ACUTE INFLAMMATIONS OF THE ACCESSORY SINUSES, SYMPTOMS, DIAGNOSIS AND TREATMENT *

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From a general standpoint, acute inflammations of the accessory cavities may be considered as primary and secondary. An inflammatory process involving the mucous membrane of the nasal cavity is the most frequent cause of acute sinus disease. Irregularities as to contour of the nasal cavity, not only interfering with the drainage of the nasal cavity, but also directing the current of mucus toward the opening of the sinus, is a common causal factor. These same pathologic conditions would be directing the current of air toward the opening of the sinus tend to carry infectious material into these cavities. This is especially true of the frontal, ethmoid and sphenoid sinuses. The narrow, poorly developed nostril, which frequently is seen as a result of postnasal obstruction in childhood (especially from adenoid vegetations), is often a cause of acute sinus involvement, owing to the fact of the abnormal arrangement of the intranasal structures, interfering with the normal opening into the accessory cavities both as to size and situation, and also interfering with the size and development of the cavity. Such irregularly formed nostrils and intranasal structures would naturally predispose the individual to inflammations of the nasal mucous membrane, which in turn would predispose to sinus involvement and infection, such lesion, however, being secondary to the primary nasal involvement.

Primary involvement of the nasal accessory cavities is a very rare condition. It may, however, be brought about by injury, or contiguity of tissue in which the nose was not primarily involved. In some cases in which the cavity is apparently primarily involved, if a careful history is obtained it will be found that previously to the existing attack there had been some inflammatory condition in the nasal cavity, with slight involvement of the accessory cavity. The nasal irritation having cleared up, yet the cavity was left susceptible, and later an exacerbation may be mistaken for a primary involvement. An important pathologic subdivision of the acute inflammatory processes of the accessory cavities is simple acute inflammation without infection and acute inflammation with infection. However, in acute catarrhal inflammation, unless it clears up in from twenty-four to forty-eight hours, on account of the constant presence of bacteria in the secretions, the simple catarrhal inflammation will become an infective one, so that from the standpoint of treatment they can be considered under the same heading, the difference being one of degree and severity rather than variety.

Occupation is an important predisposing factor, when the individual is subjected to irritating dust, vapors, or fumes.

Irregularities and abnormalities in the formation of the accessory cavities, the antrum, etc., may explain many of the peculiar and unique cases often reported. It has been shown by sections of the skull, with a view to demonstration of the relation of the accessory cavities to the nasal chamber, and to each other, that almost

any size or shape of cavity or thickness of bone is possible, the antrum cavities varying in size from a little larger than a pea to three times the usual size, and extending under the floor of the nose.

With the possible exception of the maxillary sinus, inflammation of any of the other accessory sinuses may be attended with curious mental phenomena, these phenomena depending entirely on the severity of the inflammation, and whether or not there is any existing systemic lesion.

Too much importance can not be attached to the relation of these cavities to headache and neuralgia, and curious eye symptoms. It is the duty of the rhinologist and of the ophthalmologist to look carefully into the history of the patient as to whether there was any previous history or associated history of epidemic influenza, and whether there is any pathologic alteration of these accessory cavities. It has been my experience that many cases of curious and ill-defined neuralgia about the head and face have been entirely cured when attention has been directed toward the accessory cavities.

Physiologically, the accessory cavities are practically closed cavities, and while the mucous membrane lining is somewhat similar to that of the mucous membrane of the upper respiratory tract, yet the glandular elements and the terminal nerve filaments are not so numerous as in the respiratory mucous membrane. The epithelial layer is also much thinner and the submucosa not so resistant on account of the deficient blood supply.

It is a well-known fact that the obstructive lesion which interferes with the ventilation and drainage of the frontal, anterior ethmoidal, and maxillary sinuses is usually not located in the sinuses, or even in their ostia, but is in the hiatus semilunaris and infundibulum, or in the structures in their immediate vicinity. Any cavity lined with mucous membrane is predisposed to infection and inflammation when its drainage and ventilation are impaired, and therefore any anatomic or pathologic condition which causes obstruction to the flow of the secretions from the infundibulum, via the hiatus semilunaris, will predispose the mucous membrane lining the sinuses draining into it to infection and inflammation. It is obvious that if the obstruction to the drainage and ventilation is removed, the predisposition to infection and inflammation will disappear.

The nasal obstruction may be produced by many conditions: The nasal septum is frequently deviated toward the lateral wall of the nose in the region of the anterior half of the middle turbinated body, often crowding the middle turbinal against the outer wall of the nose, thus obstructing the drainage and ventilation of the frontal, anterior ethmoidal and maxillary sinuses. The middle turbinated body is frequently enlarged by edema, hyperplasia, or by the presence of accessory ethmoidal cells in its body, and may in consequence block the hiatus semilunaris; or the middle turbinal may cling closely to the outer wall of the nose as to block the hiatus. The bulla ethmoidalis is located immediately above the hiatus, and when enlarged it may overhang and completely obstruct it. The lip of the uncinate process, or median wall of the infundibulum, may be the seat of accessory pneumatic cells which may obstruct the infundibulum. New growths, spurs on the septum, and congestion of the mucous membrane due to underlying systemic conditions, are allegorical important factors.

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The accessory sinuses, even in a simple acute cold, are slightly involved, and after the cold has disappeared a slight latent irritation remains in the cavity and may suddenly light up into a serious acute attack. In all the infectious diseases, with high temperature and necessarily vascular disturbances, nasal congestion occurs and the accessory cavities become acutely congested.

One-half of the arc of the orbit is taken up by the accessory cavities and many eye symptoms are associated with or follow lesions of these cavities. Orbital abscess is secondary to disease of the sinuses, displacement of the globe may be occasioned by encroachment on the orbit by a distended sinus, and blindness may result from an involvement of the chiasm through the roof of the cavity or by an implication of the optic nerve as it passes through its foramen, in the sphenoid, as a consequence of inflammation in the cells within that bone. A general orbital cellulitis may be occasioned by an acute inflammation of any accessory sinus. Edema of the lids is one of the most significant symptoms of disease of the accessory sinuses, the edema usually starting directly over the sinus involved. Paresis, or even paralysis, of one or more of the eye muscles may occur as a consequence of sinusitis.

Inflammatory processes involving the mucous membrane of the sinuses do not differ from those occurring in any other mucous membrane, except that they pass through the various stages with greater rapidity, so that the difference is merely one of degree or intensity. Any infection of the accessory cavities would necessarily be preceded by or associated with some inflammatory process, which process involves the opening of the sinus and thus converts it into a closed cavity, causing retention of the infectious material. This, in turn, intensifies the already existing inflammation and produces rapid changes in the mucous membrane, which if drainage is not established, may lead to total destruction of the membrane and necrosis of the underlying bony structure. If the severity of the inflammatory process is not sufficient to cause destruction of the mucous membrane and denudation of the bony walls of the cavity, a fibroid formation within the basement membrane may take place, or, in other words, the physiologic function is interfered with, resulting in permanent pathologic alteration.

As a rule, a combined acute infectious process within the accessory cavities shows irregular systemic symptoms, unless there is a point where the physiologic wall of the closed cavity has broken down, and rapid general septic infection takes place, when the clinical phenomena are pronounced. In other words, acute involvement of the accessory cavities amounts to a walled-in process, and it is only when necrosis takes place that systemic infection occurs.

A point of considerable importance in regard to systemic phenomena, as well as local symptoms, is the size and shape of the cavity and the variations in the thickness of its walls. For example, a frontal sinus with thin walls may result in perforation and involvement of the brain cavity. Dural and subdural abscesses frequently follow pathologic changes within the frontal sinus. Again, in the case of the antrum of Highmore, when the superior wall is very thin, there will be marked eye symptoms, while in another case with a thick bony wall the eye symptoms will be entirely absent.

In acute inflammation of the accessory sinuses there is usually a history of exposure to cold, acute coryza,

riding in an automobile or railroad train, or of influenza or other infectious disease. The pain is always of the dull, aching or boring character, influenced by position. Tenderness, marked over the sinus region, extends all over the head in the beginning, usually bone tenderness; the pain and tenderness are increased by percussion. Swelling, not always a prominent symptom, may or may not be present, and is irregular in extent. The patient has a curious symptom referable to the eyes. He states that when he tries to read and looks up, the eye on the side of the sinus disease hurts, the muscles seem to be involved in the edema, and there is slight edema of the lids together with ptosis. This enables the physician to tell whether one or both sinuses are involved. There is tenderness at the inner angle of the eye on pressure, more marked in frontal sinus than in the others.

In acute involvement of the frontal sinus, usually the involvement is accompanied by symptoms of acute coryza with mucopurulent discharge and intense pain over one or both eyes, and at the inner angle of the eyes. The pain is intensified by stooping forward, straining at stool, coughing, or by any sudden movement. The pain is not continuous, and is apt to cease at bed time to begin on awaking with increased intensity, and unless relieved by frequent hot douches and hot applications over the forehead, it becomes intolerable. There is also headache, with a feeling of fullness or constriction in the forehead. The symptoms are aggravated by using the eyes for reading.

In inflammation of any accessory cavity there is always "bone soreness," and the pain on pressure is not limited to nerve points. Various tender spots pointed out by certain authors are often misleading, owing to the fact of frequent irregularity in the size and formation of cavities. This is especially true of frontal and ethmoidal cavities. Irregularity of eye symptoms would at once suggest irregularity in these two cavities.

From a standpoint of diagnosis, the use of the x-ray can not be overestimated. It shows the extent of the involvement, the relation of structures, and the formation of the cavity, so that irregularities can be quickly recognized and predisposing anatomic factors easily discerned. Transillumination, unfortunately, is nothing more than an adjunct. In my experience it has been misleading as often as it has been useful, and should never be depended on in itself. However, in association with the clinical history, the careful examination of the nasal cavity, the thorough observation of the patient, and also a careful study of the x-ray picture, transillumination may aid in the diagnosis and treatment.

In my previous writings on this subject, I have urged the conservative method of dealing with these conditions, and by persistently and carefully shrinking the tissues about the orifice of the accessory cavity, have been able, in the majority of cases, to open the cavity by the natural orifice; in other words, to reverse the pathologic process. The cavity, which is an open cavity, has been converted into a closed one. By what process? Simply by inflammation with its accompanying swelling of the surrounding structure as well as the orifice. Certainly, then, by shrinking these tissues at the right point, drainage by the natural orifice can be obtained.

In making the application to these points, the contour of the intranasal structures must be carefully observed; otherwise, the application will not be made at the right point. This, I think, will explain the failure in many

individual cases to secure drainage by the natural opening, and necessitate an unnecessary radical procedure. In my clinic at Jefferson Medical College Hospital, where from 10,000 to 12,000 treatments are made yearly, and also in my private practice, where many of these acute inflammatory involvements of the accessory cavities are observed, this plan has been successfully carried out for a number of years with such satisfactory results that radical interference has been practically eliminated in acute cases. In fact, in the last year, in only two cases, and they were of the chronic variety, was the radical operation necessary. Even in the chronic cases, unless there is bony necrosis, the same plan of treatment will give equally good results.

Since, in the majority of cases, the primary lesion is intranasal, the treatment, then, should be directed toward cutting short the inflammatory attack, reducing the swelling in the nasal mucous membrane, especially about the orifices of the opening of the sinuses, so as to allow free drainage of the accessory cavity. Once the normal opening is established it is remarkable how quickly an inflammatory lesion of the accessory cavity will clear up. The 2 to 4 per cent. solution of cocaine is sufficiently strong to insure the proper amount of shrinkage of the inflamed and swollen tissue. Personally, I do not use the supracarotid extract, because in my hands I have observed that in many cases in which I have used this solution the after-irritation is so marked that it overcomes largely the beneficial results due to cocaine. For this reason, I have ceased to use it. As stated before, it is essential to study carefully the individual case in order to locate the exact position of the orifice and its relation to the intranasal structure. For example, I have seen cases involving the maxillary sinus, in which it was said that it was impossible to open the natural orifice, in which the middle turbinate was of the scroll variety, and the solution had been applied on the outside of the turbinate and never underneath this body. With a little care and minute pledgets of cotton the mucous membrane underneath the scroll turbinate was shrunken and in a very short space of time the pus began trickling from the blocked up cavity. By keeping the membrane shrunken down, free drainage was established and without any surgical interference with the antrum, a permanent cure was effected.

This paper has to deal with the acute processes, and in an acute process necrosis would not occur. To be sure, if bony necrosis has occurred within any of the cavities, nothing short of opening that cavity and removing the necrosed tissue would effect a cure, but such cases must not be confused with acute inflammations, neither must cases that have become subacute or chronic, and are largely latent when lighted up by some acute process, be termed acute. This, I think, will account for many cases of disagreement as to diagnosis and treatment, whether or not it is actually an acute process, or whether there is some left-over inflammation which has been lighted up by some infection or nasal inclination. Illustrating this, a severe acute case was treated by this conservative method.

Patient.—A young man, aged 22, a medical student, was admitted to the hospital suffering with acute inflammation of the left frontal sinus. He had a temperature of 103 F., marked tenderness and swelling over the left frontal sinus, marked edema of the upper and lower lids, with considerable redness and discoloration. He was suffering from severe boring frontal headache, and the pain extended into the temporal region. He was restless and apprehensive. Two days before, following a slight cold, suddenly the symptoms of the sinus involvement

began. The day before admission he had a decided chill, and these symptoms rapidly increased until he presented himself at the hospital as described above.

Treatment.—The application of a 2 per cent. solution of cocaine was made at once to the swollen mucous membrane in the nasal cavity, and gradually carried up to the region of the frontal sinus opening. At the same time the general condition was treated by thorough cleansing of the intestinal tract by means of calomel and a saline purge. The application of cocaine was continued until carried to the orifice of the sinus. In this particular case this was rather difficult, as the sinus opened rather high and posteriorly, and the superior portion of the nostril was narrow and obstructed. This was overcome, however, by making a short, sharp curve at the end of the applicator, and in this way carrying the cotton into the nasopharynx and bringing it forward and upward, it was possible to reach the opening. In less than two hours there was a free flow of pus from the frontal sinus. Heat was also applied externally and the resident physician was instructed to make the application at the first sign of blocking up of the sinus. In exactly three days all swelling and pain had disappeared.

Remarks.—At first examination the patient's condition was such that it seemed almost inevitable that the frontal sinus would have to be opened externally. This was obviated by the careful and faithful carrying out of the method of drainage by the natural orifice.

In 1898, I reported some cases in which apparently there was an acute involvement of the antrum, with all the symptoms pointing to such an acute inflammation, in which it was clearly proved afterward that the entire condition was produced by the accumulation of gas in the antral cavity. By directing the treatment to the orifice of this cavity the accumulated gas was allowed to escape and the symptoms rapidly disappeared. Since reporting those cases, I have observed the condition rather frequently, not only in my private practice, but in the out-patient department at the hospital.

From a general pathologic standpoint it should be remembered that the accessory cavities are truly such, and that they are not independent cavities. That they are accessory cavities to what? To the nasal respiratory tract. Hence, the origin of many pathologic lesions is the nasal cavity. It must be remembered also, that these accessory cavities are dependent on adjacent structures for nutrition. Also, when infected, the rhinologist is dealing with a closed cavity, but not a cavity of new formation, hence the pathologic alteration is not subject to the same law as that of a cavity of new formation.

I do not mean that never are we to perform the radical operation, but I wish to call attention to the fact that many patients who are subjected to the radical operation could and should be cured without any such procedure.

In general, then, the treatment should be directed to the cause and the removal of any interference with the natural drainage. Swelling of the nasal mucous membrane may be reduced by cocaine or any solution that will shrink the mucous membrane; douching with warm alkaline solutions to favor drainage; measures directed toward the relief of the pain. Rarely, it may be necessary to wash out the cavity through the natural opening, an enlargement of this opening, or through exploratory puncture. If free drainage is not maintained the condition is likely to become chronic.

Value of Playgrounds.—The twentieth century has caught the real meaning of the unsurpassed Grecian classical education; and modern cities in spending millions for playgrounds are repeating history and we are entering the new educational renaissance.—J. E. Peaus, in *Hygiene and Physical Education*.