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THE ETHMOIDAL PROBLEM.*

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A PATIENT, usually of importance, has been under our care for some time with a profuse chronic unilateral muco-purulent discharge, for the most part post-nasal, particularly annoying in the morning, chiefly on account of the glue-like secretion which accumulates in the throat and nasopharynx. After weeks of treatment and having convinced ourselves that the frontal, maxillary, and sphenoid are not diseased, in an unguarded moment, perhaps having lost patience, we suggest opening and curettage of the ethmoid cells. This advice is readily accepted and the operation performed, intra-nasally of course, and under local anæsthesia. We are surprised at the small quantity of purulent secretion which is evacuated, and at the amount of apparently healthy or but slightly affected mucosa which is removed during the operation. In any event, at the conclusion of the procedure, we are not entirely satisfied. It occurs to us that the macroscopic pathology of the removed fragments did not justify the assumption that they were solely the cause of the troublesome discharge which had proved of such annoyance to the patient. Consequently, the suggestion and even the apprehension arise that we have not been as thorough in our exenteration as we might have been, and indeed, as subsequent events prove, as was necessary for the eradication of the infection. However, we are quite optimistic and feel that, after all, with the cells opened and with regular

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applications of argyrol or similar pigments, at least a great amelioration of the symptoms will be brought about. After many more weeks of treatment, the fact is gradually driven home (disagreeable as it is) that the condition of the patient is not only unimproved but, if anything, is actually made worse as a result of our careful and painstaking surgery. This is the dilemma in which we find ourselves, and finally we are only too glad to hand over the patient, not infrequently at his own suggestion, to the care and responsibility of one of our colleagues, in whose hands he probably will fare but little better than he did under our own manipulations.

This is a typical retrospect of many of these cases. It is my purpose to continue the narrative from this point, and to analyse as far as possible the cause of our failures, as well as to advance certain suggestions as to the procedures to be adopted for the ultimate eradication of the infection.

It will be of little avail to state that we should not have operated in the first place, at least, in the method that was followed. Indiscriminate removal of all the ethmoid cells within reach of our forceps was as unnecessary as it was unscientific. We departed from the old maxim in sinus affections, "Find the pus and follow it to its source." We used our best judgment, and by a sweeping operation hoped to include all the infected parts within the scope of our surgical procedure. From the very first, however, we were practically certain to fail on account of the almost insurmountable obstacles which are, for the most part, present in suppurative ethmoiditis. In the vast majority of cases it is difficult and often impossible to open adequately all ethmoid cells by intra-nasal methods. The cells which are most severely infected are usually those lying in the most inaccessible places as, for example, a supra-orbital cell in the anterior group or a deep-lying supra-maxillary cell in the posterior group. These can be and, as a matter of fact, usually are left undisturbed after even a complete intra-nasal exenteration, where they remain to reinfect the remnants of the previously healthy cells which have been reduced to a disorganised mass by our forceps and curette. In the ordinary run of these cases where the discharge was the predominating symptom, we should have curbed our impatience and systematically studied the condition with all the means at our disposal. This can properly be preceded by complete removal of the middle turbinate followed by a

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satisfactory stereoscopic X-ray. Careful and persistent study of these negatives will disclose the anatomic formation of the cells, even if they fail to show the diseased area which, in my experience, they seldom do in a convincing manner. The so-called extra-capsular cells (fronto-ethmoidal, orbito-ethmoidal, and maxillo-ethmoidal) are plainly seen in both shape and extent. This knowledge is of inestimable value in making subsequent deductions as to the probable origin of the pathological secretion, and will very materially influence and limit the extent of the surgical interference. How much more satisfactory it is to have as a definite object the opening and draining of one or two large suspicious cells than to indiscriminately clean out the whole ethmoid in the hope of removing the diseased with the healthy structures.

The exact method to be followed will, of course, vary with each individual case, and is dependant upon following the pus to its source, a procedure which may be long and tedious, but if carried to a successful termination will more than repay us by the conservation of tissue and by the prevention of the chronic state, not to mention the satisfaction derived from the result.

To revert then to our patient, we will presume that conservative means have been applied for a sufficient length of time, with little or no influence upon the course of the disease. The suppuration continues with but slight abatement, and it becomes apparent that it can only be greatly influenced by some form of surgical intervention. What shall this consist of? To open the lid of the ethmoid by removing the middle turbinate, or by assuming the entire labyrinth should be removed and proceeding according to the method of Mosher? Obviously the latter is preferable if we are convinced that a complete exenteration is indicated; but, in our case, we are by no means certain that the infection is not localised to a few cells, in which it will be possible to bring about a cure and at the same time conserve a large portion of the ethmoidal structures. In these circumstances the removal of the middle turbinate is unquestionably to be preferred; but we are very apt at this point to disregard our patient, and to continue the operation by removing those cells which lie convenient to our forceps. This has proved, in my hands at least, to be an irretrievable blunder. Had our better judgment been followed, we would have contented ourselves with the turbinectomy, and, after healing had occurred, continued with the further study of the case. In this way not only

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would the patient have had the benefit of the doubt as to whether resolution would have followed, due to the resultant aeration and drainage incident upon the removal of the turbinate, but the operator would have been in a far better position to follow up and judge the origin of the purulent secretion. In this way the offending cells can usually be detected, and by constant and persistent attention to these, the infection is finally eradicated.

Suppose, however, we have followed our first inclination, and after removal of the turbinate, attacked with forceps and curette all cells within reach, not neglecting to open the sphenoid. What is the result? Either we have, among other things, reached the diseased parts and removed them sufficiently to bring about a cure, or the patient returns in a few weeks with the most intractable case of suppurating ethmoiditis we have ever had on our hands. The symptoms are too well known to all of us for further comment, but we may recall the morning accumulation of glue-like masses in the nasopharynx and constant nasal and post-nasal discharge. On examination, the ethmoidal region appears to be bathed in pus, which does not seem to take its origin from any particular locality, but fairly exudes from the whole of our former operative field. Removal of this secretion as carefully as we can, either by cotton mop or lavage, fails to disclose its precise origin, and no form of conservative treatment, from the application of aseptic irrigations, followed by medicaments, to suction, seems to have more than the slightest temporary influence upon its course.

Now let us consider the precise pathological condition that confronts us. We have indiscriminately removed all ethmoid cells within reach to the best of our ability, but nevertheless we have unavoidably left a portion of those originally affected, with the result that, instead of the affection being eradicated, it gradually spread through the broken-down and macerated structures until the whole mass has become involved. This presents a very different problem from that which originally confronted us, particularly when one considers the pathological changes that have been wrought. The primary condition was one of purulent infection of one or more, possibly a group of cells, the mucosa of which was thickened and inflamed, but the osseous structures were unchanged both as to form and position. In other words, the labyrinth was intact. Now, in its place, we are dealing with a disorganised and suppurating mass, the land-

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marks having been more or less obliterated. The bone has attempted to regenerate with the formation of proliferations of new osseous tissue through the trabeculæ of the cell remnants as well as the basic structures (*lamina papyracea*). Fibrous connective tissue has replaced the exuberant granulations which had succeeded the torn and traumatised mucosa, with the result that now a semi-dense, suppurating, disorganised mass occupies the position of the area operated upon. Further operative procedures are soon found to be worse than useless, the fibrous character of the attacked tissues making the removal difficult and, on account of the force required, even dangerous. Given, however, that in an exceptionally favourable case a large portion of this mass was removed, in but a comparatively short time re-infection from the original focus would occur, with a return to the old condition.

This brings us to the serious consideration of our question—the ethmoidal problem. Let us consider that one of these operated cases has presented himself for treatment. Examination has elicited the facts and conditions enumerated above. What shall be our line of procedure? Experience has, or should have, taught us that further haphazard removal of tissue will avail nothing, nor can conservative measures be continued indefinitely. We must revert to the old maxim:—find the pus and follow it to its source. But if it was difficult to apply this before, now it has become almost impossible; nevertheless, this must be attempted in order to scientifically and accurately bring the case to a satisfactory conclusion. When one examines the affected region even after thorough irrigation, the task appears thoroughly hopeless, purulent secretion everywhere but apparently coming from nowhere. Even the most painstaking probing fails to find a reservoir, although irrigation into any cavity or recess never fails to bring forth traces of pus.

In order to ascertain the source of the discharge, we must begin the systematic study of the case by excluding both the sphenoid sinus and maxillary antrum which almost invariably have become infected during the course of the disease. Needle puncture will bring forth the contents of the antrum, while the cotton tipped applicator introduced into the opening of the sphenoid will disclose the nature of its contained secretion. Let us consider how far these cavities are responsible for the amount which accumulates daily in the nose and nasopharynx of the patient? Several methods have been advanced to

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accomplish this purpose, but I have found that the most satisfactory consists in the introduction of a small quantity of powdered methylene blue on a cotton pledget into the sphenoid after thorough cleansing and drying. Into the maxillary sinus it can be insufflated through a Lichtwitz needle. The patient is instructed not to blow the nose or clear the throat as far as possible until the next morning, and then to use a large cloth or towel. Comparison of the masses of blown or hawked out secretion will at once show the amount that is tinged with blue and that which is clear of colouring matter, thus giving reliable data from which to draw a conclusion. For corroborative purposes this can be repeated until no further doubts exist. If it is shown that the mucosa of the sphenoidal or maxillary cavity is secreting a considerable amount, a differential diagnosis between these two can be made by alternating the application of the methylene blue between them.

Let us presume we have disclosed that both these cavities contribute sensibly to the whole amount of secretion. Our first endeavour is to eliminate these from further participation in its production. This can be accomplished in the case of the sphenoid by removing the entire anterior wall, particularly toward the floor, and the application of nitrate of silver solution in suitable strength (gr. xxx-lx to oz.). In the case of the antrum, other measures may be necessary, such as a large opening below the inferior turbinate. Only after the discharge from these has been controlled should the ethmoid be attacked, but it should be remembered that the antrum can and often does act as a receptacle for the secretion exuded from the ethmoid.

In order to investigate the site of the discharge, it is necessary to consider the anatomical subdivision of the ethmoid into the anterior and posterior group of cells, and to endeavour to ascertain whether either of these groups or both are exuding the pathological secretion. At this point it is well to recall that the anterior cells are small and shallow, while the posterior are large and deep; therefore the chances are overwhelmingly in favour of the latter being at fault, particularly if the presence of a fronto-orbital cell is excluded, which can be done by study of the stereoptical plates. If repeated inspection and the use of the probe show that one of the constant sources of the secretion lies in the region of the uncinate process, it can pretty well be taken for granted that the secreting area lies in the immediate

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proximity. If, on the other hand, the discharge is for the most part post-nasal and irrigation over the spheno-ethmoidal region invariably produces shreds and irregular globules of pus, it can hardly be controverted if we state that the infecting source lies in the posterior cells. If discharge be present in both areas, which more often is the rule in these cases, the entire mass is usually involved. Suppuration in the anterior cells demands the removal of the uncinate process in order to uncover those situated along the infundibulum as well as in the agger nasi, but it has been my experience that this alone is of little avail as that portion of the ethmoid lying posterior to the lamella of the middle turbinate is always co-affected and requires resection before the infecting process can be brought to a halt. By reason of the operative space thus gained by removal of the uncinate process, the lamella of the middle turbinate can be broken through and the remnants of the posterior cells reached with much greater facility and thoroughness than was previously possible. One is often enabled to make a complete exenteration to the orbital plate and into the spheno-ethmoidal fissure. The basic remains of the bony partitions can be fairly well smoothed off by sand-papering with compact wads of cotton held in the blades of the nasal forceps. After-treatment should consist in daily irrigations with a suitable solution such as hyperchlorite of sodium. Excessive granulations may be touched with a strong solution of silver nitrate. Even should it be determined that the posterior cells are solely involved, this method will give better results than attempting to remove them over the remains of the middle turbinate lamella, as a much wider field is present after the uncinate process is resected and there is less likelihood of overlooking pockets of infected mucosa. If this fails, I know of nothing that remains except the external operation.

Guisez's method or the external operation through the orbital plate is rarely indicated in these cases simply because the patient will not permit it, his symptoms not being of the severity to warrant such a radical procedure. At the most, he has a post-nasal discharge which is particularly irritating on rising, but after being cleaned out he is fairly comfortable during the day. Headaches are usually not particularly disturbing and retention symptoms rarely present, as the cells have for the most part been widely opened and their points of least resistance are toward the nasal cavity.

On the other hand, absolute indications for the external

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operation occur after intra-nasal methods have been tried, when certain eventualities prevail such as (1) the pressure of a large infected fronto-ethmoidal cell which cannot adequately be opened and drained intra-nasally; (2) the occurrence of frequent and severe headaches traceable to the infection despite treatment; (3) progressively increasing septic condition of the patient; (4) external fistula formation; (5) threatened or actual orbital or cerebral complications.

Ultimate Results from Operative Procedures.—In the uncomplicated case of purulent ethmoiditis without polyp formation, after the removal of the middle turbinate, the results obtained are usually inversely to the extent of the surgical disturbance; in other words, the greater the operative interference the less likelihood of return to normal and ultimate cure. Experience shows that once the middle turbinate is disposed of, the ethmoid labyrinth lends itself to conservative treatment and responds correspondingly with much greater facility than heretofore. In addition to this, the relations having been undisturbed, the ethmoid capsule and cells remain uninjured and intact. After a week or ten days we are in a much more favourable position to study and treat the pathological process, not to mention the benefit derived from the aeration and drainage effected by the turbinectomy. The infection will have a tendency to limit itself to one cell or to a small group of cells, which only the most careful and persistent study will disclose. This being finally accomplished, it is a comparatively easy matter to install a large opening in their most dependant parts with a suitable hook, thus permitting aeration and drainage which, coupled with irrigation, soon eliminates the active infection and puts the parts on the road towards resolution. In this instance the actual surgical interference has been small, therefore the function of the nose will be unimpaired and the cure may be termed physiological as well as therapeutic, leaving nothing to be desired.

Unfortunately, this termination has been rarely observed owing to the fact that we have not followed a rational and systematic line of procedure. Our errors were either of omission or commission, we did not operate at all, or, having decided to operate, we were not satisfied with a simple turbinectomy, but continued by removing certain of the ethmoid cells. The results of this are, of course, a continuation of the suppurative process, together with a disorganisation of the ethmoid structures

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which makes a comprehensive study almost impossible. We can therefore state that the ultimate results of this form of operation are to all intents and purposes disappointing and unsatisfactory.

The next step is the complete intra-nasal exenteration, after removal of the uncinate process. This, in my hands, except in isolated instances, has been disappointing for the reason that it has been applied only as a semi-final resort, when the pathological process has invaded the basic structures to such an extent that any intra-nasal procedure has been practically hopeless from the first. In those cases where the anatomical configuration lent itself easily to intra-nasal measures, the ultimate results have been crowned with success; but the cures have never been so striking as in the first instance, as the patient was subject to more or less permanent discharge, particularly on the inception of every fresh cold in the head.

As far as the external radical operation is concerned, my experience has been limited to a dozen or more cases. These patients are always relieved but are never physiologically cured. The operated side of the nose remains a *locus minoris resistentiæ*, always prone to more or less infecting disturbances, with the usual accompanying symptoms.

In conclusion, let me again state that operative procedures upon the ethmoid, unless slowly, carefully, and systematically carried out, are most apt to spell disappointment, and radical operations upon this structure do not by any means always end in radical cures.

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