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## ORIGINAL COMMUNICATIONS.

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### THE PRACTICAL VALUE OF LIP-READING.\*

BY MAX A. GOLDSTEIN, M. D., ST. LOUIS.

As the progress of otology develops more positive data and the functional tests for hearing approach more nearly the character of an exact science, we are placed in a better position to classify that large group of cases of pronounced deafness which have been heretofore so vaguely disposed of by the otologist.

The classic and valuable investigations of Rinné, Weber, Politzer, Bezold, Lucae, Gellé, Koenig, Schultze, Bárány, Schwabach, Gradenigo, Bing and others, have resulted in our present well-developed system of functional tests for hearing whereby we are enabled to determine not only the differentiation of affections of the sound-conducting mechanism from those of the perceiving apparatus, but also the finer distinctions between ankylosis of the ossicles, impairment of the membrana tympani, fixation of the foot-plate of the stapes, and various adhesive processes on the one hand, and oto-sclerosis in its various manifestations and still unknown pathology on the other.

Clinically we know that the various adhesive processes and similar pathologies of the middle-ear are often still amenable to treatment and that oto-sclerosis has thus far defied every therapy of the resourceful clinician.

Not only are the results obtained from carefully conducted functional hearing-tests a factor of more accurate diagnosis, but we are also placed in a position to prognosticate the future of profoundly impaired hearing.

\*Read before the Annual Meeting of the American Laryngological, Otological and Rhinological Society, June 1, 1911.

Let us assume that the patient before us presents the following hearing-test record: greatly diminished perception for both high and low tones of the tuning-fork series in both ears; conversation and whisper-voice heard only at short range; a 60-inch watch heard at one inch from the meatus; add to this a high-pitched tinnitus, paracusis Willisii and occasional vertigo and you have a clinical picture of definite oto-sclerosis. This patient asks your final advice as to his condition and depends on your dictum for the further disposition of his case. In all sincerity you must admit your impotency to help him further by any method of otologic treatment known to you. It is unfortunate that in such a case we are compelled to confess to the patient that we can offer him no further aid, that we have reached the limit of our scientific possibilities and that his defective hearing is destined to remain a permanent handicap to his well-being.

There is one hopeful outlook, however, which seems to be developing as a scientific evolution and which the otologic world is destined to recognize as a practical solution of this problem and that is the form of special education known as lip-reading, or, in its broader appellation, speech-reading.

Lip-reading is not a recently developed aid to the deaf, nor is it a new system of special education. There are authentic records that systematic instruction in this art has been attempted in Europe as early as the 16th century. Dr. John Bulwer, in 1648, refers to "that subtle art which may enable one with an observant eye to see what any man speaks by the moving of his lips." In America, John Braidwood instructed in lip-reading, in Virginia, in 1812. In 1841, Dr. Schwartz, of Dresden, published the first work in Germany relative to lip-reading, a small volume entitled "Lip-reading as a Substitute for Hearing and as a Means to Compensate as far as Possible, the Deaf for the Loss of the Sense of Hearing." The evolution of lip-reading as a systematic training arranged on scientific and phonetic principles, is of more recent origin and in its present stage of development offers to the deaf and the partially deaf, opportunities for social intercourse which may largely compensate for the impairment or loss of such an important sense-organ as the ear.

There are two classes of the deaf to whom this course of special training is applicable; the first comprises all types of the congenital deaf who have never heard the sound of the human voice and the large group of cases in which total deafness has developed before

the eighth year or where the acquisition of speech and language has been forgotten.

In the development of our system of education for this class both in institutional work and in private training there has been an interesting evolution. The sign-language, the manual alphabet, the oral method, the system of visible speech and finally lip-reading have developed step by step until to-day there is a consensus of opinion among teachers of the deaf that the most practical system of education for this class is that of the oral method and articulation, together with proficiency in lip-reading.

Our present question, however, concerns itself more especially with that large class of the incurable deaf who have lost the faculty of hearing later than the tenth or twelfth year of life. After this age the faculty of speech is so definitely developed that even though the individual becomes totally deaf, he never completely loses this practical form of expression of thought.

There is a vast difference in the acquisition and perfection of the science of lip-reading by the congenital deaf pupil on the one hand and that of the pupil with acquired deafness on the other; the former class must be instructed not only in lip-reading, but also in tone-production and articulation. If such active workers as Hartmann and Gutzmann in Germany, Love in Britain, Escat in France, Bell and Wright in America, have been able to demonstrate by practical results the splendid possibilities of the articulation and lip-reading system in the congenitally deaf pupil, where there are innumerable obstacles to overcome in the long years of training, how vastly greater are the possibilities to the incurable deaf who possess fluent speech and whom a short period of training may easily make proficient lip-readers.

We have passed the experimental period in the consideration of this valuable system of instruction and to-day we must consider the length of time of study, the place to acquire this special training, and the exercise of patience, industry and application on the part of both pupil and teacher.

The difficulties of acquiring a practical working-knowledge of lip-reading have been very much over-estimated by those unfamiliar with this field and the good intentions of many a prospective student have thus been discouraged. They have been told that the time of training is interminable and that the actual results are scarcely commensurate with the time, energy and money expended.

Practical experience has proved these hypercriticisms to be fallacies, and the results, especially in the adult deaf, have been uni-

formly satisfactory and in many instances brilliant. On one occasion I conversed for several hours with a young lady visitor, and was not aware, experienced otologist and careful observer though I am, that she was profoundly deaf, had mastered speech-reading in less than two years and was equally familiar with German, French and English.

The time to begin such a course of instruction is now. Age is no handicap to the acquirement of proficiency in lip-reading if good sight, a fair degree of intelligence and an ordinary vocabulary of spoken language are the assets of the pupil; I have known pupils of fifty to show as satisfactory progress as pupils of twenty.

As careful observers in the practice of otology, it is well known to you all that every individual with even moderate impairment of hearing unconsciously watches the lips of the speaker to assist him in the conveyance of a thought-expression which reaches the ear more or less imperfectly, but which is intensified in its central interpretation by the aid of the eye. The ear has been so commonly regarded as the only sensory organ through which speech may be conveyed to the brain that few realize that the same result, difficult as it may seem, may be reached by another sensory organ—the eye. Just as the sense of touch may be hyper-developed as an accessory sensory organ to the blind to express recorded thought, so may the eye be trained as a valuable substitute to the ear to interpret the spoken word.

Scattered throughout this broad land you will find a trained teacher here and there whose period of practical service in this field qualifies him to assist in this grand cause. It is an interesting observation, however, that no concerted action has, as yet, been attempted whereby the enormous class of the partial deaf and incurable deaf may be offered the practical advantages of systematic training in lip-reading; it seems to me that our own profession has not yet realized to its fullest extent the enormous possibilities of the systematic teaching of lip-reading.

The importance to the otologist, as well as to the incurable deaf patient of a knowledge of the art of lip-reading or speech-reading certainly requires no discussion. To the partial or incurable deaf the acquisition of lip-reading is a manifold blessing; it releases him from the constant handicap of his aural infirmity; it relieves the constant nervous strain and embarrassment of isolation from the rest of his fellows; it restores his social status and his means of communication with his fellow-men. To the otologist it offers a consolation for his inability and impotency to cope with certain

forms of aural pathology and it places him in a position to restore the peace of mind and to instil new hope in his deaf patient.

Before we are in a position, however, to advise our patients to take up this practical training we must ourselves be more familiar with our subject; there are a number of practical considerations of this question to which your attention should be directed, especially if we agree that the art of lip-reading is so important a field of study and has the far-reaching possibilities claimed for it.

Grant that every otologist has in his clientele a large number of patients partially or totally deaf, the result of suppurative, catarrhal or sclerotic aural processes, and that the limit of practical treatment has been reached; this is the group of cases of every clientele whom you should advise to take up the systematic study of lip-reading. The first question put to you as advisor will be: "Where may I obtain such instruction?" Our national otological bodies are not all centered around the metropolitan cities of the East where some of these special schools and teachers are located; many of our fellows live in smaller cities, North, South and West where such schools and teachers are scarce or unknown. Our first need, therefore, is a sufficient number of experienced teachers necessary to supply the great demand of concerted action in this good work. To complete my paper I have added a list of special normal schools and private instructors where such training is offered to intelligent, active, patient, observant men and women to perfect themselves as teachers in this noble cause.

In discussing this question with a number of lip-reading experts of long experience, I have drawn the conclusion that one to two years of careful training and constant practice with a large variety of pupils, will place these pupil-teachers in a position to undertake the intelligent teaching of this useful art. Let each otologist of our organization, therefore, select from his own community several intelligent young men or women, who, in his judgment, may be qualified; urge them to go to one of the training schools for teachers of lip-reading and pledge them to return to his community to take up this work.

The patient on receiving your advice to take up lip-reading will ask several pertinent questions:—"How long is the required course of study? How often will instruction be given? Where can such instruction be obtained? What will be the expense?"

The principles of lip-reading may be mastered in comparatively few months, but the practical value of this art will perhaps be appreciated only after proficiency is attained by considerable prac-

tice; such proficiency, however, depends on the patience and application of the pupil rather than on the number of lessons after the principles have been mastered. A pupil of average intelligence and alertness may master the principles of lip-reading in from five to six months, taking two hour-lessons each week; add to this one year of daily practice for accuracy and speed, and the time of pupil-service is completed; in short, a term of from one to two years is required to develop practical independence and experience to qualify the lip-reader to readily carry on an accurate, fluent conversation.

Lip-reading is not only a pedagogical, but essentially also a psychological problem; mind-training is as important a factor in the production of the proficient speech-reader as is the accurate mechanical training of the eye to read the lips. The training of the pupil to analyze the various movements of speech as produced by the lips is but one factor in the systematic education that develops the expert speech-reader. The language of facial expression, the external physiology of speech, the many positions of the lower jaw, the temperamental differences of speakers, the psychology of language-intelligence, the sequence of expressed thought all are units necessary to the upbuilding of a perfect mastery of speech-reading.

There are many words which appear alike to the eye of the speech-reader, as for instance, those beginning with the labial consonants *p, b, m*, and the linguals *t, d, n*, and words whose consonants are practically invisible as *end, hen, head*, and those whose vowels are difficult of analysis, as *hate, eight, aid*,—letters and words which could not be differentiated by the eye alone unless brought into association with the other words of a phrase or sentence and the facial physiology which accompanies the expressed thought.

The speech-reader sees more than the form of the lips, the position of the tongue and the size and shape of the aperture of the mouth; he depends much on the expression of the eye, the contraction or elevation of the brow, the movements of the head, the gestures of the hand and body and all other elements that may be used to express spoken thoughts. The pantomime of language is as vital to the speech-reader as is the formation of the lips.

In a recent experiment, Gutzmann, in his work, "Facial Speech-Reading," cites some remarkable instances of faultless speech-reading among his pupils solely from pantomime and facial expression, even when the mouth of the speaker was hidden.

If we proceed with this analysis further, it would involve us in a discussion of the various methods of training in this field, a subject which is foreign to the present paper; it is simply my desire to point out to the uninitiated the many phases of this problem and the dignified position to which such special training may rise.

What a fertile field and wonderful opportunity for good work, meriting the active and moral support of every otologist and the

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J. CLARK,  
*Clerk to the Board.*

SCHOOL BOARD OFFICE, 16 ROYAL EXCHANGE SQUARE,  
GLASGOW, August, 1910.

energetic, patient and skillful direction of every specially qualified teacher!

Our esteemed confrere, Dr. James Kerr Love, of Glasgow, has opened another avenue in which the mastery of lip-reading may find appreciative recognition—an avenue of public education and charity. During my visit to Glasgow last season, Dr. Love pointed out to me some of the practical opportunities possible to instruction in lip-reading as an aid to public education. He has organized classes for the poor where such instruction is systematically imparted at nominal fees for the course; he has interested the Board

of Education of the city of Glasgow and already the results of this good work are being manifested. The accompanying card is self-explanatory. This plan is worthy of emulation in every metropolitan city of our great commonwealth.

This is, I think, the first attempt that has been made to interest the American otologists as a body, in this special form of education, and I appeal to every Fellow, not only for his good will and moral support, but for active co-operation in an endeavor to plan a general movement which may have for its purpose the education of the public to the value of lip-reading as a system of instruction to assist those partially or totally deaf to a more independent social status among their fellow-men. We would direct the attention of the medical profession to the opportunities and resources which a knowledge of lip-reading may afford this class of the people; the specially qualified teachers to the worthy cause in which they may be enlisted; the otologists for the boon which they may confer on that large class of the deaf heretofore so seriously handicapped in carrying out their social and economic functions. All who may be interested in this work should realize that there is no effort in the wide realm of education more heroic or more charitable than the emancipation of the deaf.

3858 Westminster Place.



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## INSTITUTIONS.

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Columbia Institution for the Deaf and Dumb—		Dr. Percival Hall.
The Kendall School for the Deaf and Gallaudet College..	Washington, D. C.....	Dr. Lyman Stead.
Normal Practice Public Day-School for the Deaf.....	Chicago, Ill.....	Miss Mary T. McCowen.
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## ACUTE AND CHRONIC INFLAMMATION OF THE MAXILLARY SINUS.—ITS RECOGNITION AND TREATMENT.\*

BY THOMAS CHEW WORTHINGTON, M. D., BALTIMORE.

Acute inflammation of the maxillary sinus when uncomplicated is most frequently seen as the result of influenza and is quickly relievable by attention to the acute rhinitis, or when necessary by the puncture and irrigation of the sinus through the inferior meatus.

Chronic maxillary sinusitis may be caused by a neglected or unrecognized acute inflammation of the sinus. It may begin as a chronic inflammation when it is caused by drainage into the sinus from diseased conditions in the ethmoidal or other cells, as most frequently happens. It may result from pneumonia, typhoid fever and other acute infectious diseases. Finally, it may be of dental origin.

It is important to remember the fact that while the anterior ethmoidal cells drain through the infundibulum into the middle meatus, the posterior ethmoidal cells empty into the superior meatus and reach the lower nasal cavity through the olfactory cleft. This distribution of the ethmoidal drainage explains why diseased conditions in both the maxillary and sphenoidal sinuses so frequently follow inflammatory changes in the ethmoidal labyrinth.

Inflammation of the maxillary sinus may produce a purulent, sero-purulent or a very thin, clear mucous discharge, the latter variety being easily overlooked. The character of the exudate is not necessarily the same in appearance as that of the ethmoidal secretion which has caused the trouble. Thus a thick purulent discharge from the maxillary sinus may follow a simple non-purulent ethmoiditis, or the conditions may be reversed and a purulent ethmoiditis may result in a clear mucous discharge from the maxillary sinus, or again, there may be no perceptible discharge until the sinus is opened, when there may or may not be visible a clear thin fluid, while the sinus may contain much granulation or polypoid tissue, or it may be denuded of its lining membrane.

This may be accounted for by the interference with drainage and with the entrance of air into the sinus because of inflammatory changes within the infundibulum, obstructing or closing the ostium

\*Read before the Meeting of the Southern Section of the American Laryngological, Rhinological and Otological Society, Lynchburg, Virginia, January 21, 1911.

maxillare, and this may make the difference between the character of the exudate mentioned and a true empyematous condition.

These explanatory statements are necessary in order to emphasize the well-known order of operative procedure.

The operation for the cure of chronic inflammation of the maxillary sinus, if accompanied by disease of other sinuses, should begin with the radical treatment of the diseased ethmoidal, frontal or sphenoidal sinuses and at the same time the removal of sufficient of the maxillary sinus wall, below the inferior turbinate to insure complete and permanent drainage and aeration of the sinus. Should the inflammation be of dental origin, whether from a diseased molar or an embryonic tooth within the sinus (and this is easily demonstrated by the X-ray), the removal of the offending tooth by the easiest method and an opening left in the naso-antral wall will insure a perfect and permanent cure.

**SYMPTOMS OF ACUTE INFLAMMATION:** The presence or absence of symptoms of acute or chronic inflammation of the maxillary sinus depends upon the patency of the ostium maxillare as well as upon its location in the infundibulum and its relation to the middle turbinate.

I have seen very few cases of truly acute maxillary sinusitis; for most of those cases which appeared to be acute were found on careful study to be but acute exacerbations of chronic inflammatory conditions. I may add that I have seldom felt perfectly sure of my diagnosis until verified by the opening of the sinus.

In acute coryza affecting the sinus there may be nothing distinctive in the relation between the middle turbinate, the nasal septum and outer wall, or the general swelling of the parts may almost cover the middle turbinate and squeeze it tightly against the infundibulum. With the swelling already within the cavity this may partially or completely close the normal opening (or openings) in the sinus wall.

The pain will be in proportion to the hyperemia and the lessening of the air-pressure within the sinus: it will depend more upon these conditions than on the volume of fluid contained.

When the air becomes rarified and the mucous lining of the cavity hyperemic and edematous, the consequent irritation to the nerve fibers in this membrane and particularly to the superior maxillary branch of the trifacial nerve as it passes through the infra-orbital canal, may become so great that the pain may radiate from the seat of trouble to the orbit, or follow the entire course of the nerve. It may even invade the region of its fellow of the opposite side. I am

convinced that many cases of chronic neuralgia of the trifacial never originate in unrecognized disease of the maxillary sinus. Of the subjective symptoms of acute inflammation of the maxillary sinus, pain and sometimes tenderness to pressure and photophobia are the most constant; the pain and tenderness may be over the canine fossa or malar region or in the teeth.

The objective symptoms are intra-nasal discharge and lacrimation and sometimes swelling. The lacrimation as well as the photophobia are the result of irritation of the ophthalmic branch of the trifacial nerve and not of pressure within the sinus against the lacrimal canal, which is less than one-quarter of an inch in length within the sinus.

Intra-nasal discharge is much more likely to be of ethmoidal origin than coming from the maxillary sinus, but should this discharge be abundant and purulent, and especially if external swelling has occurred, the condition should be regarded as chronic and treated as such.

The symptoms of chronic inflammation of the maxillary sinus may include those which have been mentioned under the heading symptoms of acute inflammation, but in many cases none may be observed.

The discomfort arising from disease or obstruction in the other sinuses usually overshadows or masks the slight discomfort from chronic disease of this cavity. It should be mentioned that there is usually annoyance from the excessive discharge. If the discharge is purulent and the opening in the sinus wall normally placed (slightly posterior to the lower end of the hiatus semilunaris), the discharge will be seen making its way between the middle turbinate and the outer wall and flowing or crusting over a part of the inferior turbinate to the floor of the nasal cavity. Should the ostium maxillare be situated farther back than normal or more than one opening be present, the greater part of this discharge may be carried backward under the middle turbinate and be found in the choana of the affected side, on the palatal floor or pharyngeal wall, and further, unless expectorated.

**DIAGNOSIS:** It is needless to state that the diagnosis is easily made in those cases in which the subjective and objective symptoms above referred to are clearly shown. But since the greater number of cases of chronic maxillary sinus inflammation show few or no symptoms and there is no absolutely reliable method of making a positive diagnosis except through operation in such cases, we must depend upon the operative opening of the sinus. This holds good

equally for all cases of acute inflammation if the symptoms are not relieved by the usual treatment of the sinus.

Should there be a well established chronic disease of the other accessory sinuses, it is safe to presume that the maxillary sinus has not escaped. I make this statement because in many instances where there was no indication of maxillary sinus disease, upon opening the sinus it was found to be filled with exudate of exactly the same character as that of the higher cells. In a number of cases in which I have omitted opening the maxillary sinus because of the absence of symptoms at the primary operation, I was obliged to perform a second operation, opening of the maxillary sinus, a few weeks later, when the signs of disease of this sinus became manifest. Only in this way was I able to complete the cure.

A differential diagnosis between disease of the maxillary sinus and a dentigerous cyst is not always easily made. A dentigerous cyst may excite chronic inflammation of the maxillary sinus, but it is much more likely to be mistaken for sinus disease than to be recognized as its cause, even after careful examination. A mistake which has occurred in the experience of the writer.

**TREATMENT:** There is no treatment excepting the operative treatment in all chronic cases and in many acute cases.

**TREATMENT OF ACUTE INFLAMMATION:** As above stated, these are usually relieved promptly by the common treatment directed towards the rhinitis, and many recover spontaneously. If the acute symptoms do not quickly disappear, the sinus must be opened and irrigated. If the exudate becomes purulent, the opening in the sinus wall should be enlarged sufficiently to insure drainage and ventilation.

**TREATMENT OF CHRONIC INFLAMMATION:** The method for opening the maxillary sinus which I have found best is as follows: With a strong, sharp and abruptly curved curette (Figure 1) an opening is made in the sinus wall at the point of election which is about three-quarters of an inch beyond the anterior end of the inferior turbinate and directly under its attachment to the superior maxillary bone.

Should the inferior turbinate be obstructive, enough of this bone is removed anteriorly to insure post-operative drainage and entrance of air within the cavity. The wall of the maxillary sinus is then cut away freely and posteriorly from the point of entrance into the sinus. This opening should include the space from the inferior turbinate above to the nasal floor below and extend to the posterior wall of the sinus or far enough backward to insure drain-

age either while in the recumbent posture or by the effort to clear the nasal cavity through the pharynx. This opening is easily made by the use of the large-size Freer-Gruenwald cutting-forceps. The sinus is then examined and cleared with Coakley's curettes, irrigated with warm normal saline solution and lightly packed with plain sterile gauze, which should be removed in twenty-four hours, to be followed by daily irrigation with very warm saline solution through a curved cannula (Figure 2). I shall emphasize here the necessity of thorough drainage and irrigation of the other nasal accessory sinuses and the futility of endeavoring to cure the maxillary sinus disease while pus is draining into it from above. If it becomes necessary to do a radical operation on the higher cells the maxillary sinus should be included in the operation unless the operator has very positive reason to believe that the maxillary sinus is not diseased, or will not become infected as a result of the operation.

I make this statement because in chronic multiple sinusitis the ethmoidal labyrinth becomes so disorganized and carious that a broken-down cell may drain directly into the sinus or the purulent contents of the frontal sinus and ethmoidal cells may pass down through the hiatus semilunaris and through the normally placed ostium maxillare into the maxillary sinus. Should the maxillary sinus have escaped this mode of infection, it is impossible in many cases to do a complete ethmoidal operation without invading the roof of the sinus because in the removal of the group of ethmoidal cells which are often situated just posterior to the lacrimal bone (and aid in forming the roof of the sinus) the sinus may receive a part of this purulent and carious discharge within the cavity. The entire operative field should receive the irrigation until the ethmoidal and other sinuses cease to discharge. My experience shows that the maxillary sinus is soon well if the work on the higher cells has been thoroughly done. The difficulties of the intra-nasal method of opening the maxillary sinus are very few and comprise when necessary the removal of a part of the inferior turbinated body, and in finding the thin area in the sinus wall. Many individuals have not this area of thin bone or I have been unable to find it.

I have found it necessary to do the external operation in but few cases. The dangers of the maxillary sinus operation are also few and easily avoided. They are: (1) Puncturing the roof of the sinus which is the orbital floor. (2) Wounding the infra-orbital canal. (The instrument for perforation should be pointed outward and a little downward in entering the sinus). (3) Cutting the posterior

external nasal artery which, when wounded, will require a tight tampon. This accident is only possible when the operation is about completed.

The results of the operation are uniformly good. In the course of a few months the sinus is often completely filled with a smooth firm mass covered by healthy mucous membrane. In other cases the sinus only becomes shallow but equally smooth and healthy in appearance.

A description of this operation has been given only in order to emphasize the importance of making a very large opening and establishing it permanently; it is not my intention to lay claim to any new operative procedure. The two instruments reproduced I have had made especially for this work. Figures 1-2.

The curette has the advantage of the combination of a perforator and a sharp spoon with which the opening made can easily be en-



Figure 1.



Figure 2.

larged sufficiently to irrigate or to complete the operation with other instruments.

The curved cannula for irrigation has fenestrated openings close to the blunt, but open tip, and thus ensures perfect irrigation without damage from too high pressure of the fluid.

A brief summary of the cases of which I have accurate records may prove of interest, though the conclusions of this paper are based upon a larger number than here collected. Of the 103 maxillary sinuses operated upon (70 individual cases), four were acute and 63 were chronic; two cases were unaccompanied by any other nasal disease and one was malignant disease of the sinus (sarcoma). In 68 there was disease of other sinuses, the ethmoidal cells being affected in 65 cases, the sphenoid in 28 and the frontal sinus in 51; two of these cases were complicated by dentigerous cysts.

**SYMPTOMS:** Sixty complained of headache or pain; ten were without pain; 58 had a purulent discharge; 12 had a mucous or sero-mucous discharge. The maxillary sinus was opened at the time

of the first operation, and as a part of a radical intra-nasal operation in 54 cases. The operation was bilateral in 33 cases, the right side opened alone in 20 cases; the left in 17 cases. The maxillary sinus was not opened at the time of the first operation but later, either as a part of further operations upon the nose or as a separate operation in 16 cases, the bilateral operation being done in 3, the right opened in 4, the left in 9 cases, making 19 sinuses.

FINDINGS: In 7 maxillary sinuses which were opened there were no evidences of disease; 42 contained pus; 31 pus and polyps; 6 polyps alone; 13 sero-mucous or mucus, bone denuded in 4, but with no visible exudate.

Cases punctured and later opened 5; 33 males and 37 females. The oldest patient in this series was 75 years. The youngest was almost 10 years.

#### REPORT OF CASES.

*Case 1.* The case I shall now report is one of acute inflammation of the maxillary sinus occurring during acute influenza. On December 23, 1908, I was called to see Dr. R., who gave the following history: Acute influenza for a week with the usual bodily pain and discomfort accompanying this disease. For two days past the pain, very severe over the right side of the head, about the eye and sometimes in the right cheek. The cheek feels full and tight, as though the antrum were involved, no tenderness on pressure over canine fossa and no nasal discharge of moment. The intra-nasal examination was negative.

The diagnosis was trifacial neuralgia, without enough evidence to be positive as to its origin from inflammation of the maxillary sinus. The Doctor was in great pain and wanted me to puncture the sinus as he felt sure the trouble was there.

I was not at all sure and asked him to wait until the next day and advised aspirin and hyosciamus.

On the next day, December 24, the Doctor said he had been perfectly easy since taking the medicine and had no pain of any kind. December 25 he had an occasional neuralgia, but was fairly comfortable. The pain over the right side of the head and about the eye began to grow worse on the afternoon of December 25. It steadily became more severe and he had passed a wretched night. The sinus again felt full as though under tension. Upon examination I found the intra-nasal conditions negative, excepting a very thin mucous in both nasal chambers. I then punctured and irrigated the sinus with immediate relief of all symptoms, and no recurrence. During irrigation a small quantity of clear mucous appeared, about one-half dram.



This case is very interesting because typical of the acute form of maxillary sinus disease and because the diagnosis was first made by the patient, who alone could properly estimate the subjective symptoms within the sinus, and further that the small amount of exudate found was not in proportion to the feeling of tension and fullness within the sinus, but to disturbance of air-pressure and irritation of the infra-orbital nerve in its course across the roof of the maxillary sinus, which was quickly and permanently relieved by the first treatment.

*Case 2.* On February 13, 1909, I was called to see Mr. H. Z., aged 45 years, with the following history: "For the past year or over have had headaches leaning more to the right side of the head, beating and soreness in top of head. I feel like rubbing the pain from across eyes. Nearly every morning I awaken with headaches, no particular nasal discharge, but hawk and spit in morning. Since last Sunday much pain and soreness over right cheek, but always feel like protecting right side of head and face. Head aches when lowered, and eyes feel weak and water when the pain comes on, rise of temperature for probably last three weeks. Have taken aspirin every morning for nearly a year. Second molar tooth extracted last spring, the dentist said the root entered the antrum."

Intra-nasal examination showed a very small quantity of yellow mucous in the olfactory cleft and about the right middle turbinate. The sinus was slightly sensitive to pressure.

The diagnosis was chronic inflammation of the right maxillary sinus, with disease of other accessory sinuses of the same side. I immediately punctured the sinus, with complete relief of pain. A slightly discolored mucus appeared during irrigation. The inner sinus wall felt puffed and thick. On February 18, for the purpose of establishing permanent drainage and to prevent further trouble with the maxillary sinus during a trip abroad which the patient was about to take, I removed a part of the sinus wall intra-nasally. There was only a small quantity of pus found within the sinus.

This case is of interest because notwithstanding the presence of chronic ethmoiditis and pressure from a deflected septum, the fronto-parietal neuralgia disappeared entirely upon opening the maxillary sinus. This points to relief of the nerve by the restoration of air-pressure within the sinus more than to the small quantity of fluid withdrawn.

The extraction of the tooth was entirely unnecessary, as the trouble was secondary to the ethmoidal disease and was not of dental origin.

*Case 3.* Having known this man from his childhood and having him in my care from his first trouble, this report will be of especial interest.

Mr. M. T., aged 31 years. History: In the early part of December, 1903, he contracted epidemic influenza with the usual acute sinus symptoms peculiar to the epidemic form of this disease. As I remember, he made a good recovery, but about a month after, January 26, 1904, he again consulted me and complained of a discharge from the right nostril and a slight pain in the right eye and root of the nose. Examination showed a scant purulent discharge coming from the infundibulum and from the olfactory cleft. Under local treatment and irrigation he was soon apparently well. In January, 1905, he again consulted me for severe neuralgia about the right side of the head and face, especially about the upper jaw teeth. He said the right eye pains and waters—this condition had existed for a week. Examination: There was tenderness to touch of the skin over the right cheek, but no nasal discharge. The surface of the right side of the head and face was hyper-sensitive in areas following the course of the trifacial nerve. This condition was soon relieved, yet I advised a radical operation as soon as he could have sufficient time at his disposal, but which he deferred because of the interference which would occur in his employment. On April 1, 1905, he again consulted me with the following history: "Since the latter part of January severe pain in right upper jaw and in upper teeth, skin tender to the touch, the right side of nose has been dryer than usual, but for past two days a little moist. Within the hour have had three upper jaw teeth drawn. Much pain when I hold left side of nose closed and blow hard; also pain on holding head down."

Present condition: Small quantity of pus about middle turbinate. I punctured the maxillary sinus, and removed four and one-half drams, by measurement, of a clear straw-colored fluid, with immediate relief. He had no pain while in my care, to April 18, 1905. On June 3 he complained of pain along the site of the extracted teeth, and again I opened the sinus, but found nothing.

I lost sight of him, but on January 21, 1906, he again consulted me. The history as given by him is so descriptive that I will give it in his own words: "A discharge from the right side of the nose, for about four weeks, a feeling of soreness and pressure with a sudden motion or cough, or for instance, stepping suddenly on a stone in the street there passes a sudden feeling of soreness through the right cheek bone as if the tooth (indicating the first bicuspid) was full, a feeling of soreness in the right cheek bone."

On January 22, 1906, at the Baltimore Eye, Ear and Throat Hospital, I did a radical intra-nasal operation which comprised the removal of the ethmoidal labyrinth, of the anterior sphenoidal wall, of the maxillary sinus wall below the inferior turbinate, and the opening into the frontal sinus. The ethmoidal and sphenoidal sinuses were diseased. The sphenoidal sinus was filled with muco-pus. The maxillary sinus contained a small quantity of pus and a few polyps; the frontal sinus gave no evidence of disease. His pain gradually disappeared.

On February 22, 1906, he says: "There is an occasional neuralgia when an application is made within the maxillary sinus. There is no discharge from the nose," and he thinks his nose is about right. On May 4, 1906, he reported that he was practically free from pain. In January, 1909, he called again to see me to say that the pain had recurred, and that he was about to have the nerve divided for relief of the pain.

Dr. Harvey Cushing on January 24, 1910, very kindly sent me his data on this case, from which I shall now read: "It was my impression that the case was not definitely one suitable to the ganglion operation, but he was suffering intensely while here in the hospital, and the peripheral operation had given him a slight measure of relief, so that it seemed wise to do this more radical procedure. I was not quite clear as to whether the sensory disturbance might not have been brought about by a chronic inflammation of Meckel's ganglion rather than the Gasserian ganglion. However, he did very well after the operation, and when I saw him six months later he had gained about 20 pounds in weight and seemed to be in good general condition."

From the records of the Johns Hopkins Hospital, also sent me by Dr. Cushing, I have taken the following: March 23, 1909. (Date of Admission). \* \* \* "A few weeks ago an infra-orbital operation was performed by Dr. Pancoast without, however, giving any marked relief to the discomfort. Patient was kept under observation from the time of his admission until April 3. During this period he complained greatly of pain, chiefly in the territory of the submaxillary division in the lip, jaws, infra-orbital region, etc.; pain at times radiating in the territory of the first division above it. Some of the paroxysms seemed fairly typical of trigeminal, with twitching, closing of the eye, lacrimation, etc. However, movements of the mouth, chewing, talking, etc., do not precipitate these paroxysms, so that the case is one fairly typical of the usual trigeminal neuralgia. On April 3, 1909, the sensory root on the right side was

avulsed. The operation presented no complications. No bleeding. Wound closed without drainage.

On December 25, 1910, I saw Mr. M. T. He complained of a burning, drawing pain, corresponding to the second and third divisions of the fifth nerve, with spasmodic twitching of the cheek and eye-lids. He said that though this was still severe it was nothing in comparison with the pain before Dr. Cushing's operation.

This case is of great interest, (1), because the disease in the Gasserian or Meckel's ganglion was clearly a consequence of the inflammatory changes within the maxillary and ethmoidal sinuses; (2) because, if the radical intra-nasal operation could have been done earlier the patient might have been saved much suffering.

*Case 4.* Miss L. F., aged 42. January 4, 1907—History: "Catarrh in left side of nose for 15 years: have colds most all the time, especially in summer, more or less constant misery over left brow and through bridge of nose, between eyes, pressure about left side of nose and around eye above and below. More pain about 9 a. m., easing off from 3 to 4 p. m. Pus and stuff terrible which comes from nose and throat, discharge offensive for several days past. Left eye pains, now; seems back of eye-ball; lids always red, and eyes feel drawn and sensitive to light; look downward and frown a great deal."

Diagnosis: Chronic purulent multiple sinusitis of left side, with probable involvement of the maxillary sinus.

January 4, 1907: Operation at Baltimore Eye, Ear and Throat Hospital—Removal of ethmoidal labyrinth, opening into frontal sinus through fronto-nasal duct, removal of anterior sphenoidal wall; also of the maxillary sinus wall through the inferior meatus. Pus came in quantities from the frontal, ethmoidal and sphenoidal sinuses. The maxillary sinus was also full of pus; the walls were carious and rough. January 9, patient says there is very little neuralgia, and that she feels much better about head. January 23, very little nasal discharge. June, 1907, complete recovery.

This case is instructive in comparison with those preceding, because: (1) There is no history of acute maxillary sinusitis even upon close inquiry; (2) although there is a history of fifteen years' duration of nasal catarrh, there have been apparently no symptoms other than nasal discharge to call attention to the disease of the maxillary sinus, notwithstanding that the sinus was full of pus when opened.

CONCLUSIONS.

Pathological conditions within the maxillary sinus cannot be determined with certainty until after the sinus has been opened. Transillumination is very unreliable and radiography is often misleading as to conditions within the sinus.

2. The absence of subjective symptoms in disease of the maxillary sinus may be due to patulency of the opening or to their being overshadowed by more intense symptoms arising in the other sinuses.

3. Many cases of tri-facial neuralgia (*tic douloureux*) are associated with disease of the maxillary and other sinuses. The explanation may be found for many cases in the course of the second division of the fifth nerve, and the location of Meckel's ganglion within the "danger zone" of sinus disease.

4. In every case of suspected disease of the maxillary sinus the patient should receive the benefit of the doubt and the sinus should be opened. There is more danger, present or remote, in non-interference than in any operation for examination of the maxillary sinus or for the establishment of its permanent drainage.

5. When operating for serious or long-standing disease of the ethmoidal or other cells, the maxillary sinus should as a rule be opened during the primary operation. This will not only insure the completeness of the operation, but what is most important, it will prevent the possibility of infection of the operative field from a diseased maxillary sinus.

6. In performing the maxillary sinus operation it is often unnecessary to remove any part of the inferior turbinated body. If it is large and obstructive, the patient will have suffered no loss by its removal and gains by the better aeration and the greater accessibility of the sinus during the after-treatment.

7. If general surgical principles, including thorough drainage are applied to the operative treatment of disease of the maxillary sinus and the after-treatment is carried out carefully and minutely both by operator and patient, a favorable result is assured.

8. The successful treatment of maxillary sinus disease requires the eradication of purulent discharges of the neighboring accessory sinuses. These are often overlooked and to this error many failures are to be ascribed.

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