed advisable to remove it. Two days later the packing was removed. There was only a slight post-operative rise of temperature. The recovery was uneventful and the patient was soon discharged from the hospital. The point of special interest is the fact that such a large fragment of shell could pass through the bony structure of the face and remain in the antrum so long without causing symptoms by its presence. The only feature of the operation worthy of note was the distinct advantage in the lessening of troublesome bleeding by the use of local anesthesia in conjunction with general anesthesia.
A SERIES OF FOREIGN BODIES IN THE BRONCHI AND ESOPHAGUS.

By HENRY LOWNDES LYNAH, M. D., New York City.

In the presentation of this series of foreign bodies in the food and air passages, the writer wishes to call attention to the difficulties often encountered in the removal of some of the intruders, the mechanical method of removal, and also the comparative ease in which many of the uncomplicated foreign bodies may be removed.

In the removal of all sharp pointed objects, such as pins and tacks, great care should be taken to see that the point is disengaged from the bronchial wall before removal is attempted. Faulty manipulation of a sharp pointed foreign body may place it in such a position in the bronchial wall as to render its removal extremely difficult, if not impossible. The prolonged sojourn of a foreign body in the bronchus makes the removal much more difficult than one that has been recently aspirated. Long-standing foreign bodies in the bronchus are usually surrounded by granulation tissue. There is also a stricture of the bronchial wall, with a resultant bronchiecstasy or pulmonary abscess below the foreign body or stricture, due to the retention of pulmonary secretion of long duration. Bronchiecstasy and pulmonary abscess usually improve, and even get entirely well, after the removal of the obstructing foreign body and pumping out of the "sponge soaked" lung and establishing proper lung drainage. Bronchoscopic dilatation of the remaining stricture and evacuation of the bronchiecastic cavity may be necessary several times before the cavity is finally cured. These are only a few of the complications which may arise in bronchoscopic foreign body extraction; the difficulties and dangers however are numerous, and perforation of the bronchial wall and sudden death of the patient from pneumothorax has been known to occur in the attempted removal of sharp-pointed foreign bodies, and one case is recorded where the bronchus was ruptured accidentally on the introduction of the bronchoscope. Therefore, extreme care on the introduction of the bronchoscopic tube, and gentle manipulation of the foreign body should be constantly before the operator who wishes to successfully remove foreign bodies from the bronchi and esophagus with a minimum amount of damage.

The difficult removals encountered in this series were the sharp-pointed objects, one of which was transfixed, and the im-
pacted foreign bodies, at times completely covered with edema. As a rule smooth objects are extremely difficult to grasp with forceps, and are therefore difficult to extract. The esophageally lodged foreign bodies, such as coins, are as a rule easy removals, especially when the operator sees the case before several unsuccessful attempts and much traumatism has been made before admission.

At times the foreign body is buried in a dense ring of edema, which renders its exact localization problematical, and its removal in these instances is extremely difficult.

The irritation and inflammation produced by the lodgement of metallic foreign bodies in the bronchi are not nearly as pronounced as the result of inspired nuts and food of any sort.

The longer the lodgement of a bronchial or esophageal foreign body the greater the danger to the patient and the more difficult the removal. At times the very innocently lodged penny in the esophagus may slough through into the trachea and the patient succumb to pneumonia.

The most extremely irritating substances bronchially lodged in this series were found to be raw carrot, parched peanut kernel, masticated toilet paper pulp, cheesy infectious material from the tonsil, meat and casts of diphtheritic membrane. All of them were looked upon with extreme suspicion as diphtheria, for the symptomatology and physical signs are much the same. In bronchial diphtheria, asthmatic respiration is usually present, and this is also an accompaniment of all irritating substances inhaled into the lung. The onset in the fulminating types of bronchopulmonary or asthmatic types of influenza simulate these types of foreign body closely, both in characteristic symptoms and physical signs, where there is no history of foreign body inspiration. Given a case with such symptoms negative radiographic findings mean nothing, and the only means of one being able to arrive at a definite diagnosis is by a bronchoscopic examination. When such substances are inhaled by young children, which is frequently the case, they wheeze and rasp and are profoundly prostrated. There is often a marked pulmonary emphysema on the side of the obstruction, for air is much more easily inspired by the foreign body than expired. Therefore, the lung necessarily compensates in turn, and there is a marked ballooning of the lung. If the effort at inspiration by a tight obstruction is kept up for many hours, the child soon becomes exhausted, and death may rapidly follow. In one of these cases
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there was such an enormous amount of pulmonary emphysema that the lung ruptured, and there was a generalized tissue emphysema just prior to death. There is always extreme cyanosis when pulmonary or tissue emphysema appears.

CASE REPORTS.

Case 1. Shawl pin in right superior lobe bronchus of a woman thirty years of age, referred by Dr. Ard of Plainfield, N. J. In bronchus 25 hours. By radiographic and bronchoscopic examination the point was deeply imbedded in the opposite bronchial wall. The head of the pin had entered the upper lobe orifice as far as it would go, while the point was transfixed in the opposite bronchial wall. The shaft of the pin presented across the mouth of the bronchoscopic tube, and neither head nor point were visible. The head of the pin could not be pushed farther into the upper lobe orifice to release the point, and a very difficult mechanical problem presented. The point of the pin by lateral radiographic measurement had penetrated deeply into the opposite bronchial wall. To attempt to remove the pin in the position presenting would only court failure, and attempting to pull it out would prove disastrous by causing a rupture of the bronchial wall.

With a 9 m.m. bronchoscope in situ, the head and neck of the patient were rotated well to the right, for the transfixed and buried point had to be attacked in the bronchial wall on the opposite side. The long slanting tip of the bronchoscopic tube was used to press out the bronchial wall just above the imbedded point while the side curved forceps partly open covered the shaft of the pin and gradually followed it up towards the point while pressure was made with the bronchoscopic tube lip. By keeping the blades of the forceps in such position they acted by gentle counter pressure on the bronchial wall, and at the same time were in a position to grasp the pin point as soon as it was released. After seventeen minutes the point was released and as the forceps were in position it was grasped. Now the head of the patient was moved to the left and the pin easily extracted in the normal manner. Had not the head been rotated well to the right it would have been next to impossible to disengage the point.
The patient had been a sufferer for a long time from a substernal goiter and the X-ray revealed an enormous thymus gland. While the patient had received a dose of morphia and local cocaine, the cough reflex was not affected.

Fig 1. (Case 1).

Case 2

Case 2 A

Fig. 2. a. Shawl pin in the larynx supposed to be in the upper esophagus. Radiographic plate taken before attempted removal from the esophagus. (Case 2).
and an extremely irritating cough from which she had suffered for a long
time persisted during the entire operation.

Case 2. A girl of sixteen referred by Dr. William Dougherty of New York
City. The girl gave a history of having swallowed a shawl pin some five
days prior and had no cough or discomfort after it had disappeared. A
radiographic picture taken by Dr. George S. Dixon showed the pin to be located
in the upper cervical region. There was considerable swelling of the neck
of the patient and she complained of pain in her throat from an attempted
removal before admission. The patient had some difficulty in swallowing.
The patient was prepared for an esophagosopic examination and the spatula
esophagoscope was introduced without anesthesia. There was no pin in the
larynx. There was a long rip in the cricopharyngeus constrictor and esophag-
geal wall, and the swelling we had noted in the neck was due to subcutaneous

Fig. 2. b. Radiographic plate taken on admission after an attempted
removal of pin from the esophagus. Note that the pin was dislodged from
the larynx and was found in the left bronchus. The white area over the
base of the heart is due to mediastinal pneumothorax. Compare this plate
with the one taken before the esophagus was ruptured. (Case 2).

emphysema, no foreign body was visible. As the pin had disappeared the pa-
tient was sent again to the radiographic room and another picture taken of the
entire chest and abdomen.

The chest plate showed the pin to be lodged in the left bronchus with the point
in the upper lobe orifice. As the patient was in very poor condition from
the esophageal rupture no anesthetic was used. A dose of morphia was ad-
ministered and the pin was rapidly removed through a 7 m.m. tube. The point
of the pin was in the left upper lobe bronchus, but it was easily pushed down-
ward after grasping the shaft with forceps and disengaged. The removal of
the pin from the left bronchus taking three minutes. After the removal of the
pin the esophagus was inspected.
There was a long slit in the esophagus, the edges of the wound were covered with a thick slough. A suction tube was introduced into the wound and with a twenty-inch vacuum some foul-smelling material was removed. The wound was then swabbed with tincture of iodine. As the patient had been unable to swallow for the past twenty-four hours, and was suffering from water hunger, milk and water were injected by syringe into the stomach through the esophagoscope. A soft rubber stomach tube was then introduced, and the patient fed by the syringe method through the proximal end of the tube which extended out of her mouth. The tube was attached to the neck by tape to prevent its becoming dislodged and swallowed. By this time there was marked emphysema of the neck and face and the temperature had risen to 103.2° F. The pulse was weak and rapid. The patient was at all times conscious, and her chief complaint was a severe stabbing pain in the region of the sternum on inspiration. There was a booming systolic heart sound over the entire precordial region. The second sound could not be elicited. Scattered rales were elicited over the anterior aspect of the chest, but these were probably due to the crackles of the subcutaneous emphysema in this area. The following day after a thorough dose of the "water cure" treatment, the patient requested that the tube be removed. This was done and the wound in the esophagus was again swabbed with iodine after thorough evacuation of the pocket. The feeding tube was then replaced. This treatment was continued from day to day, and by the end of the first week the patient showed signs of improvement. The temperature was 101.4°, pulse 110 and regular and respirations 32. There was a pleuritic rub over the region of the sternum, but the heart sounds could be distinctly heard. By the tenth day the patient continued to show improvement, but strenuously objected to the method of feeding. She was esophagoscopyed and the wound inspected. The wound had almost completely healed, but there was still an inflammatory exudate about it. This was probably protective for there was no foul odor. The patient was given a swollowing trial with a glass of milk and did fairly well. The reintroduction of the feeding tube was discontinued. By the end of the second week the girl was able to be up and about, and by the end of the fourth week she was able to leave the hospital. She could swallow without difficulty at this time, and the esophageal wound had completely healed. The patient was seen one year later and there was no stricture of the esophagus, and no difficulty in swallowing. A radiographic plate taken at this time showed the lungs and precordial region to be normal. It is extremely interesting to note the difference in the two radiographic plates. The one taken just after the accident before an attempt was made to remove the pin from the cervical esophagus, and the other after the attempted esophageal removal and rupture of the esophagus. Air entered the mediastinum and it can be definitely made out in the radiographic plate taken after the esophageal rupture.

Case 3. A boy of seven years of age was admitted to the Kingston Avenue Hospital suffering from measles and croup. There was a large periharyngeal abscess present which Dr. Cannon, the Resident Physician, recognized as the probable cause of the croupy symptoms. As the abscess was opened there was a blast of air through the wound and much pus was sucked in with inspiration. The child was immediately inverted and a quantity of foul-smelling pus was drained from the abscess cavity. Then the wound was examined and found to communicate with the trachea. On examination of the tracheal
fistula Dr. Cannon saw an object in the wound and as he opened the tracheal fistula the object dropped into the lung. The following day a radiographic plate was made which showed a closed safety pin in the right main bronchus. By peroral bronchoscopy through a five millimeter tube the pin was located and easily extracted in four minutes. The larynx looked not unlike a larynx following prolonged intubational tubage, but it readily returned to normal. The tracheal fistula healed in the usual manner. The child had been treated for diphtheria and croup for six weeks, and it was only after he was admitted to
the hospital for measles that the true nature of the cause of the croup was recognized. The boy made a complete recovery and there was no stenosis after one year.

Case 4. Dental root brooch in left superior lobe bronchus. The patient was a young lady of seventeen years who inhaled the tooth canal reamer which slipped from the fingers of the dentist. Dr. Fidler saw the patient and after having taken some excellent radiographic plates referred the patient to the writer for removal of the foreign body. The brooch was in the left superior lobe bronchus for thirty hours. Under local anesthesia the brooch was readily extracted through a 7 m.m. bronchoscope in two minutes. No sign of the presenting hair like point could be seen in the mouth of the left upper lobe bronchus until the patient's body was rotated well to the right. In this position a small hair like point was visible lying on the floor of the bronchus. It was gently grasped by straight forceps and removed. The patient recovered.

Case 5.

Fig. 4. (Case 5).

Case 5. Carpenter screw in the lung of a boy of two years. I had the good fortune to see this case with Dr. Arrowsmith whom I assisted at the first trial. Neither of us were able to grasp the head of the screw at the first trial with the forceps at hand, for there was a firm ring of edema above the head of the screw which almost completely hid it from view. It was very evident from the radiographic plate that the screw was a large one and the head must have been considerably larger than the diameter of the bronchus into which it had entered, but nevertheless it had worked its way downward by its ratchet movement as far as it was possible to go.

After fifteen minutes trial further attempts at removal were discontinued and a second trial was to be made one week later. In the interval the writer had a special pair of alligator forceps made which would dilate the stricture
above the head of the screw and at the same time grasp it firmly. One week later a second attempt was made to extract the screw by upper bronchoscopic, and after Dr. Arrowsmith had worked for a few minutes he decided that it would be advisable to remove the screw by tracheotomic bronchoscopy owing to the massiveness of the head of the screw which was bound to cause much traumatism if removed through the glottis, and the resultant secondary subglottic edema would necessitate tracheotomy later. Dr. Arrowsmith performed a low tracheotomy with the 5 m.m. bronchoscope in situ. After working for a short time Dr. Arrowsmith's eyes became very tired, and he gave me a second trial at removal. I luckily had the good fortune to have the blades of the forceps dilate the edematous stricture above the foreign body and engage it, and the screw, forceps and bronchoscope were removed through the tracheal fistula. Had not Dr. Arrowsmith's eyes become tired I would never have had a chance to remove the foreign body, for had his vision not become impaired he would have worked a few minutes longer and removed it himself. The child was successfully deaccumulated and made a complete recovery.

Case 6. Metal intubation tube removed from the right main bronchus of a child of two years. The child was admitted to the Kingston Avenue Hospital suffering from laryngeal diphtheria for which she was intubated. A large dose of antitoxin was administered and as the general condition of the child was good on the fourth day an attempt was made to extubate. The tube was lost on the attempt to extubate and was thought at first to have been coughed up and swallowed, for the child had little discomfort and breathed well through the larynx. During the afternoon the child had some difficulty in breathing but intubation was not considered necessary. The case was referred to the writer for bronchoscopic examination and on the introduction of a 5 m.m. tube the head of the tube was seen to be in the right bronchus. The lumen in the head of the tube was entered with the extracting forceps and it was removed through the mouth. As the head of the tube was much larger than the glottis there was some traumatic subglottic edema which followed and the child again became "croupy" but reintubation was not necessary. The child made a complete recovery.
Case 7. A special O'Dwyer tube with large retaining swell and head was accidentally showed down during the act of digital extubation. The tube, a three-year size was introduced into one of the cough-up cases owing to the great diameter of the retention swell. The tube gravitated downward owing to the absence of the cricoid cartilage which would have ordinarily held it in place, had not the cartilage sloughed out as a result of perichondritis which is the chief factor in all cases of coughing up of the tube. As the head of tube had gravitated downward there being no cricoid cartilage to hold it in position, the added attempt to remove it shoved it down into the bronchus below. The child immediately became cyanotic and an emergency tracheotomy was performed. The tube was removed through the tracheotomic fistula. The child recovered, but became one of the post-diphtheritic retained tracheal cannula cases. He was eventually decannulated and made a complete recovery.

Case 8. A two year intubation tube removed from the right bronchus in a child of two and one-half years at Riverside Hospital. The usual thing occurred at attempted extubation by the digital method that the tube head was pushed through the glottic opening and fell into the bronchus. A second tube was introduced after the first tube fell into the bronchus, but as this gave no relief tracheotomy was performed and the tube was extracted by tracheotomic bronchoscopy a 5 m.m. tube being used. The child was greatly improved following the removal of the tube, but as she had a bronchopneumonia before the accident which continued to spread she succumbed two weeks later.

Case 9. A two year intubation tube removed from the left bronchus in a boy of two years and nine months. The boy was admitted to the Willard Parker Hospital and intubated for laryngeal diphtheria. A large dose of antitoxin was administered and as the general condition was good on the fifth
day a digital detubatory trial was made. The attempt to remove the tube was unsuccessful at the first trial and several attempts were made. Finally the operator said that he could not feel the tube. An attempt was made by the Resident Physician to locate the tube but this was unsuccessful. The writer was notified of the condition and removed the tube the same afternoon with some difficulty through the mouth. The child became stenotic a few hours after removal of the tube and reintubation was necessary to relieve subglottic edema. The tube was worn for one week and removed by the direct method. The child remained without the tube and made a complete recovery.

Case 10. A one year non-cough-up tube removed from the right bronchus of a child of one and a half years. The child was admitted to the Kingston Avenue Hospital and intubated with a one year O'Dwyer tube. After a large dose of antitoxin the child improved, but was unable to remain without the tube at the first trial. During the second week the child started to cough-up the tube, and one of the writers non-cough-up tubes was introduced. This tube was retained and put a stop to further trouble. One week later one of the staff while attempting to remove the tube shoved it down into the bronchus. At first the tube was thought to have been extracted and swallowed for there was little discomfort following the lodgement in the bronchus. A radiograph showed the tube to be in the right bronchus. The child had so little discomfort from the tube in the bronchus that at first it was thought impossible until the child became stenotic five days after the accident the afternoon of the same day that the X-ray was taken. The writer attempted to remove the tube after the introduction of a 5 m.m. bronchoscope, and while the tube could be brought up to the glottis it could not be extracted. A tracheotomy was performed with the bronchoscope as a guide and the tube removed by the straight extractor through the tracheotomic fistula. The child wore the tracheal cannula for a long period after the removal of the tube but was eventually decannulated and made a complete recovery.

Case 11. A small piece of toilet paper in the right lower lobe bronchus in an infant of eight months. The case was referred by Dr. Angelo Smith of
Yonkers, N. Y. The infant was in the habit of putting paper in her mouth, and the nurse who had been left in charge of the baby probably paid little attention to her during the absence of the parents. When the nurse returned to the room she found the child choking. She immediately put her finger in the mouth of the infant and removed several pieces of toilet paper. The child was in extremis, and Dr. Smith was notified. When the writer saw the child a few hours later, she was in poor condition. The lungs were balloonied, and there was a marked asthmatic wheeze on expiration. Little air entered the right lower lobe of the lung. The radiographic plate was negative. The infant was bronchosoped, a 4 m.m. tube being used. In the right bronchus, as far as it could go, was seen a whitish mass which looked not unlike a plaque of diphtheritic membrane. This was removed by suction, for fear of maceration with forceps. Both bronchi were then explored, but no further purplie masses found. The baby improved after the removal of the piece of paper and much secretion by suction, but within a short time the lungs began to fill and there was difficulty in breathing. The 4 m.m. tube was again introduced and much secretion evacuated. Marked subglottic stenosis was seen on the second introduction of the bronchoscope, even though we had only worked fifteen minutes. We decided to perform tracheotomy for the subglottic stenosis and drainage of the lung. Tracheotomy was performed with the bronchoscope as a guide.

Case 11

Case 12

The tracheotomy temporarily relieved the condition, but pulmonary edema became very troublesome, and repeated aspirations were made to remove secretion. This was easily accomplished by the introduction of a small catheter into the tracheotomy tube. Repeated aspirations continued each time that there was difficulty with respiration, but this was all to no purpose, for thirty-four hours after bronchoscopy the unfortunate infant succumbed to pulmonary edema.

Case 12. This is a bronchoscopic gauze sponge, which became detached from a sponge holder which was not fixed properly and became lodged in the right upper lobe bronchus. This accident occurred in an adult suffering from tracheobronchial diphtheria after the removal of a diphtheritic cast. It was during the process of swabbing the tracheobronchi with antitoxin that the sponge was lost. The nurse, in applying the sponge, did not tighten the collar over the grasping blades of the sponge holder, and it was easily detached and lost. The sponge, readily absorbing the bloody secretion in the bronchus after the removal of the membrane, was difficult to locate. However, after a few
minutes search, it was located in the upper lobe orifice, and was easily removed. The patient made a complete recovery from the diphtheritic foreign body and sponge.

Fig. 6. a. Anteroposterior radiograph of an upholsterer's tack in right stem bronchus complicated by lung abscesses. (Case 13).

Fig. 6. b. Lateral radiograph of same patient.

Case 13. An upholsterer's tack removed from the right stem bronchus opposite the middle lobe orifice, after a sojourn of two and a half years. I had the
pleasure of seeing this patient, a boy of eight years, with Dr. Forbes. The
tack was in a difficult location in the right stem bronchus, and the head was
anchored at the middle lobe bronchus, imbedded in a firm stricture of long du-
ration. The point of the tack could be easily seen through the 7 mm. tube
pointing well to the left. The head of the tack was not visible. Dr. Forbes
had dilated the stricture several times, but the tack could not be budged. I
had the good fortune to be of assistance at two sittings, and it was at the last
trial that I was given the opportunity to remove the tack. The difficult prob-
lem presenting was, that the shaft and point of the tack were pointing well to
the left, and that the head of the tack would be reanchored in the lip of the
middle lobe bronchus each time an attempt was made to remove it against the
axis of the presenting point. Therefore, the boy's body was rotated well to
the left and the bronchoscope and forceps were brought into a line with the
presenting shaft and point of the tack. Now axis traction was applied with
considerable pull, and in one minute the bronchoscope, forceps and tack were all
removed together. There was a lung abscess which ruptured into the pleura,
and a rib was resected to drain the cavity. It was a long time after the re-
moval of the foreign body before the drainage tube could be removed from
the pleura. The boy recovered.

Case 14

Case 14. Four pieces of raw carrot inhaled into the right and left bronchi
in a child of three years of age. The child had a croup cough and violent
asthmatic wheezing for five days, and had been treated as a case of diphtheria.
As the asthmatic dyspnea did not improve after antitoxin, and as Dr. Raymond
Laub had obtained a history from the mother that the child had a choking
spell five days prior while eating raw carrot, the child was referred to the
writer for bronchoscopic examination. On admission, the child was in extremis
and made no effort to cough. There was a marked asthmatic wheezing expi-
reration audible at some distance. Dr. Laub had made a physical examination
of the chest, and stated that little air was entering either lung, and that the
percussion note was tympanic. There was a general subcutaneous emphysema
present which involved the face, chest and trunk. The larynx was emphyse-
matous and shiny. The trachea and bronchi were not involved. With a 5
mm. tube a piece of carrot was removed from the right main bronchus. The
child was moribund and died shortly after the removal of the large piece of
carrot. An autopsy was permitted by the parents and three smaller pieces of
carrot were removed from the lung. One piece was found in the right super-
ior lobe bronchus; the third piece in the left main bronchus, and the fourth
piece in the dorsal branch of the left lower lobe bronchus, at which location
there was a well defined abscess containing foul-smelling pus. The lungs were beefily congested and ballooned with air. The visceral pleura was covered with air blebs from the size of a pea to a half-dollar. The rupture of the blebs probably caused a leaking of air into the mediastinum, which followed the cervical fasciae and produced tissue emphysema. The heart was increased in size. This case illustrates the valve-like action of loosely placed foreign bodies in the air passages. It also illustrates that the irritating effect of raw carrot in the air passages is equally as irritating and fatal as the inhalation of peanut kernels, and was rapidly productive of food inhalation bronchitis and lung abscess within five days after the accident.

Fig. 7. (Case 15).

Case 15. Peanut pulp of a parched nut removed from the right bronchus of a child two and a half years of age. The child had been given several pieces of peanut which had been partly broken up by the mother. The child aspirated it into her lung shortly after taking it into her mouth, and had a violent choking spell. The child was brought to the hospital six hours after the accident. The physical examination showed that little air was entering the right lung.
was an asthmatic expiratory wheeze. An X-ray plate revealed a shadow over the right upper and middle lobes, but the radiographer thought there was also a shadow in the right lower bronchus. Bronchoscopy was performed without anestesia and a small piece of peanut was removed from the right stem bronchus opposite the middle lobe orifice. A 5 mm. tube being used. As the piece removed by forceps seemed to be the largest piece, the remaining fragments were removed by suction through a two-millimeter tube. The small pieces of pulp were readily removed by this method, care being taken not to wad the pulp in the lower lobe bronchus.

Case 16

All of the peanut pulp was apparently removed, for air entered the whole of the right lung. There was a high rise in temperature to 105.2°, following the removal, but gradually fell to normal within two days. The child was kept under observation for two weeks and then discharged after repeated stetho-

Fig. 8. (Case 16).

scopic examinations of the chest. The child made a complete recovery and was in perfect health six months after the extraction. This case illustrates the value of suction in removing small pieces of peanut from the lung. Had an attempt been made to remove all of the small fragments with forceps there would have been great danger of macerating them, and some of the tiny fragments would have been lost, and the result would have been a fatal peanut bronchitis and pulmonary abscess.

Case 16. Peanut kernel and several small pieces removed from the right bronchus of a child of three years and eight months. The child was admitted
to the hospital five days after the accident. A splendid radiograph taken showed a dense shadow over the right lower lobe. Bronchoscopic examination was made and a fragment removed from the right stem bronchus. By suction several small fragments were removed and about a dram of foul-smelling pus evacuated from the lower lobe bronchus. After having worked for fifteen minutes the procedure was discontinued. There was considerable reaction following the bronchosopic examination, and the temperature rose to 104.2°. The pulse and respiration were rapid. A physical examination made at this time showed that there was a diffuse bronchitis and pneumonia over the lower lobe of the right lung. Posteriorly, there was no air entering. Three days later a second bronchoscopic examination was made with a 4 m.m. tube and the dorsal branch of the lower lobe bronchus explored. No fragments of peanut were removed, but some pus was evacuated. From this time on the child began to run a septic temperature. The left lower lobe was aspirated with a long needle and the abscess cavity located. The unfortunate child had devel-

Case 17

ed a pulmonary abscess owing to the failure to remove a small fragment which had entered a small dorsal branch bronchus. Later the abscess increased in size and a rib was resected. This drained the abscess but the child did not improve. She continued to linger in this septic condition and succumbed six weeks later.

Case 17. Some fragments of meat removed from the right bronchus of a boy of four years. The boy was admitted to the Kingston Avenue Hospital for laryngeal diphtheria, for a dose of antitoxin given by the family physician did not relieve the dyspnea. On admission, Dr. Adams Eberle, by a very careful physical examination, ruled out tracheobronchial diphtheria, and notified the writer of the possibility of a foreign body on account of the mother's statement that the child choked while at the table and developed croup the same night. The onset of the croupy attack was too sudden for diphtheria, and Dr. Eberle suspected that a foreign body in the right lung was the cause of the trouble. A bronchoscopic examination was made with a 5 m.m. tube and a
small mass of chewed meat was removed from the right bronchus. The physical signs did not clear up while the bronchoscope was in situ, and on a second inspection a small piece was removed from the lower lobe bronchus. The physical signs to the stethoscope immediately improved after the removal of the fragment, and air readily entered the lung. The boy was kept in the hospital for two

weeks and discharged cured. The interesting points of this case are the diagnosis of a foreign body by Dr. Eberle on a vague history and the stethoscopic signs in the chest. And second, that a stethoscopic physical examination with

the bronchoscope in situ is of the greatest aid in determining whether all of the foreign body has been removed.

Case 18. Some small pieces of cheesy infectious material removed from the right upper lobe bronchus of a child of one year. The child was admitted to Riverside Hospital for supposed diphtheria. After the acute diphtheritic process had subsided there was a severe hacking cough and a peculiar wheeze
on expiration, Dr. John Crawford suspected the presence of a foreign body and had an X-ray picture made. The X-ray showed a very dense shadow over the upper lobe of the right lung. Two days later we bronchosoped the child and located a foreign body in the orifice of the right upper lobe bronchus. Through a 4 mm. tube there was a whitish mass seen in the orifice of the upper lobe bronchus. It was grasped with forceps and removed. On its removal a small piece was seen to fall into the stem bronchus. The child was placed in an exaggerated Trendelenberg position and with a small suction tube this piece was removed. With the first piece removed there was a small sac which seemed to contain the particles. A few hours later the child developed subglottic edema, even though we had only worked ten minutes. The stenosis required intubation, a one-year tube being worn for two days. One month later the child was discharged from the hospital cured. The specimen was sent to Dr. Jefferies of the Polytechnic Medical School Laboratory and he reported that the material was enclosed in an epithelial sac. "The material removed from the right bronchus of K. Z. was a mass of pus cells and mixed organisms, no tubercle bacilli were found. The mass is similar to the cheesy infectious material removed from the crypts of tonsils, and no doubt it fell from the tonsil into the lung." The child had hypertrophied tonsils with cheesy material in them when examined after the report from Dr. Jefferies. The small mass in its epithelial covering produced a complete blocking of the right upper lobe of the lung. Later X-ray plates showed the lung to be clearing.

Case 19. A tracheo-bronchial diphtheritic cast removed from the right bronchus of a boy eight years of age. The boy had been ill with a mild bronchitis for six days and diphtheria was suspected by Dr. Brendler, who asked me to see the case with him. A large dose of antitoxin had failed to relieve the "croupy attack," which had become gradually worse twenty-four hours later. The child was in extremis, and expiration was difficult and accompanied by an asthmatic wheeze. A rapid bronchoscopic examination showed that little air was entering the right lung. There were many noisy rales over both lungs. We bronchosoped the boy and found the larynx congested. The lower tracheal and right bronchus were filled with membrane, which was easily removed by suction. The trachea and bronchi were swabbed with antitoxin and a long intubation tube introduced. There was a very severe reaction following the removal of the membrane, and the temperature gradually rose until it was 107°.
one hour later. It was very evident at this time that the boy was in extremis and would probably succumb. He was very irritable and craved for water, which he could not swallow on account of the trickling into the tube. A small rubber catheter was introduced through his nose into the esophagus and a half-pint of milk with two drams of whiskey introduced. His thirst having been relieved the boy fell to sleep. Within two hours his temperature had fallen to 105° and it continued to range between 105° and 103.2° for the next two days. Feeding was continued by gavage and as he was getting a good amount of nourishment he continued to improve. By the end of the fourth day the general condition of the boy had improved to such a degree that I decided to remove the long bronchial tube. This was done and there was no discomfort after its removal. Reintubation was not necessary. The boy had a protracted convalescence owing to a patchy pneumonia following, but he made a complete recovery after two months.

Case 20

Case 20. Membranous diphtheritic plaques removed from the trachea and bronchi. This case was seen with Dr. Ginsberg of Yonkers, N. Y. The child had been intubated by Dr. Pisek who had given a large dose of antitoxin. The child was greatly improved after intubation of the larynx, but the same evening he became dyspneic in spite of the tube, and the writer was called to bronchoscopic the patient. In the meantime the tube had been coughed up, and when I arrived the boy was in much distress. The bronchoscopic examination revealed a loose cast of membrane in the trachea. This was removed, and a thin piece was visible in the right bronchus. After this was removed there was no further membrane visible. An intubation tube was introduced. The condition of the boy was much improved the following day and he was in sufficiently good condition to remove the tube on the third day. There was no further trouble after the removal of the tube and the patient made an uneventful recovery. The tube used was a 5 m.m and the time of operation six minutes.
FOREIGN BODIES IN THE BRONCHI AND ESOPHAGUS.

ESOPHAGEAL FOREIGN BODIES.


Case 2. Small piece of breast bone of sternum of chicken. Clinic case in child of four years. Presenting crosswise and transfixed in upper thoracic esophagus for five days. Marked edema. Radiographic plate did not show bone. Easily removed through seven m.m. esophagoscope in a few seconds after turning to avoid cutting esophageal wall.

Case 4. U. S. Penny, in esophagus of a child of one year. In esophagus below cricopharyngeus one week. Esophagus lacerated and swollen from two attempts to remove before admission. Spatula esophagoscope and alligator forceps, extraction in eight minutes. Difficult to locate on account of marked edema and sloughs in esophagus. Extraction cure. No stricture of esophagus six months later.


Case 6. Coin, U. S. Nickel. Referred by Dr. Angelo Smith. In esophagus of child two and one-half years, upper thoracic region for eight days. Much edema covering coin. Extraction, cure. Four minutes. Tube seven m.m. bronchoscope.

Case 7. Coin, U. S. Nickel, in esophagus of a child of three years and eight months. In esophagus four weeks. Opposite bronchial crossing after having been thought to have been shoved down with a stomach tube. Extraction, cure. Esophagoscope. Time, 10 minutes.

Case 9. Coin, U. S. Nickel, in esophagus of an infant of one and a half years. In upper esophagus two days. Difficulty in breathing and swallowing. Extraction through laryngeal spatula with alligator forceps in one minute.

Case 10. Coin, U. S. Quarter of a dollar, in esophagus of a child of three years for fourteen days. Marked edema. Esophagus covered with thick exudate. No history of any attempted removal before admission. Pharyngeal wall much inflamed. Membrane removed was diphtheritic by culture. Foreign body completely hidden from view in membrane and edema. Difficult extraction owing to edema, which was difficult to push aside to see coin. Extraction cure. Esophagoscope and long alligator after separating edema over coin with blades of forceps. Seven minutes.

Case 11

Case 12

Case 12. Large triangular piece of the sternum of a chicken in esophagus of a woman of thirty years. In esophagus below pharyngeus two days. Good X-ray plate of triangular piece of bone. Referred by Dr. Angelo Smith, Yonkers, N. Y. Points deeply imbedded in esophagus with some bleeding at fixation of points. Spatula esophagoscope. Rotated to disengage points to prevent laceration. Extraction cure. Four minutes.

Fig. 12. Triangular piece of the sternum of a chicken in esophagus.
Case 13. Mother of pearl button in upper thoracic esophagus in a girl of six years. In esophagus forty-six hours. Easy extraction through 7 mm. esophagoscope in two minutes. No anesthesia. Recovery.

Fig. 13. Button in esophagus at bronchial crossing.

Case 14. Large mother of pearl button in esophagus of a girl of ten years. Referred by Dr. Angelo Smith. In esophagus five days. Radiographic plate showed button below bronchial crossing. Patient had been forced-fed and efforts had been made to push the button down. There had also been several emetics administered by the parents with the hope of bringing it up or sending it down. No re-X-ray picture taken just before esophagoscopy. A seven millimeter esophagoscope showed a curdled mass below the bronchial crossing, but no button was seen. X-rays were then taken of the stomach and intestines, but no button was located. The curdled mass seen in the esophagus was the remains of the dissolved button, the button having been dissolved by the frequent emesis of hydrochloric acid. At the suggestion of Dr. Goldhorn, a similar button was removed from her coat and immersed in a very dilute solution of hydrochloric acid. The button became a cheesy mass within twenty-four hours. It is interesting to note that these buttons, so often called mother of pearl, are made of compressed caesin and are readily dissolved in dilute hydrochloric acid. Had an X-ray plate been made just prior to the esophagoscoopic examination the operation would never have been attempted, for no foreign body shadow would have been seen. However, on the other hand, failure to find nothing but the cheesy mass of the button taught us what these buttons were made of.
Case 15. A lead skirt-weight in esophagus of a boy of six years. In esophagus, below cricopharyngeus, for four days. Extraction spatula esophagoscope in two minutes.

Case 16. Apricot seed held firmly in cricopharyngeus in a man of sixty-two years. In esophagus five hours. Much pain and gagging and difficulty in breathing. Extraction through spatula esophagoscope with Jackson's safety-pin closer in five minutes. Head held well over end of table for fear that the relaxation of the spasm of the cricopharyngeus would release the foreign body.

Fig. 14. Olive bougie in gastroptotic stomach.

Case 17. Olive pointed bougie and staff accidentally broken off while a gastro-enterologist was attempting to dilate a stricture blindly. Case referred
by Dr. Wolff Freudenthal. Patient an extremely emaciated woman of forty-three years. Bougie in esophagus forty-six hours. Much laceration of upper esophagus from attempted extraction before admission. Olive by X-ray in gastroptotic stomach in pelvis. Metal of staff opposite and below bronchial crossing. Esophagoscope 10 m.m. and presenting metal part of staff grasped by long alligator. Extraction cure in three minutes. The bulbous end was not held in a stricture on removal.

Case 17

FAILURES AND DEATHS.

Out of this series of foreign-body extractions there has been one failure to remove the foreign body at the first trial, and three deaths. The failure was an attempted extraction of a deeply-
located shawl pin in the dorsal branch of the right lower lobe bronchus, the point having penetrated through the bronchial wall of the opposite side. The point was disengaged and an attempt was made to remove the intruder, which now looked extremely easy. The point and shaft of the pin were brought outward through the bifurcation, while the head of the pin, which caught on the opposite bronchial wall, held it firmly, and this caused the forceps to slip its hold. The writer had worked only for a short time, but as the pin was now placed in an extremely difficult position, further attempts were not made, as it was decided then that new X-ray plates were advisable to determine the changed position before another attempt was made. The second trial for the writer, however, was not forthcoming, as Dr. Jackson was consulted in the meantime, and the pin successfully extracted by him one week later. The patient suffered no discomfort other than the mental anxiety of knowing that the pin was still in the lung. The temperature and pulse remained normal throughout the week before the successful removal.

Of the three deaths, two occurred shortly after bronchoscopy. One was moribund on admission and would have died shortly after with or without examination, and the other, an infant, had pulmonary edema at the time of the bronchoscopic examination, which continued up to the time of her death. The third death was due to the retention of a piece of peanut kernel, which caused septic bronchitis and pulmonary abscess, and death ensued six weeks later. General anesthesia was not used for any of the extractions. Cocain, 10 per cent., was used for the bronchoscopic examinations, and no anesthesia for the esophagoscopy.

The two diphtheritic foreign bodies included in this series recovered, but one of them had a very stormy time. In a former series of diphtheritic foreign bodies reported, all of the cases without complications recovered. Pneumothorax occurred in one very difficult extraction after the report of this series and is therefore not included, but will be reported later in another series.
AMERICAN LARYNGOLOGICAL, RHINOLOGICAL AND
OTOLOGICAL SOCIETY, Inc.

MINUTES.

The Twenty-fifth Annual meeting of the American Laryngological, Rhinological and Otological Society, Inc., convened at the Hotel Commodore, New York City, June 6th and 7th, 1919.

The Society was called to order by the Vice-President, Dr. Robert Lewis of New York City.

The following members registered during the sessions:

DR. JOSEPH H. ABRAHAM .................... New York, N. Y.
DR. WILLIAM J. ABBOTT .................. Cleveland, Ohio
DR. JOHN H. ALLEN ....................... Portland, Me.
DR. F. C. ARD .................. Plainfield, N. J.
DR. HUBERT ARROWSMITH ............... Brooklyn, N. Y.
DR. WILLIAM C. BANE ................... Denver, Colo.
DR. JOHN F. BARNHILL .................. Indianapolis, Ind.
DR. JOSEPH C. BECK ..................... Chicago, Ill.
DR. T. PASSMORE BERENS .................. New York, N. Y.
DR. HUGH B. BLACKWELL ................ New York, N. Y.
DR. WESLEY C. BOWERS .................. New York, N. Y.
DR. H. H. BRIGGS .................. Asheville, N. C.
DR. DON M. CAMPBELL .................... Detroit, Mich.
DR. WILLIAM WESLEY CARTER ............ New York, N. Y.
DR. WILLIAM B. CHAMBERLIN ............ Cleveland, Ohio
DR. TALBOT R. CHAMBERS ............... Jersey City, N. J.
DR. LEWIS A. COFFIN .................... New York, N. Y.
DR. LEE COHEN .................. Baltimore, Md.
DR. THEODORE CORWIN .................. Newark, N. J.
DR. CLAUDE E. COOPER .................. Denver, Colo.
DR. GEORGE F. COTT .................. Buffalo, N. Y.
DR. ROBERT H. CRAIG .................. Montreal, Can.
DR. EUGENE A. CROCKETT ................ Boston, Mass.
DR. WILLIAM LEDLIE CULBERT ............ New York, N. Y.
DR. FRANKLIN E. CUTLER ............... Cleveland, Ohio
DR. GEORGE E. DAVIS ................. New York, N. Y.
DR. EWING W. DAY .................. Pittsburgh, Pa.
DR. LEE WALLACE DEAN ............... Iowa City, Iowa
DR. FREDERICK F. C. DEMAREST ........ Passaic, N. J.
DR. EDWARD B. DENCH .................... New York, N. Y.
DR. FRANK L. DENNIS .......................... Colorado Springs, Col.
DR. ARTHUR B. DUEL .......................... New York, N. Y.
DR. JOHN W. DURKEE ......................... Brooklyn, N. Y.
DR. JAMES GARFIELD DWYER .................. New York, N. Y.
DR. WELLS P. EAGLETON ...................... Newark, N. J.
DR. THOMAS O. EDGAR ....... .................. Dixon, Ill.
DR. H. BERT ELLIS ....... ................... Los Angeles, Cal.
DR. FRANCIS P. EMERSON .. .................. Boston, Mass.
DR. LINN EMERSON ............................ Orange, N. J.
DR. JOHN F. FAIRBAIRN ...................... Buffalo, N. Y.
DR. THOMAS H. FARRELL ...................... Utica, N. Y.
DR. STANWOOD E. FISHER .................... Portland, Me.
DR. HENRY HALL FORBES ..................... New York, N. Y.
DR. JOHN M. FOSTER ......................... Denver, Colo.
DR. EDMOND P. FOWLER ...................... New York, N. Y.
DR. WOLFF FREUDENTHAL ..................... New York, N. Y.
DR. THOMAS J. GALLAHER .................... Denver, Colo.
DR. MAX A. GOLDSTEIN ...................... St. Louis, Mo.
DR. D. C. GREENE, JR. ...................... Boston, Mass.
DR. JOSEPH BERRY GREENE ................... Asheville, N. C.
DR. LOUIS K. GUGGENHEIM ................... St. Louis, Mo.
DR. J. H. GUNTZER ............................ New York City
DR. THOMAS H. HALSTED ..................... Syracuse, N. Y.
DR. THOMAS J. HARRIS ....................... New York City
DR. HENRY J. HARTZ ........................... Detroit, Mich.
DR. HAMPTON P. HOWELL ..................... New York, N. Y.
DR. E. V. HUBBARD .......................... New York, N. Y.
DR. THOMAS HUBBARD ......................... Toledo, Ohio
DR. LESTER MEAD HUBBY .................... New York, N. Y.
DR. LEE M. HURD ............................. New York, N. Y.
DR. SAMUEL IGLAUER ......................... Cincinnati, Ohio
DR. CHARLES J. IMPERATORI ................ New York City
DR. J. W. JERVEY ............................ Greenville, S. C.
DR. CLARENCE PORTER JONES ................. Newport News, Va.
DR. PHILIP D. KERRISON .................... New York, N. Y.
DR. FRANK E. KITTREDGE ................... Nashua, N. H.
DR. DANIEL W. LAYMAN ....................... Indianapolis, Ind.
DR. M. D. LEDERMAN ......................... New York, N. Y.
DR. EUGENE R. LEWIS ....................... Dubuque, Iowa
DR. H. W. LOEB ....... ...................... St. Louis, Mo.
DR. HENRY L. LYNAH .......................... New York, N. Y.
DR. JOHN EDMUND MACKENTY ................ New York, N. Y.
DR. PERCY E. D. MALCOLM .................. New York, N. Y.
DR. WILLIAM BEVERLY MASON ................ Washington, D. C.
DR. JUSTUS MATTHEWS ....................... Minneapolis, Minn.
DR. JAMES F. McCAW ....................... Watertown, N. Y.
MINUTES.

DR. JOHN H. McCoy ........................................ New York, N. Y.
DR. JAMES HOMER McCREADY .......................... Pittsburgh, Pa.
DR. SAMUEL McCULLAGH ................................ New York, N. Y.
DR. RICHMOND McKinney ................................ Memphs, Tenn.
DR. JOHN O. McREYNOLDS .............................. Dallas, Tex.
DR. W. V. MULLIN ........................................ Colorado Springs, Colo.
DR. THOMAS W. MOORE .................................... Huntington, W. Va.
DR. ROBERT L. Moorhead ............................... Brooklyn, N. Y.
DR. HARRIS P. Mosher ................................. Marblehead, Mass.
DR. CARL E. MUNGER ..................................... Waterbury, Conn.
DR. JOHN W. Murphy ...................................... Cincinnati, Ohio
DR. ROBERT C. MYLES ..................................... New York, N. Y.
DR. GORDON B. New ...................................... Rochester, Minn.
DR. JAMES P. O’Kelley .................................. New Orleans, La.
DR. SEYMOUR Oppenheimer ................................ New York, N. Y.
DR. LAFAYETTE PAGE ...................................... Indianapolis, Ind.
DR. WENDELL C. Phillips .............................. New York, N. Y.
DR. JOHN A. ROBINSON .................................. New York, N. Y.
DR. SYLVAN ROSENHEIM .................................. Baltimore, Md.
DR. GEORGE T. Ross ...................................... Montreal, Canada
DR. DUNBAR ROY .......................................... Atlanta, Ga.
DR. RUFUS B. Scarlett .................................. Trenton, N. J.
DR. WARREN S. Shattuck ................................ Brooklyn, N. Y.
DR. A. JOHN Smith ........................................ Yonkers, N. Y.
DR. HARMON SMITH ....................................... New York, N. Y.
DR. OWEN SMITH .......................................... Portland, Me.
DR. HERBERT E. Smyth ................................... Bridgeport, Conn.
DR. FREDERICK N. SPERRY ............................. New Haven, Conn.
DR. GEORGE E. Steel ...................................... New York, N. Y.
DR. JOHN J. Thomson ................................... Mt. Vernon, N. Y.
DR. A. P. Voislawsky .................................... New York, N. Y.
DR. IRVING Wilson Voorhees .......................... New York, N. Y.
DR. LEON E. White ...................................... Boston, Mass.
DR. JOSEPH A. White .................................... Richmond, Va.
DR. ALFRED Weiner ...................................... New York, N. Y.
DR. NORTON L. Wilson .................................. Elizabeth, N. J.
DR. D. J. Gibb Wishart .................................. Toronto, Canada
DR. SIDNEY Yankauer ................................. New York, N. Y.
SIR ST. CLAIR THOMSON ................................ London, England
DR. FRANK ROSE .......................................... London, England
DR. FERNAND Le MAITRE ................................ Paris, France
REPORT OF SECTION MEETINGS.

Report of the Eastern Section.

Gentlemen: The Eastern Section held its meeting at the New York Academy of Medicine on the fifteenth of February, 1919. There were over seventy Fellows in attendance. The following program was presented:

1. Presentation of a Patient Demonstrating the Development of the Voice after Total Laryngectomy, and one with a Hemangiopericytoma of the External Auditory Canal, by Dr. Lee M. Hurd.


4. Report of the Activities of the Medical Research Laboratory of the Air Service at the Hazelhurst Aviation Field No. 1, Mineola, L. I. Illustrated with lantern slides and motion pictures by Lieutenant-Colonel E. G. Siebert, Major Lewis Fisher and Captain H. W. Lyman.

Unfortunately time did not permit of the reading of Major Harold Hays' paper, "The Experiences of a Nose, Throat and Ear Specialist with the American Expeditionary Forces"; and Dr. Seymour Oppenheimer's paper, "The Importance of Blood Examinations in the Surgery of the Nose and Throat."

At the close of the morning session, the Fellows partook of a lunch tendered by the New York members, in the hall of the Academy. During lunch, Dr. G. L. Richards gave a very interesting resume of the work which he and others contemplated as a part of the Red Cross work in Armenia. The Chairman, in the name of the Society, extended to Dr. Richards and his companions their great admiration for the sacrifice they were making for the benefit of the sufferers in Armenia, their appreciation of the finer humanities that such work demanded, and the hope that they would meet with the success that their efforts would warrant and would return in good health and good spirits, proud with what they had accomplished.

The Chairman desires to thank Drs. Coffin and Page, and also those who contributed to the program, for the aid they gave in making the meeting a success.
During the afternoon operations and clinics were held at the Manhattan Eye, Ear and Throat Hospital, Bellevue Hospital, Roosevelt Hospital, and the New York Eye and Ear Infirmary, where, among other demonstrations, Dr. Lynah showed Direct Laryngeal Intubation and Extubation, Tracheal Galvano-canteriorization, Retrograde Laryngeal Tubage for Persistent Laryngotracheal Stenosis, and Dr. Hubert Arrowsmith presented a case demonstrating Auto-Esophagoscopy.

Respectfully submitted,

Robert Lewis,
Chairman of the Eastern Section.

Report of the Southern Section.

The meeting of the Southern Section of the Laryngological, Rhinological and Otological Society, Inc. was held at Richmond, Virginia, March 1st, 1919. This was a well-attended and enthusiastic meeting. Good papers were presented and fully discussed.

The meeting was called to order by the Chairman at 10 A.M. Dr. J. A. White gave a short talk of welcome.

Dr. I. W. Voorhees made some observations without presenting formal paper. Discussed by Drs. J. W. Jervey, Fisher, Briggs, Kuyk and Voorhees.

Dr. Gray’s paper discussed by Drs. Fisher, Cohen, Lynah, Jervey and Gray.

Dr. Green’s paper discussed by Dr. John Dunn.

Dr. D. A. Kuyk exhibited some instruments.

Dr. Cohen’s paper discussed by Drs. J. H. Horsley, Briggs, Voorhees and Cohen.

Major Fisher, U. S. Army, gave some interesting pictures of Aviation work.

Clifton H. Miller,
Chairman of the Southern Section.

Report of the Middle Section.

The Annual meeting of the Middle Section of the American Laryngological, Rhinological and Otological Society, Inc., was held under the chairmanship of Otto J. Stein, in the Green Room of the Congress Hotel, Chicago, Illinois, Saturday, February 22nd, 1919. The entire day was devoted to the reading and discussion of papers prepared for the occasion. A sudden and severe wet snow storm contributed much to the enjoyment and comfort of
remaining indoors and listening to the excellent contributions prepared by the essayists, and the very liberal discussion that followed their reading.

The following program was carried out:


"Foreign Bodies in the Bronchi of Young Children," Dr. John W. Murphy, Cincinnati, Ohio. Discussion opened by Dr. Samuel Iglaue.

"Asthma," Dr. Justus Matthews, Minneapolis, Minn.

"Some Experiences with Mastoid Disease Following the Influenza Epidemic," Major George E. Shambaugh, Camp Grant, Illinois.

"Some Observations on Hemolytic Streptococci," Dr. Frederick Menge, Chicago, Ill.

"Otologic Developments in Connection with the Air Medical Service," illustrated by motion pictures, Lieutenant-Colonel Eugene R. Lewis, Mineola, L. I.

"Report of Three cases of Acute Esophagitis," Dr. J. A. Stucky, Lexington, Ky.

"Report of a Case of Ethmoiditis with Metastasis," Dr. Ira Frank, Chicago, Ill.

"Types of Orbital Abscess and Exophthalmos from Intranasal Suppurative Processes," Dr. Derrick T. Vail, Cincinnati, Ohio.

The number in attendance was thirty.

On Wednesday, Thursday and Friday preceding the meeting, clinics were held at various hospitals by Drs. Menge, Younger, Pollock, Frank and Stein.

A luncheon and evening dinner was given to the visiting Fellows and guests by the local members.

Otto J. Stein,
Chairman of the Middle Section.

Report of the Mid-Western Section.

A meeting of the Mid-Western Section of the American Laryngological, Rhinological and Otological Society, Inc. was held at Denver, March 1, 1919. It was very well attended, considering that there were many absentees from civil practice owing to the war.

Six Fellows out of a possible eleven living in this section were present, and we enjoyed the visit, as well as the paper, of one of our Fellows from the Middle Section, Dr. George F. Keiper
of Lafayette, Indiana. Both the morning and afternoon sessions were devoted to the reading of papers and their discussions.

I desire to call attention to the large area comprising the Mid-Western Section, containing, as it does, ten states. This Society is represented in only one of these, namely: Colorado. We have no members in Kansas, Nebraska, North and South Dakotas, Utah or Montana. In all of these states, no doubt, there are many desirable men; also, there are cities sufficiently large to be medical centers of their respective communities, and to exercise a very decided influence in medical affairs. It would seem, therefore, that in order to spread the ideals of this Society it would be advantageous to have members residing in these cities. I would suggest, therefore, that some provision be made by the Council whereby the chairman of the Mid-Western Section or a committee from its membership, may come in contact with the Oto-Laryngologists of these communities and interest those men having the necessary qualifications for membership in the work and activities of this Society.

In this section, according to the directory of the American Medical Association, there are three hundred and eighty-nine men practicing Oto-Laryngology. Of these, two hundred and twenty-eight practice it exclusively, and in many instances, Ophthalmology. One hundred and sixty-one practice it together with other branches. Of course, these latter are not to be considered, but out of the two hundred and twenty-eight, our membership should be numerically larger than it is; not because of the number, but rather because these men live in several states of fair population not represented at all in our Society.

An invitation to present a paper or participate in the program was sent to about one hundred and fifty of these two hundred and twenty-eight men. Acceptances, as expected, were few, because a certain number were in the service and others found the demands of their practice too urgent to permit them to present a paper or attend the meeting. There possibly was some disinterest in the matter, because the Society has not been active in this section, outside of the state of Colorado.

The following program was carried out:

1. Ear Complications Seen in the Recent Influenza Epidemic, Dr. William C. Bane, Denver, Colo.

2. The Significance of Headache, Dr. Edward Jackson, Denver, Colo.
3. Conditions in Acute Suppurative Otitis Media Particularly Predisposing to the Chronic Form, Dr. James J. Pattee, Pueblo, Colo.

4. Thrombosis of the Lateral Sinus Without Sepsis, Dr. Harry L. Baum, Denver, Colo.

5. Operative Treatment for Chronic Daeryoceystitis, Illustrated with Stereopticon, Dr. A. J. Ridges, Salt Lake City, Utah.


7. Carcinoma of the Maxillary Antrum with Report of Two Cases, Dr. Franklin E. Wallace, Pueblo, Colo.

8. Tight Strictures of the Esophagus Due to Lye Burns, with Report of a Case, Illustrated with Roentgenograms, Dr. George F. Keiper, Lafayette, Ind.


Respectfully submitted,

CLAUDE E. COOPER,
Chairman Mid-Western Section.
EXECUTIVE SESSION.

Report of the Committee on Nominations:

The Chairman, Dr. J. G. S. Wishart, announced that the Committee had very carefully considered the suggestion made at an earlier session with reference to the re-election of General Birkett as President. The Committee found that it would be a departure from the rules of the Society, and, while it was regrettable that General Birkett could not be present to officiate as President, it was decided not to place his name on the list of nominations for another year.

Report of Nominating Committee:

2. Wells P. Eagleton, Newark, N. J., Chairman Eastern Section.
4. Samuel Iglauer, Cincinnati, Ohio, Chairman Middle Section.
5. Frank L. Dennis, Colorado Springs, Colorado, Chairman Mid-Western Section.
6. H. Bert Ellis, Los Angeles, California, Chairman Western Section.
7. William H. Haskin, 40 East 41st St., New York City, Secretary.

Class A:

9. Thomas J. Harris, New York City.
10. Lee Wallace Dean, Iowa City, Iowa.
11. Francis P. Emerson, Boston, Mass.

Class B:


Class C:

16. Herbert S. Birkett, Montreal, Canada.
17. Lafayette Page, Indianapolis, Ind.

It was moved and seconded that the report of the Nominating Committee be accepted and placed on file, to be acted upon at a later session. Carried.
Ephraim Fletcher Ingals was born in Lee Centre, Illinois, September 29th, 1848. His father, Charles Francis Ingals, a native of Abington, Conn., settled in Illinois in 1834, and engaged in agriculture and stock raising. His mother, Sarah Hawkins Ingals, was a native of Reading, T. Dr. Ingals was descended from one of two brothers, Edmund and Francis Ingals, who came from Lincolnshire, England, in 1628, and settled in Lynn, Mass.

His early life was passed in Lee Centre, where he attended the public schools of his native country. Later his education was continued at a branch of the Normal School at Bloomington and the Rock River Seminary at Mount Morris, Ill.

He attended Rush Medical College, from which he received his degree in 1871. Following graduation he served as an interne in Cook County Hospital, and upon the completion of his service, associated himself in practice with his uncle, Ephraim Ingals. In 1873, he went abroad and visited the hospitals and medical schools of London and Paris. He received the degree of A.M., in 1879, from the old University of Chicago.

From the time of his interneship, Dr. Ingals took an active interest in the teaching of medicine. Up to within a few months of his death, which occurred April 30th, 1918, he continued the practice of his specialty, in which he was one of the pioneers. His professional career embraced a span of 47 years, during which time he held the following positions in Rush Medical College:

Assistant Professor of Materia Medica, 1871 to 1873.
Lecturer on Diseases of the Chest and Physical Diagnosis, Spring Course, from 1874 to 1883.
Professor of Laryngology, from 1883 to 1890.
Professor of Laryngology and of the Practice of Medicine, from 1890 to 1893.
Professor of Laryngology and Diseases of the Chest, 1893 to 1898.
Professor of the Diseases of the Chest, Throat and Nose and Comptroller of the College, from 1898 to the time of his death.
Professorial Lecturer on Medicine in the University of Chicago.

In the Northwestern University Women's Medical School he also held the Chair in the Diseases of the Chest and Throat from 1879 to 1898.
Dr. Ingals’ hospital connections were varied, and during his active career he was a member of the staff of the following institutions:

Professor of Laryngology and Rhinology in the Chicago Policlinic; Attending Physician to the Cook County Hospital; Attending Laryngologist to the Presbyterian and St. Joseph’s Hospitals.

As a member of various medical societies, his influence in them was shown by the fact that he was honored with presidency of the Illinois State Medical Society, the American Climatological Association, the Association of American Medical Colleges, the Chicago Laryngological Society, and he was Chairman of the Section of Laryngology of the Pan-American Medical Congress of 1893. He served as a Trustee of the American Medical Association for a number of years. Other societies with which he affiliated himself were the Chicago Medical, the American Laryngological, Rhinological and Otological, the Institute of Medicine of Chicago, the Chicago Pathological Society and the American College of Surgeons.

Outside of his professional activities he found time to serve as a member of the Civic Federation, and at one time was President of the Citizens’ Association of Chicago. In the old Medical Reserve Corps he held a commission as Lieutenant, but during the late war he was advanced to a Captain, and, acting in an advisory capacity, he rendered valuable service.

In the advancement of medical education, Dr. Ingals took a leading and active part. It was through his initiative and effort that the affiliation of Rush Medical College and the University of Chicago was eventually brought about. His ambition, however, was not satisfied by the nominal connection first made, as he realized the desirability of an organic union between the two institutions. No event in his life gave him greater satisfaction than when this plan was finally consummated.

He married Miss Lucy S. Ingals, a native of Chicago and daughter of Ephraim and Mellissa R. Ingals, in 1876. His widow and four children, Francis Ephraim, Mellissa Rachel, Mary Goodell and E. Fletcher, Jr., survive him.

For more than a third of a century he was easily among the foremost Laryngologists of America, in fact of the world. Age did not seem to dim his vigor, for he was ever alert in his readiness to adopt and develop new methods as they appeared. When he was about sixty years of age he began to study and to practice
endoscopy, which had just come into being and up to the time of his death he maintained a high place among the experts in this method.

As a writer, Dr. Ingals' contributions to the literature were many and varied. Four editions of his text-book on the Diseases of the Chest, Throat and Nose were issued. The great scope of his studies is shown by the following partial list of his contributions:

2. Laryngeal Tumors and Laryngeal Tuberculosis. Reprint, Chicago, 1879.
5. Report to the Illinois State Medical Society on Laryngeal Tumors. 1881.
11. Recurrent Laryngitis and Obstruction of the Nares, or Ordinary Catarrh. Chicago, 1885. Reprint.
18. The Effects of Dry Atmosphere on Chronic Inflammation of the Larynx and Nares. Reprint, Chicago, 1890.
24. Hypertrophy of the Pharyngeal, or Luschka’s Tonsil. Reprints, Chicago, 1894.
25. The Necessities of a Modern Medical College. Reprint, Easton, Pa., 1894.
34. Results of Antiseptic Treatment in Laryngo-Pulmonary Tuberculosis.
35. Reprint, Chicago, 1898.
42. The Relation of Diseases of the Nose and Throat to Life Expectancy. Reprint, Philadelphia, 1900.
43. Tuberculosis and Insurance. Reprint, Chicago, 1900.
44. Notes on Adrenalin and Adrenalin Chloride. Reprint, Chicago, 1901.
45. The Diagnosis of Diaphragmatic Hernia. Reprint, Chicago, 1891.
46. The Prognosis and Treatment of Suppurative Pleurisy (with an analysis of 83 cases). Reprint, Springfield, 1902.
47. Laryngectomy for Carcinoma. Reprint, Chicago, 1903.
58. Chronic Laryngitis. Reprint, St. Louis, 1905.
64. Intranasal Drainage of the Frontal Sinus. Reprint, New York, 1905.
68. New Operation and Instruments for Draining the Frontal Sinus. Reprint, St. Louis, 1905.
70. Chronic Laryngitis. Reprint, St. Louis, 1906.
72. Intranasal Drainage of the Frontal Sinus. Reprint, St. Louis, 1907.
73. The Relation of Tonsillitis to Rheumatism. Reprint, Springfield, 1907.
74. Non-Recurrent Carcinoma of the Larynx Removed From the Natural Passages. Reprint, St. Louis, 1907.
75. Intranasal Drainage of the Frontal Sinus; Ingals’ and Halle’s Operations. St. Louis, 1907.
77. Intranasal Drainage of the Frontal Sinus. Reprint, Chicago, 1908.
79. Bronchoscopy, Esophagoscopy, the Technic, Utility and Dangers. Reprint, St. Louis, 1909.
81. Quinae and Urea Hydrochlorata (syn. quinae-carbamidum, urea-quinine) as a Local Anesthetic. Reprint, St. Louis, 1910.
83. Tacks and Nails in the Air Passages; Bronchoscopy. Reprint, Chicago, 1912.
84. Vaso-motor Rhinitis (apart from hay fever). Reprint, New York, 1911.
89. What Relation, if any, have the Faucial Tonsils to Pulmonary Tuberculosis? Reprint, Chicago, 1913.
90. Diagnosis and Treatment of Paralysis of the Vocal Cords. Reprint, Chicago, 1913.
91. Nasopharyngeal Mycosarcoma; Several Operations and Final Spontaneous Recovery; under observation for 27 years. Reprint, St. Louis, 1914.
92. Symptoms and Diagnosis of Laryngeal Tuberculosis. Reprint, St. Louis, 1915.
94. Fluoroscopic Bronchoscopy With Case Reports and One by Dr. Stanton A. Friedberg. Reprint, Chicago, 1915.

WALTER FRANKLIN CHAPPELL.

The maternal grandparents of Dr. Chappell were of Scotch and Irish lineage, while his father’s ancestors were of English descent. His father, Robert Chappell, a native of Gloucestershire, England, was married to his mother, Mary A. Moore, a native of County Antrim, Ireland, in Canada, in 1855. The eldest child of this couple, the subject of this sketch, was born at Decow Falls, Ontario on September 26, 1856.

His early life was that of a normal healthy Canadian boy, who took great delight as well as interest in all kinds of outdoor sports. From early childhood he showed signs of the studious nature which marked his later life. His high standing in college work was probably nurtured by his tutor, Professor Carswell. His high school work was done at the Collegiate Institute, St. Catherines, Ontario; his college work at Toronto University, in which he was honored as silver medalist.

He was graduated in medicine from Toronto University in 1879. Later he undertook graduate work in the Trinity Medical College, Toronto, being awarded the gold medal by that institution. For
five years he pursued his medical studies in England, under such
great teachers as Sir Morrell MacKenzie and Sir Frederick Treves,
becoming a member of the Royal College of Surgeons in 1881.

Dr. Chappell's training and scholarly attributes soon gave him
a position among laryngologists of New York City, where he
settled after the completion of his European studies.

His most conspicuous service to laryngology was in connection
with the development of the Manhattan Eye, Ear and Throat Hos-
pital, with which he was connected for 32 years as Clinical Assistant,
Visiting Surgeon, Secretary and President of the Board of Surgeons.

He was Clinical Professor of Laryngology in Columbia Univer-
sity from 1907 to 1916.

He was a member of the New York Academy of Medicine and
a Fellow of the American College of Surgeons, the American
Laryngological Association and of this Society.

Dr. Chappell was married on January 31, 1894, to Mary Louise
Graves, and is survived by three children: Louise Rike Chappell
Kunhardt, Constance Lavinia Chappell Talmadge and Walter
Franklin Chappell, Jr.

Dr. Chappell, although of a pronounced studious nature was
devoted to outdoor life—golfing, hunting and fishing. He was of
a bright, jovial disposition with a keen insight and understanding
of humanity. Above all he was a great lover of his home and
family.

His important contributions to medical literature include the
following:

1895. Clinical Notes on Methods and New Remedies in Treat-
ment of Diseases of the Upper Air Passages.


1898. Throat and Nose Affections and Their Relation to Gen-
eral Medicine.

1903. The Early Appearances, Diagnosis and Treatment of
Tuberculosis of the Upper Air Tract.

1904. Four Unusual Tumors in the Naso-Pharynx.

1905. Relationship of Laryngeal to Pulmonary Tuberculosis.

1907. Large Tumor of the Laryngo-Pharynx Removed by Sub-
Hyoid Pharyngotomy.


1909. Remarks on Recent Surgery of the Upper Air Test.

1909. A Rare Hypertrophic Form of Syphilis Involving the
Fauces and Epiglottis.
Dr. Ray was born in Nelson County, Kentucky, on Aug. 19, 1860, the son of Isaac N. and Ruth Bodine Ray. His paternal ancestors came from Manchester, England, prior to 1696, settling in Prince George County, Maryland. One of his ancestors, Nicholas Ray, moved to Marion County, Kentucky, in 1769. His maternal ancestors were of French Hugenot extraction.

His early life was spent in Bloomfield, Kentucky, where he received his early education. His college work was done in Georgetown College, Kentucky, and he was graduated in medicine from the University of Louisville in 1882. From 1882 to 1884 he was an interne in the Manhattan Eye, Ear and Throat Hospital, New York.

After continuing his training in London, Paris, Berlin and Vienna, he began the practice of medicine in Louisville, in 1886, devoting himself exclusively to the eye, ear, nose and throat.

Dr. Ray’s ability as a practitioner and a teacher was early recognized, evidenced by the following positions which he held in his alma mater, the University of Louisville: Demonstrator of Diseases of the Eye, Ear, Nose and Throat, 1886 to 1889; Lecturer, 1889 to 1891; Professor, 1891 until his death.

He was for many years a valued member of the staff of the Louisville City Hospital and of Sts. Mary and Elizabeth’s Hospital.

His medical society affiliations included in addition to local, state and national associations, the American College of Surgeons, the American Ophthalmological, the American Otological, the Academy of Ophthalmology and Oto-Laryngology, of which he was president in 1914, and this Society, which has always held him in the highest esteem.
Dr. Ray came from a family of ardent Baptists, but he himself never affiliated with any denomination. With a firm belief in Almighty God, he was tolerant of all religions and respected them all.

His manner was at times jovial, at other times taciturn, yet underlying this external variability of mood, he was inherently good of heart, generous to a fault, and entirely unselfish.

Dr. I. A. Lederman, a devoted friend and admirer, thus writes of him:

"I have reason to know personally his generosity to the youngster entering the active life of his chosen profession. Almost without exception, every young man who came to this city to practice in our specialty, came to Dr. Ray for advice. He never left empty-handed, but he was fathered and assisted not only by words but in every material way that an older man can help a younger. If the young man strayed from the path of strict professional ethics, and if he failed to make material progress, it was not through any fault of the man who fostered him. Nothing gave Dr. Ray more pleasure than to see a young man succeed. In the profession of our city he was beloved in spite of his seeming eccentricities. Those who knew him best loved him most dearly. One of his characteristics indicating his interest in medical education, was his devotion to the University of Louisville. He not only worked faithfully, probably more than any other man in Louisville, for the interests of the University, but as long as his strength permitted he would not relinquish his position as teacher. Not only this, but he impelled others to perform their duties, and when necessary enforced a discipline which made his assistants fear him while they loved him. In his private work and in his public hospital work, the question of financial gain never entered into consideration. His time was never so valuable that the pauper could never receive his full measure. He was if anything more openly sympathetic with the poor whom he had under his care than with those who paid him amply for his work."

Having no immediate family, his affections were lavished on his sisters and their children, to whom he was as a father. He cared for his mother to the day of her death as only a most devoted son could.

Among his contributions to literature are the following:
1. The Inefficiency of the Wilde Incision. 1901.
2. A Case of Vascular Naevus of the Iris, with Dr. Verhoef.


6. The Blind of Kentucky; Based on a Study of 175 Pupils of the Kentucky Institute for the Education of the Blind. Amer. Prae. and News, 1895.


Edgar Miller Holmes was born at Middletown, Connecticut, on May 25, 1868, and met his death by drowning on September 19, 1918. He was the first of two sons of Emma R. (Miller) Holmes and Giles D. Holmes. He came from sturdy stock, his mother surviving him.

His early training was received in the public schools of Middletown, where he was graduated from the High School.

As a young man he taught in the public school of his native town, and gave private lessons on the violin. Later, he took up the study of dentistry, and he practiced that profession for five years.

Next, he began the study of medicine at Harvard, and was graduated from that institution in 1895. He served as interne at the Boston City Hospital, in the department for Diseases of the Ear, Nose and Throat, remaining here the customary eighteen months.

For several years he was an instructor in the Harvard Post-Graduate School of Medicine, and for the past two or three years he was an instructor in Otology at Tufts College Medical School.

Early in the days of his practice he became a member of the visiting staff of the Boston City Hospital, and at the time of his death he was in charge of the department for Diseases of the Ear, Nose and Throat. He also was visiting surgeon in this department of Saint Elizabeth's Hospital, Boston, for over twenty years. For many years he was visiting surgeon at the Boston Dispensary, and he was consulting aurist at the Forsyth Dental Infirmary.

He was a member of the American Medical Association, the Massachusetts Medical Society, the New England Otological and Laryngological Society, the American College of Surgeons, the American Academy of Ophthalmology, the American Laryngological, Rhinological and Otological Society, and the American Otological Society.

In 1895 Doctor Holmes married Pauline G. Prentice of Grafton, who died of pneumonia in 1907, being survived by three children, Marjorie, Pauline and Edgar Miller Holmes, Jr., who are all living. Later he married Charlotte Crowell, of Middletown, Connecticut.

Dr. Holmes was a man of sterling character, with a charming personality and a lively fund of wit and humor. He had a host
of friends, and to these he was loyal to the highest degree. His patients were his friends, for he found things in common with them, and many of them brought their problems to him for discussion.

He always took an active part in the meetings of the several societies in which he held membership, especially in the branches pertaining to his specialty.

Dr. Holmes possessed a high degree of mechanical ability, somewhat influenced possibly by his early dental career. He could fashion an instrument over night if the occasion demanded it. His greatest contribution in this line was the Holmes nasopharyngoscope, which has been found of service by laryngologists all over the world.

As an extemporaneous speaker, he was clear and logical, and he spoke with that vigorous manner that left no doubt as to the mastery of his subject.

Dr. Holmes was a rapid and careful operator, and an untiring worker. There was nothing in laryngology and otology he could not do and do well. He was a splendid teacher, and he could illustrate the subjects he taught by blackboard drawings, or water color sketches.

He had the ability to leave his care when he left his office, but even then he was busy about some work which gave him pleasure. One had but to visit his summer home at Allerton, Mass., to see the fruits of his labor about the grounds.

While an interne at Boston City Hospital, he studied the ears in two hundred and fifty cases of typhoid fever, the results of which he read before the Massachusetts Medical Society over twenty years ago. This was the first of over twenty terse, scientific monographs which he wrote and read before various medical societies throughout the country. Recently he finished several articles, but up to the time of his death he had not read them at medical gatherings.

His complete bibliography is as follows:


2. Aural Complications of Typhoid Fever. Read at the Annual Meeting of the Massachusetts Medical Society, June 8, 1897.


Walter Shanley Daly was born at Ogdensburg, N. Y., on Dec. 10, 1858, and died on March 18, 1918. His mother, Katherine Cassleman, was of Dutch descent but was born in Canada. His father, Cornelius Daly, was born in Ireland, but emigrated to Canada when quite young.

He attended the public schools at Ogdensburg, N. Y., until he was thirteen years of age, when he entered the High School department at St. Mary's Jesuit College, at Montreal. He received the A. B. degree from the College Department of this institution in 1881.

He then entered the Medical Department of McGill University, from which he was graduated as Doctor of Medicine in 1885. After a short period in general practice, he took a post-graduate work in Eye, Ear, Nose and Throat Diseases at the Post-Graduate Hospital in New York (1892), and under various instructors in Berlin and Vienna (1893). Since this, he had been in the active practice of his specialty in Ogdensburg.

Although modest in his demeanor and more disposed to classical and thoughtful pursuits, he was well-informed on current topics, and took a becoming interest in the activities of his community. He was a member of the City Board of Education from 1896 to 1912, and was its President in 1908.

His most important paper was entitled "Hypertrophy of the Pharyngeal Lymphatic Ring as a Factor in the Production of Epileptic Equivalence," which was published in the Annals of Otology, Rhinology and Laryngology, June, 1907.

He was married in 1894 to Elizabeth Moran, who died in 1898, leaving one child, Margery, who still survives.

Dr. Daly was devoted to this Society and never failed to attend its meetings when it was possible.

Dr. Mosher announced the serious illness of Dr. H. Holbrook Curtis, and suggested that the Secretary be instructed to send some word of appreciation to Dr. Curtis. On motion, duly seconded and carried, the Secretary was instructed to send to Dr. Curtis a token of friendship.

The Committee on the Teaching of Oto-Laryngology reported progress. During the war no work was done by the Committee. A meeting was held two days ago, and some active discussion took
place, but there had not been time to formulate this as a report. The fact that seventy per cent. of otologists had their applications for commissions in the Army rejected was evidence that there was much work for the Committee to do. It was therefore moved that the Committee be re-appointed. Seconded. Carried.

The resignations of the following members were read by the Secretary:
- Dr. Harry Friedenwald, Baltimore, Md.
- Dr. George A. Webster, Boston, Mass.
- Dr. Harvey Smith, Winnipeg, Canada.

It was moved and seconded that the resignations of these members be accepted with regret. Seconded. Carried.

Adjourned.

EXECUTIVE SESSION.
Friday Morning, June 6th, 1919.

Reception of Guests:
- Sir Sinclair Thomson, London, Dr. Fernand Lemaitre, Paris, Dr. Frank Rose, London.

Appointment of the following Nominating Committee:
- Dr. D. J. G. Wishart, Chairman; Dr. John W. Murphy, Dr. Thomas J. Gallacher, Dr. Lewis A. Coffin.

Election of Fellows:
- Dr. James S. Greene, New York City.
- Dr. John D. Kernan, New York City.
- Dr. H. W. Lyman, St. Louis, Mo.
- Dr. William V. Mullin, Colorado Springs, Col.
- Dr. Charles M. Robertson, Chicago, Ill.
- Dr. C. C. Jones, Cincinnati, Ohio.

Election of Honorary Members:
- Dr. C. M. Miller, Vice-President, presided.

The Board of Directors proposed the following men for election as Honorary Fellows: Sir Sinclair Thomson, London, Dr. Fernand Lemaitre, Paris, Dr. Frank Rose, London.

Upon motion, duly seconded and carried, the above were elected to honorary membership.

Adjourned.

EXECUTIVE SESSION.
Saturday Morning, June 7th, 1919.

Dr. Claude E. Cooper, Vice-President, presided.
Report of the Secretary.
To the Fellows of the American Laryngological, Rhinological and Otological Society:

Gentlemen:

Your Secretary is most grateful for the co-operation of all members and sincerely hopes that with the final ending of the war and the return of our Fellows to their homes that they will one and all give the results of their experiences in their various spheres to the Society, which has done its best to keep up its high standard during their enforced absence.

It is a sad duty to report the deaths of four Fellows during our past year:

Dr. U. S. Bird, Tampa, Fla.
Dr. W. F. Chappell, New York City.
Dr. C. J. Blake, Boston, Mass.
Dr. E. M. Holmes, Boston, Mass.

Resignations have been accepted from Dr. H. Friedenwald, Dr. W. Harvey Smith, Dr. G. A. Webster and Dr. J. P. Tunis.

Six Fellows have been elected, making a total loss for the year of two.

The applications of fifteen men have been approved and theses have been requested of them.

Extension of time, owing to war conditions, was granted to ten approved candidates, so we can confidently hope for a substantial increase at our next Annual meeting.

Respectfully submitted.

W. H. Haskin,
Secretary.

Moved and seconded that the report of the Secretary be received and filed.

Report of the Treasurer.

AMERICAN LARYNGOLOGICAL, RHINOLOGICAL & OTOTOLOGICAL SOCIETY, INC., STATEMENT OF RECEIPTS AND DISBURSEMENTS MAY 16, 1918 TO MAY 28, 1919.

Balance May 16, 1918.................................................$ 1,841.80

Receipts.
Transferred from Savings Account...............$ 800.00
27 dues received year 1917-1918................. 270.00
194 dues received year 1918-1919.............. 1,940.25
13 initiations ........................................ 130.00

$ 3,140.25

$ 4,982.05
Disbursements.

1. Dr. Loy McAfee, reporting meeting... $100.00
2. Col. Birkett, entertainment.............. 108.60
3. Alfred Moore, lantern, etc............... 35.00
4. Dr. Layman, section meeting............... 25.00
5. J. Payson Clark.......................... 11.50
6. V. L. P. Shriver, premium on treasurer's bond................... 37.50
7. Mercury Pub. Co., programs, postage, etc................. 290.00
8. Safety deposit box......................... 5.00
9. Fourth Liberty Loan Bond, 4 1/2%... 1,000.00
10. Stamps.................................. 9.00
11. Dr. W. C. Phillips, expenses, Midwinter Meeting of Council........ 69.02
12. Dr. G. L. Richards, postage, telephone, stenographer............. 79.81
14. Dr. W. H. Haskin, expenses, 1918-1919....... 200.00
15. Victory Bond............................ 1,000.00

$3,087.19

Cash on hand May 28th, 1919........ $1,894.86

Audited and found correct,

L. V. SATTELE,
Works Accountant,
National Tube Co.

AMERICAN LARYNGOLOGICAL, RHINOLOGICAL & OTOTOLOGICAL SOCIETY, INC., STATEMENT OF INVESTMENT ACCOUNTS AT THE CLOSE OF BUSINESS MAY 28, 1919.

Cash deposited with People's National Bank, Pittsburgh, Pa., in Savings Account, pass book No. F 127, as follows;—

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<tr>
<th>Date</th>
<th>Description</th>
<th>Amount</th>
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<td>Apr. 24, 1918</td>
<td>Balance .........................</td>
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<td>June 1, 1918</td>
<td>Dividend P. R. R. stock............</td>
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<td>Aug. 1, 1918</td>
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<td>Dividend P. R. R. stock............</td>
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<td>Oct. 31, 1918</td>
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<td>Oct. 31, 1918</td>
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<td>59.50</td>
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<tr>
<td>Dec. 3, 1918</td>
<td>Dividend P. R. R. stock...........</td>
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<td>Jan. 31, 1919</td>
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<td>June 1, 1918</td>
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<td>Dec. 1, 1918</td>
<td>Interest .......................</td>
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<td>Mar. 1, 1919</td>
<td>Dividend P. R. R. stock...........</td>
<td>75.00</td>
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MINUTES.

Mar. 21, 1919  Liberty Bond coupons ...... 35.00
Apr. 23, 1919  Liberty Bond coupons ...... 40.40
Apr. 23, 1919  Cresson Bond coupons...... 180.00
Apr. 30, 1919  Westinghouse Air Brake stock 59.50

Total ........................................ $ 899.43

Disbursements.
Tranferred to Checking Account................. $ 1,800.00
Balance on hand May 28th, 1919................. $  129.02

Investments.

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<td>First Liberty Loan Bonds 2,000.00</td>
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<td>1</td>
<td>Fourth Liberty Loan Bond 1,000.00</td>
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<tr>
<td>2</td>
<td>Victory Bonds 1,000.00</td>
<td>1,000.00</td>
</tr>
</tbody>
</table>

$14,700.00 $16,509.50

Mercury Publishing Co., bill rendered......................$1,387.77

Audited and found correct,

L. V. SATTELE,
Works Accountant,
National Tube Co.

Moved and seconded that the Treasurer’s report be received and filed.

EXECUTIVE SESSION.
Saturday Afternoon, 1 P. M.

Election of Officers:
The Board of Directors as nominated by the Nominating Committee was read by the Secretary. It was moved that the Secretary be instructed to cast one vote for the Board as nominated. Seconded. Carried. The Secretary announced that one vote had been cast, and the Board of Directors were declared elected.

Adjourned.
FELLOWS

Abraham, Jos. H. .................. 130 West 58th St., New York
Abbott, Wm. J. .................. 210 Lennox Bldg., Cleveland, Ohio
Alexander, Lawrence Dade ......... 130 West 59th St., New York
Allen, John H. .................. 711 Congress St., Portland, Me.
Allport, Frank .................. 7 West Madison St., Chicago, Ill.
Ard, F. C. .................. 604 Park Ave., Plainfield, N. J.
Arrowsmith, Hubert .............. 170 Clinton St., Brooklyn, N. Y.
Atkinson, Wm. J. .................. 111 North Main St., Paterson, N. J.
Bane, Wm. C. ............. Metropolitan Bldg., Denver, Colo.
Barnhill, John F. .............. Pennway Bldg., Indianapolis, Ind.
Barnes, Harry A. ............ 520 Commonwealth Ave., Boston, Mass.
Beck, Joseph C. .............. 2551 N. Clark St., Chicago, Ill.
Berens, T. Passmore .......... 25 Park Ave., New York City
Bigelow, F. Nolton .............. 265 Benefit St., Providence, R. I.
Birkett, H. S. .................. 252 Mountain St., Montreal, Can.
Blackwell, Hugh B. .............. 148 W. 58th St., New York
Bowers, Wesley C. .............. 27 West 49th St., New York City
Braislin, W. C. .................. 425 Clinton Ave., Brooklyn, N. Y.
Braun, Alfred .................. 616 Madison Ave., New York
Briggs, H. H. .................. 73 Haywood St., Asheville, N. C.
Brown, Clayton M. .............. 510 Delaware Ave., Buffalo, N. Y.
Brown, H. Beattie .............. 53 West 52nd St., N. Y. City
Brown, John E. .............. 239 E. Town St., Columbus, Ohio
Brown, John Mackenzie .......... 1002 Brockman Bldg., Los Angeles, Cal.
Brumm, Seth A. .............. 1411 Walnut St., Philadelphia, Pa.
Bryant, W. Sohier .............. 107 East 39th St., New York
Campbell, Don M. .............. 801 Peter Smith Bldg., Detroit, Mich.
Campbell, Wm. E. .............. Atlanta National Bank Bldg., Atlanta, Ga.
Canfield, R. Bishop .............. 330 S. State St., Ann Arbor, Mich.
Carmody, Thos. E. Metropolitan Bldg., Denver, Colo.
Carter, Wm. Wesley ........................................ 69 W. 50th St., New York
Chamberlin, Wm. B. ........................................ 614 Osborn Bldg., Cleveland, O.
Chambers, Talbot R. ........................................ 15 Exchange Pl., Jersey City, N. J.
Chenery, Wm. E. ............................................. 222 Huntington Ave., Boston, Mass.
Chisholm, W. Alexander ..................................... 68 W. 55th St., New York
Cline, L. C. .................................................. 21 Willoughby Bldg., Indianapolis, Ind.
Cobb, Frederick C. .......................................... 11 Marlboro St., Boston, Mass.
Coffin, Lewis A. ............................................. 616 Madison Ave., New York
Coggleshall, Henry ........................................... 40 E. 58th St., New York
Cohen, Lee .................................................... 1820 Eutaw Place, Baltimore, Md.
Collins, Burnitt ............................................. 645 St. Marks Ave., Brooklyn, N. Y.
Corwin, Theodore ............................................. 20 Central Ave., Newark, N. J.
Coolidge, Algermon .......................................... 613 Beacon St., Boston, Mass.
Cooper, Claude E. ............................................ Metropolitan Bldg., Denver, Colo.
Cott, Geo. F. ................................................. 1001 Main St., Buffalo, N. Y.
Cox, Chas. N. .................................................. 257 Jefferson Ave., Brooklyn, N. Y.
Cox, Gerhard II ............................................... 8 East 54th St., New York
Craig, Robert H ............................................. 510 Sherbrooke St., W. Montreal, Can.
Crockett, Eugene A. ......................................... 298 Marlboro St., Boston, Mass.
Culbert, Wm. Ledlie ........................................... 16 E. 54th St., New York
Culp, John F. .................................................. 410 No. Third St., Harrisburg, Pa.
Cunningham, Henry Mortimer ................................ Birks Bldg., Vancouver, B. C.
Curtis, H. Holbrook .......................................... 853 Seventh Ave., New York
Cutler, Franklin E. ........................................... 1025 Schofield Bldg., Cleveland, O.
Davis, George E. ............................................... 42 W. 77th St., New York
Dean, Lee Wallace ........................................... Iowa City, Iowa
Demarest, Frederick F. C. .................................. 29 Academy St., Passaic, N. J.
Dench, Edward B. ............................................. 15 E. 53rd St., New York
Dennis, Frank L. ............................................. 218 Burns Bldg., Colorado Springs, Colo.
Downey, Jesse W., Jr ....................................... 529 No. Charles St., Baltimore, Md.
Dudley, Wm. H. ............................................... 512 Brockman Bldg., Los Angeles, Cal.
Duel, Arthur B. ............................................... 27 E. 57th St., New York
Dunn, John .................................................... 411 East Franklin St., Richmond, Va.
Durkee, John W. ............................................... 142 Clinton St., Brooklyn, N. Y.
Dwyer, James Garfield ...................................... 40 E. 41st St., New York
Eagleton, Wells P. ........................................... 15 Lombardy St., Newark, N. J.
Edgar, Thomas O. ............................................ Dixon National Bank, Dixon, Ill.
Ellegood, Joshua A................. Equitable Bldg., Wilmington, Del.
Ellis, H. Bert.................. 245 Bradbury Bldg., Los Angeles, Cal.
Emerson, Francis P........ 520 Commonwealth Ave., Boston, Mass.
Emerson, Linn................ Metropolitan Bldg., Orange, N. J.
Fairbairn, John F............... 131 Allen St., Buffalo, N. Y.
Farrell, Thomas H............... 236 Genesee St., Utica, N. Y.
Fetterolf, George............. 2047 Chestnut St., Philadelphia, Pa.
Fisher, Stanwood E........... 192 State St., Portland, Me.
Fitzpatrick, T. V............... 19 W. 7th St., Cincinnati, O.
Fleming, Ernest W., Trust and Savings Bldg., 6th and Spring Sts., Los Angeles, Cal.

Forbes, Henry Hall............. 40 E. 41st St., New York
Forsyth, Edgar A............. 471 Virginia St., Buffalo, N. Y.
Foster, John M................ Metropolitan Bldg., Denver, Colo.
Fowler, Edmond P............. 616 Madison Ave., New York
Frank, Ira....................... 104 So. Michigan Ave., Chicago, Ill.
Friedenthal, Wolff............. 59 East 75th St., New York
Friedberg, Stanton A........... Monroe Bldg., Chicago, Ill.
Friesner, Isidore.............. 814 Lexington Ave., New York
Gallaher, Thomas J............. California Bldg., Denver, Colo.
Gile, Ben Clark................ 1627 Walnut St., Philadelphia, Pa.
Goldsmith, Perry G.............. 84 Carlton St., Toronto, Can.
Goldstein, Max A............ 3858 Westminster Place, St. Louis, Mo.
Graef, Charles............... 1125 Boston Road, New York
Graham, Harrington Bidwell, 240 Stockton St., San Francisco, Cal.
Greene, D. C., Jr.............. 23 Bay State Road, Boston, Mass.
Greene, Jas. S................. 44 Gramercy Park, New York City
Greene, Jos. Berry............. Medicine Bldg., Ashville, N. C.
Griffin, E. Harrison........... 55 West 47th St., New York
Guggenheim, Louis K........... 1006 Carleton Bldg., St. Louis, Mo.
Guntzer, J. H.................... 40 East 41st St., New York
Hastings, Thomas H............ 831 University Block, Syracuse, N. Y.
Harr, Thomas J................ 104 East 40th St., New York
Harrison, William G........... 904 Empire Bldg., Birmingham, Ala.
Haskin, William H............... 40 East 41st St., New York
Hastings, Hill, Trust and Savings Bldgs., 6th and Spring Sts., Los Angeles, Cal.
Hays, Harold..........................2178 Broadway, New York
Hedges, Halstead S........................Charlottesville, Va.
Held, R. Johnson..........................616 Madison Ave., New York
Holmes, Christian R........................8 East 8th St., Cincinnati, Ohio
Horn, Henry..........................135 Stockton St., San Francisco, Cal.
Horn, John..........................72 East 92nd St., New York
Howell, Hampton P........................616 Madison Ave., New York
Hubbard, E. V..........................17 East 38th St., New York
Hubbard, Thomas........................515 Nicholas Bldg., Toledo, Ohio
Hubby, Lester Mead........................27 West 68th St., New York
Hurd, Lee M..........................39 East 50th St., New York
Hyatt, Frank, The Rochambeau, 815 Connecticut Ave., Washington, D. C.
Iglauer, Samuel..........................701 Race St., Cincinnati, Ohio
Imperator, Charles J........................17 East 38th St., New York
Ingersoll, John M..........................1021 Prospect Ave., Cleveland, O.
Jackson, Oliver II........................34 North Main St., Fall River, Mass.
Jervey, J. W..........................Greenville, S. C.
Johnson, Walter B........................170 Broadway, Paterson, N. J.
Johnston, Richard Hall......................807 N. Charles St., Baltimore, Md.
Jones, Charles C..........................14 West 7th St., Cincinnati, O.
Keiper, George F..........................Lafayette, Ind.
Kennon, Beverly R........................Taylor Bldg., Norfolk, Va.
Kernan, John D..........................156 East 79th St., New York
Kerrison, Philip D........................58 West 56th St., New York
Kirkendall, J. S..........................Ithaca, N. Y.
Kittredge, Frank E........................Masonic Temple, Nashua, N. H.
Kopetzky, Samuel J........................51 West 73rd St., New York
Kuyk, D. A..........................114 North 5th St., Richmond, Va.
Kyle, John J..........................702 Title Insurance Bldg., Los Angeles, Cal.
Large, Secord H..........................536 Rose Bldg., Cleveland, Ohio
Lasalle, J. J..........................226 Michigan St., Toledo, Ohio
Layman, Daniel W., 608 Hume-Mansur Bldg., Indianapolis, Ind.
Lederman, M. D..........................58 East 75th St., New York
FELLOWS.

Levy, Robert ................ Metropolitan Building, Denver, Colo.
Levis, Eugene R. ................ 1270 Main St., Dubuque, Iowa
Levis, Robert .................. 48 West 40th St., New York
Lincoln, William R. ........ Lenox Bldg., Cleveland, Ohio
Linhart, C. P. ................... 106 East Broad St., Columbus, Ohio
Lockard, Lorenzo B. ........ Metropolitan Bldg., Denver, Colo.
Loeb, H. W. ..................... 537 North Grand Ave., St. Louis, Mo.
Logan, Jas. E. ................. 1208 Wyandotte St., Kansas City, Mo.
Loughran, Robert Livingston ... 145 West 58th St., New York
Lowman, John B. ................. 142 Park Place, Johnstown, Pa.
Lyman, H. W. ................... 700 Carleton Bldg., St. Louis, Mo.
Lynah, Henry Lowndes .......... 127 W. 58th St., New York

MacKenty, John Edmund .......... 43 West 54th St., New York
Maclay, Otis H. .................. 29 East Madison St., Chicago, Ill.
McPherson, D. .................... 616 Madison Ave., New York
Martinez, Emilio ................ 56 Neptune St., Havana, Cuba
Mason, William Beverly ......... 1738 M St., Washington, D. C.
Matthews, Justus, 1021 Metropolitan Bank Bldg., Minneapolis, Minn.
McCaw, James F. ................. 202 Sherman Bldg., Watertown, N. Y.
McClelland, Lefferts A. ... 78 MeDonough St., Brooklyn, N. Y.
McCoy, John J. ................. 157 West 73rd St., New York
McCready, Jas. Homer ........ 816 Empire Bldg., Pittsburgh, Pa.
McCullagh, Samuel ............ 108 W. 58th St., New York
McKernon, Jas. F. ............. 62 West 52nd St., New York
McKimmie, O. A. M., 1330 Massachusetts Ave., N. W., Washington, D. C.
McKinney, Richmond, Bank of Commerce and Trust Bldg., Memphis, Tenn.
McLaury, Frank H. .............. Westport, Conn.
McReynolds, John O. ........... Trust Bldg., Dallas, Tex.
Means, Chas. S. ................. 137 East State St., Columbus, Ohio
Menge, Frederick .............. 25 East Washington St., Chicago, Ill.
Mercer, William F. .......... 1101 West Franklin St., Richmond, Va.
Mial, Leonidas L. ............. Morristown, N. J.
Miller, Clifton M..............3 West Grace St., Richmond, Va.
Miller, Frank E...............17 West 54th St., New York
Miller, H. Edward............310 Metropolitan Bldg., St. Louis, Mo.
Milligan, Robert..............Westinghouse Bldg., Pittsburgh, Pa.
Mooney, Jas. J................390 Delaware Ave., Buffalo, N. Y.
Moorhead, Robt. L.............185 Hancock St., Brooklyn, N. Y.
Morgenthau, George...........104 S. Michigan Blvd., Chicago, Ill.
Mosher, Harris P.............828 Beacon St., Boston, Mass.
Moss, Robert E................Hicks Bldg., San Antonio, Tex.
Mullin, AVilliam..............Burns Bldg., Colorado Springs, Colo.
Murphy, John W..............2700 Union Central Life Bldg., Cincinnati, Ohio
Murray, Gilbert D............516 Spruce St., Scranton, Pa.
Myers, Harry L................Taylor Bldg., 151 Granby St., Norfolk, Va.
Myles, Robert C................11 E. 48th St., New York
New, Gordon B................Mayo Foundation, Rochester, Minn.
Oppenheimer, Seymour.........45 East 60th St., New York
Page, John R..................127 East 62nd St., New York
Page, Lafayette..............603 Hume-Mansur Bldg., Indianapolis, Ind.
Park, J. Walter................32 North 2nd St., Harrisburg, Pa.
Parker, Edward F..............70 Hassel St., Charleston, S. C.
Patterson, Jas. A.............214 Burns Bldg., Colo. Springs, Colo.
Phillips, Wendell C...........40 West 47th St., New York
Pierce, Norval H..............22 E. Washington St., Chicago, Ill.
Pischell, Kaspar.............135 Stockton St., San Francisco, Cal.
Rae, John B...................247 West 70th St., New York
Reik, Andrew J. N............1202 No. Charles St., Baltimore, Md.
Reik, Henry O.................360 East 30th St., Baltimore, Md.
Renner, W. Scott..............341 Linwood Ave., Buffalo, N. Y.
Richards, George L............124 Franklin St., Fall River, Mass.
Richards, John D..............8 East 54th St., New York
Richardson, Charles W........1317 Connecticut Ave., Washington, D. C.
Roberts, W. Hunce.............461 East Colo. St., Pasadena, Cal.
Robertson, Charles M.........30 N. Michigan Ave., Chicago, Ill.
Robinson, John A.............40 East 41st St., New York City
Root, Arthur G..................................218 States St., Albany, N. Y.
Rosenheim, Sylvan........................1710 Linden Ave., Baltimore, Md.
Ross, George T............................456 Mackay St., Montreal, Can.
Roy, Dunbar....................................Grand Opera House Block, Atlanta, Ga.
Sauer, Wm. E..................................Humboldt Bldg., St. Louis, Mo.
Scarlett, Rufus B............................78 North Clinton Ave., Trenton, N. J.
Scranton, William A......................123 East 78th St., New York City
Senseney, Eugene T........................308 Lister Bldg., St. Louis, Mo.
Shambaugh, Geo. E..........................People’s Gas Bldg., Chicago, Ill.
Sharp, J. Clarence............................62 West 46th St., New York
Shattuck, Warren S..........................160 Clinton St., Brooklyn, N. Y.
Sluder, Greenfield............................3542 Washington Ave., St. Louis, Mo.
Smith, A. John..................................Yonkers, New York
Smith, Harmon..................................44 West 49th St., New York
Smith, Owen..................................692 Congress St., Portland, Me.
Smith, E. Terry...............................36 Pearl St., Hartford, Conn.
Smyth, Herbert E.............................376 John St., Bridgeport, Conn.
Spence, Frank R..............................Physicians’ Block, Boulder, Colo.
Sperry, Frederick N.........................33 College St., New Haven, Conn.
Spratt, Charles N............................Phy’s and Surg’s Bldg., Minneapolis, Minn.
Steel, George E...............................256 W. 79th St., New York
Stein, Otto Jacob.............................30 North Michigan Ave., Chicago, Ill.
Stickle, Waldo Charles......................86 Pierrepont St., Brooklyn, N. Y.
Stillman, F. L.................................185 E. State St., Columbus, Ohio
Stout, George C..............................1611 Walnut St., Philadelphia, Pa.
Stuckey, J. A..................................The McClelland Bldg., Lexington, Ky.
Sullivan, John James, Jr..........................401 Traders Bank Bldg., Scranton, Pa.
Theisen, Clement F............................172 Washington Ave., Albany, N. Y.
Thigpen, C. A.................................13 South Ferry St., Montgomery, Ala.
Thigpen, F. M.................................13 South Ferry St., Montgomery, Ala.
Thompson, John A............................628 Elm St., Cincinnati, Ohio
Thomson, John J...............................3 Park Ave., Mt. Vernon, N. Y.
Thrasher, A. B.................................N. E. Cor. 7th and Race Sts., Cincinnati, O.
Trowbridge, D. H..............................Fresno, Cal.
Turnbull, Thomas............................835 Western Ave., Pittsburgh, Pa.
FELLOWS.

Vail, Derrick T. ............... 24 East 8th St., Cincinnati, Ohio
Vanderhoof, Don Allison... Exchange National Bank Bldg., Colorado Springs, Colo.
Voislawsky, A. P. ............. 47 East 57th St., New York
Voorhees, Irving Wilson........ 13 Central Park West, New York
Wagner, Henry L........... 518 Sutter St., San Francisco, Cal.
Wales, Ernest DeW...... 1236 N. Pennsylvania St., Indianapolis, Ind.
Waterman, James S........... 676 St. Marks Ave., Brooklyn, N. Y.

Wells, Walter A........... The Rochambeau, Washington, D. C.
White, Joseph A........... 200 East Franklin St., Richmond, Va.
Whiting, Frederick........... 19 West 47th St., New York
Wiener, Alfred........... 550 Park Ave., New York
Wilson, Harold ........... 1501 David Whitney Bldg., Detroit, Mich.
Wilson, Norton L........... 410 Westminster Ave., Elizabeth, N. J.
Winslow, John R........... The Lathrobe Apt., Charles and Read Sts., Baltimore, Md.

Wishart, D. J. Gibb........... 47 Grosvenor St., Toronto, Can.
Worthington, Thomas C........ 1022 Madison Ave., Baltimore, Md.
Yankauer, Sidney........... 616 Madison Ave., New York

HONORARY FELLOWS.

Bell, Alex Graham...... 1331 Connecticut Ave., N. W., Washington, D. C.
Gradenigo, Gius...... Via Gughemo Sanfelice, 33, Naples, Italy
Law, Edward........... 8 Wimpole St., Cavendish Sq., London, Eng.
Lemaitre, F................. Square Money, Paris, France
Love, James Kerr........... 650 Shields Road, Pollokshields, Glasgow, Scotland.
Luc, H.......................... 54 Rue de Varenne, Paris
Maclntyre, John.......... 179 Bath St., Glasgow, Scotland
Moure, E. J........... 25 Cours du Jardin Public, Bordeaux, France
Rose, Frank........... 68 Wimpole St., London, Eng.
FELLOWS.

Schmieglow, E.......... 18 Norregade, Copenhagen, Denmark
Sendziak, J.......... 10 Crywariska St., Warsaw, Poland, Russia
Turner, Logan.......... 27 Walker Street, Edinburgh, Scotland
<table>
<thead>
<tr>
<th>Eastern Section</th>
<th>Southern Section</th>
<th>Middle Section</th>
<th>Western Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>1896 Joseph O'Dwyer, M. D.</td>
<td>(Only one Vice-President elected.)</td>
<td>J. S. Mahon, M. D.</td>
<td>J. E. Logan, M. D.</td>
</tr>
<tr>
<td>1897 F. L. Jack, M. D.</td>
<td>Wm. Shepperegell, M. D.</td>
<td>J. A. Mahon, M. D.</td>
<td>J. E. Schadle, M. D.</td>
</tr>
<tr>
<td>1898 A. G. Root, M. D.</td>
<td>A. W. Calhoun, M. D.</td>
<td>Max Thorner, M. D.</td>
<td>H. L. Wagner, M. D.</td>
</tr>
<tr>
<td>1899 C. W. Richardson, M. D.</td>
<td>C. A. Thigpen, M. D.</td>
<td>H. S. Straight, M. D.</td>
<td>Robert Levy, M. D.</td>
</tr>
<tr>
<td>1900 G. H. Makuen, M. D.</td>
<td>J. A. Stucky, M. D.</td>
<td>N. H. Pierce, M. D.</td>
<td>J. O. McReynolds, M. D.</td>
</tr>
<tr>
<td>1901 W. S. Reunner, M. D.</td>
<td>J. A. White, M. D.</td>
<td>H. W. Loeb, M. D.</td>
<td>E. W. Fleming, M. D.</td>
</tr>
<tr>
<td>1902 H. H. Curtis, M. D.</td>
<td>C. F. McGahen, M. D.</td>
<td>L. C. Cline, M. D.</td>
<td>F. P. Gillia, M. D.</td>
</tr>
<tr>
<td>1903 F. C. Cobb, M. D.</td>
<td>Dunbar Roy, M. D.</td>
<td>C. Jackson, M. D.</td>
<td>R. W. Payne, M. D.</td>
</tr>
<tr>
<td>1904 G. L. Richards, M. D.</td>
<td>J. F. Woodward, M. D.</td>
<td>Thomas Hubbard, M. D.</td>
<td>M. A. Goldstein, M. D.</td>
</tr>
<tr>
<td>1905 S. MacCuen Smith, M. D.</td>
<td>Wm. Cheatham, M. D.</td>
<td>W. L. Ballenger, M. D.</td>
<td>H. B. Ellis, M. D.</td>
</tr>
<tr>
<td>1906 T. H. Halsted, M. D.</td>
<td>H. L. Meyers, M. D.</td>
<td>J. M. Ingersoll, M. D.</td>
<td>W. C. Bane, M. D.</td>
</tr>
<tr>
<td>1907 F. B. Sprague, M. D.</td>
<td>J. M. Ray, M. D.</td>
<td>J. F. Barnhill, M. D.</td>
<td>W. H. Roberts, M. D.</td>
</tr>
<tr>
<td>1908 E. A. Crockett, M. D.</td>
<td>H. O. Reik, M. D.</td>
<td>R. B. Canfield, M. D.</td>
<td>J. C. Reck, M. D.</td>
</tr>
<tr>
<td>1910 J. F. McCaw, M. D.</td>
<td>O. A. M. McKimmie, M. D.</td>
<td>La Fayette Page, M. D.</td>
<td>Wm. H. Dudley, M. D.</td>
</tr>
<tr>
<td>1911 H. P. Mosher, M. D.</td>
<td>J. A. Kent, M. D.</td>
<td>John A. Thompson, M. D.</td>
<td>Thomas J. Gallagher, M. D.</td>
</tr>
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<td>1912 Theodore Corwin, M. D.</td>
<td>Otto Joachim, M. D.</td>
<td>Wm. E. Sauer, M. D.</td>
<td>Hill Hastings, M. D.</td>
</tr>
<tr>
<td>1913 George C. Stout, M. D.</td>
<td>J. W. Jervey, M. D.</td>
<td>B. R. Shurley, M. D.</td>
<td>Lorenzo B. Lockard, M. D.</td>
</tr>
<tr>
<td>1914 Lewis A. Coffin, M. D.</td>
<td>F. M. Thigpen, M. D.</td>
<td>John W. Murphy, M. D.</td>
<td>Frank R. Spencer, M. D.</td>
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<tr>
<td>1915 Stephen H. Lutz, M. D.</td>
<td>Halstead S. Hedges, M. D.</td>
<td>William B. Chamberlin, M. D.</td>
<td>Thomas E. Carmody, M. D.</td>
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<td>1916 John B. Rae, M. D.</td>
<td>Robert C. Lynch, M. D.</td>
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<td>1917 John F. Culp, M. D.</td>
<td>Richmond McKinney, M. D.</td>
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<td>1918 D. Crosby Greene, Jr., M. D. Thomas W. Moore, M. D.</td>
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<td>1919 Robert Lewis, M. D.</td>
<td>Clifton M. Miller, M. D.</td>
<td></td>
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<tr>
<td>1920 Wells P. Eagleston, M. D. Joseph B. Greene, M. D.</td>
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</tr>
</tbody>
</table>

**Mid-Western Section.**
Frank R. Spencer, M. D.
Frank L. Dennis, M. D.
Claude E. Cooper, M. D.
OFFICERS.

SECRETARY AND TREASURER.

1896 to 1900
Robert Cunningham Myles, M. D.
1901 to 1906
Wendell C. Phillips, M. D.
1907 to 1916
Thomas J. Harris, M. D.
1917 William H. Haskins, M. D.

1896—T. P. Berens, M. D.
J. H. Billings, M. D.
D. L. Hubbard, M. D.
H. H. Curtis, M. D.
W. C. Phillips, M. D.
R. C. Myles, M. D.

1897—G. H. Makuen, M. D.
T. P. Berens, M. D.
W. C. Phillips, M. D.
H. H. Curtis, M. D.
E. W. Day, M. D.
D. L. Hubbard, M. D.

1898—J. E. Nichols, M. D.
H. H. Curtis, M. D.
L. A. Coffin, M. D.
W. C. Phillips, M. D.
E. W. Day, M. D.
C. W. Richardson, M. D.
S. E. Solly, M. D.

1899—W. H. Daly, M. D.
W. C. Phillips, M. D.
T. H. Halsted, M. D.
J. O. Roe, M. D.
H. W. Loeb, M. D.
T. C. Christy, M. D.
F. L. Jack, M. D.
D. L. Hubbard, M. D.

1900—S. E. Solly, M. D.
W. H. Daly, M. D.
A. W. Calhoun, M. D.
J. B. Clemens, M. D.
J. F. McKernon, M. D.
W. C. Phillips, M. D.
J. E. Sheppard, M. D.
J. Price Brown, M. D.
Max Thorner, M. D.

1901—D. B. Kyle, M. D.
S. MacCuen Smith, M. D.
S. E. Solly, M. D.
J. Price Brown, M. D.
W. H. Daly, M. D.

1897 to 1900

1901 to 1907
Ewing W. Day, M. D.

1908 Chevalier Jackson, M. D.

1909 to date.
Ewing W. Day, M. D.

COUNCIL.

1902—D. B. Kyle, M. D.
J. F. McKernon, M. D.
C. W. Richardson, M. D.
F. C. Cobb, M. D.

1903—C. W. Richardson, M. D.
R. C. Myles, M. D.
D. B. Kyle, M. D.
J. F. McKernon, M. D.
S. MacCuen Smith, M. D.
F. C. Cobb, M. D.
N. H. Pierce, M. D.
T. P. Berens, M. D.
J. A. White, M. D.

1904—J. A. Stucky, M. D.
C. W. Richardson, M. D.
R. C. Myles, M. D.
A. G. Root, M. D.
T. P. Berens, M. D.
C. R. Holmes, M. D.
E. B. Dench, M. D.
F. L. Jack, M. D.
J. E. Schadle, M. D.
F. R. Packard, M. D.

1905—N. H. Pierce, M. D.
J. A. Stucky, M. D.
C. W. Richardson, M. D.
L. A. Coffin, M. D.
T. H. Halsted, M. D.
C. R. Holmes, M. D.
E. B. Dench, M. D.
F. L. Jack, M. D.
J. E. Schadle, M. D.
F. R. Packard, M. D.
OFFICERS.

1906—F. C. Cobb, M. D.
   N. H. Pierce, M. D.
   J. A. Stucky, M. D.
   E. B. Dench, M. D.
   F. L. Jack, M. D.
   F. R. Packard, M. D.
   L. A. Coffin, M. D.
   T. H. Halsted, M. D.
   J. F. McKernon, M. D.
   W. W. Loeb, M. D.

1907—J. E. Logan, M. D.
   F. C. Cobb, M. D.
   N. H. Pierce, M. D.
   L. A. Coffin, M. D.
   T. H. Halsted, M. D.
   J. F. McKernon, M. D.
   H. W. Loeb, M. D.
   C. W. Richardson, M. D.
   B. B. Kyle, M. D.

1908—W. C. Phillips, M. D.
   J. E. Logan, M. D.
   F. C. Cobb, M. D.
   J. F. McKernon, M. D.
   H. W. Loeb, M. D.
   C. W. Richardson, M. D.
   D. B. Kyle, M. D.
   C. R. Holmes, M. D.
   J. M. McCaw, M. D.

1909—J. E. Logan, M. D.
   D. B. Kyle, M. D.
   C. W. Richardson, M. D.
   W. C. Phillips, M. D.
   J. F. McCaw, M. D.
   W. R. Lincoln, M. D.
   G. L. Richards, M. D.
   J. F. Barnhill, M. D.
   G. H. Makuen, M. D.

1910—C. R. Holmes, M. D.
   G. L. Richards, M. D.
   J. F. Barnhill, M. D.
   G. H. Makuen, M. D.
   N. H. Pierce, M. D.
   W. C. Phillips, M. D.
   F. R. Packard, M. D.
   A. B. Duel, M. D.
   Robert Levy, M. D.

1911—J. F. McKernon, M. D.
   J. A. White, M. D.
   N. L. Wilson, M. D.
   C. R. Holmes, M. D.
   A. B. Duel, M. D.
   F. R. Packard, M. D.
   Robert Levy, M. D.

1912—C. R. Holmes, M. D.
   F. R. Packard, M. D.
   N. H. Pierce, M. D.
   J. F. McKernon, M. D.
   J. A. White, M. D.
   N. L. Wilson, M. D.
   C. Jackson, M. D.
   M. A. Goldstein, M. D.
   A. B. Duel, M. D.

1913—James F. McKernon, M. D.
   Joseph A. White, M. D.
   Norton L. Wilson, M. D.
   Chevalier Jackson, M. D.
   Max A. Goldstein, M. D.
   Arthur B. Duel, M. D.
   Harris P. Mosher, M. D.
   E. Fletcher Ingals, M. D.
   G. Hudson-Makuen, M. D.

1914—Chevalier Jackson, M. D.
   Max A. Goldstein, M. D.
   Arthur B. Duel, M. D.
   Harris P. Mosher, M. D.
   E. Fletcher Ingals, M. D.
   G. Hudson-Makuen, M. D.
   H. Holbrook Curtis, M. D.
   John E. Sheppard, M. D.
   Robert Levy, M. D.

1915—Joseph A. White, M. D.
   Harris P. Mosher, M. D.
   E. Fletcher Ingals, M. D.
   G. Hudson-Makuen, M. D.
   H. Holbrook Curtis, M. D.
   John E. Sheppard, M. D.
   Robert Milligan, M. D.
   John M. Ingless, M. D.
   B. R. Shurley, M. D.

1916—G. Hudson-Makuen, M. D.
   H. Holbrook Curtis, M. D.
   John E. Sheppard, M. D.
   Robert Milligan, M. D.
   John M. Ingersoll, M. D.
   B. R. Shurley, M. D.
   E. B. Dench, M. D.
   D. J. Gibb Wishart, M. D.
   Robert Levy, M. D.
1896
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OFFICERS.

1917—Robert Milligan, M. D.       Walter A. Wells, M. D.
    John M. Ingersoll, M. D.        Thomas J. Harris, M. D.
    E. B. Dench, M. D.             Francis P. Emerson, M. D.
    D. J. Gibb Wishart, M. D.      L. W. Dean, M. D.
    B. R. Shurley, M. D.           Frank R. Spencer, M. D.
    Robert Levy, M. D.             Joseph C. Beck, M. D.
    S. MacCuen Smith, M. D.        Wendell C. Phillips, M. D.
    Thomas H. Halsted, M. D.       1920—Class A
    Walter A. Wells, M. D.

1918—D. J. Gibb Wishart, M. D.     Thomas J. Harris, M. D.
    B. R. Shurley, M. D.            Lee Wallace Dean, M. D.
    Robert Levy, M. D.              Francis P. Emerson, M. D.
    S. MacCuen Smith, M. D.         Class B
    Thomas H. Halsted, M. D.
    Walter A. Wells, M. D.
    T. J. Harris, M. D.
    Francis P. Emerson, M. D.
    L. W. Dean, M. D.

1919—S. MacCuen Smith, M. D.       Class C
    Thomas H. Halstead, M. D.

DECEASED WHILE MEMBERS OF THE SOCIETY.

Resident Members.

Noyes, J. L., M. D. .................. 1896
O'Dwyer, Joseph, M. D. ............. 1897
Hengst, D. A., M. D. ............... 1898
Nichols, J. E. H., M. D. .......... 1898
Hopkins, Woolsey, M. D. .......... 1899
Rankin, D., M. D. .................. 1900
Wenner, R. J., M. D. ............... 1900
Chapman, S. Hartwell, M. D. ....... 1903
Friedenberg, Edward, M. D. ....... 1903
Kibbe, A. B., M. D. ............... 1903
Hoople, H. Nelson, M. D. .......... 1905
Brandegee, Wm. P., M. D. .......... 1906
Solly, S. E., M. D. ................ 1906
Harland, W. G. B., M. D. .......... 1907
Burnett, Peter V., M. D. .......... 1908
Roosa, D. B., St. John, M. D. ..... 1908
Schadle, J. E., M. D. .............. 1908
Pette, C. H., M. D. ............... 1909
Sprague, F. B., M. D. ............. 1909
Mullins, John B., M. D. .......... 1909
McGahan, C. F., M. D. ............. 1910
Anderson, Willis S., M. D. ....... 1910
Calhoun, A. W., M. D. ............ 1910

Gradle, Henry, M. D. ................ 1911
Koyle, F. H., M. D. ............... 1911
Dudley, William F., M. D. ....... 1912
Kimball, Irving E., M. D. ....... 1913
Gildea, Patrick F., M. D. ....... 1913
Adams, J. L., M. D. ............... 1914
Gibb, Jos. S., M. D. .............. 1914
Gruening, Emil, M. D. .......... 1914
Sheppard, John E. ................ 1916
Roe, John Q. ...................... 1916
Ballenger, Wm. L. ................ 1916
Dye, Hobart S. .................... 1917
Kyle, D. Braden ................... 1917
Makuen, G. Hudson ................. 1917
Solenberger, Amos R. ............. 1917
Daley, Walter S. .................. 1918
Ingals, E. Fletcher ............... 1918
Yates, D. G. ..................... 1918
Chappell, Walter F. .............. 1919
Ray, James Morrison ............... 1919
Bird, N. S. ...................... 1919
Blake, Clarence J. ................. 1919
Holmes, E. M. .................... 1919

HONORARY MEMBERS WHO HAVE DIED.

Whistler, W. McNeill ................. 1899
Gougenheim, Achille ................ 1901
Gruber, Joseph ..................... 1901
Brown, Lennox ..................... 1902

Smyly, Sir Philip .................. 1904
Joal, Joseph ......................
Woakes, Edward ....................

1904