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T H E S I S

ON THE

ETIOLOGY, SYMPTOMS, DIAGNOSIS A TREATMENT OF EMPYEMA

OF THE NASAL ACCESSORY CAVITIES.

Being a Thesis for the Degree of M.D.

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G U Y B E R T R A M H O L L I N G S,

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NOTES ON THE

ETIOLOGY, SYMPTOMS, DIAGNOSIS & TREATMENT OF EMPYEMA

OF THE NASAL ACCESSORY CAVITIES.

With a few Introductory Remarks concerning  
the Anatomy.

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A few years ago little was known as to disease occurring in the nasal accessory chambers, but during the last ten or twelve years much work has been done by various observers in the pathology of this region, with the result that the diagnosis of disease occurring there has been put on a firm and scientific basis and, moreover, symptoms which, previous to our knowledge of the existence of disease affecting this locality could not be explained, can now have their proper source assigned to them.

Before commencing the study of Empyema of the Nasal Accessory Cavities it would be well if we bring into focus some of the more important anatomical/

ical facts which have more or less bearing on the diagnosis and treatment of this condition. Correct anatomical details are more especially to be insisted upon when we come to study the means of exit for the secretions from these cavities, for when once these are appreciated it is easy to understand how the disease starting in one cavity can be directly communicated to another.

There are four nasal accessory chambers on each side:-

1. The Maxillary Antrum, opening into the Middle Meatus.
2. Frontal Sinus, opening into middle meatus.
3. Ethmoid cells:  
    anterior  
    middle       opening into middle meatus.  
    posterior, opening into superior meatus.
4. Sphenoidal Sinus, opening into the sphenoidal recess.

It will be convenient to take up first the anatomy and then a description of disease, as it occurs in the maxillary antrum, for it is in this chamber that suppuration most frequently occurs.

The antrum is the air chamber occupying the body of the superior maxilla, it is more or less pyramidal in shape and has an apex, a base, and four walls; its form, however, varies considerably and not/



infrequently there is a want of correspondence between the two antra. The chamber is larger as a rule in the male than in the female, and in early life its walls are comparatively thick; but as age advances they usually become thinner, partly due to the enlargement of the cavity and partly due to absorption of cancellated tissue in their vicinity. The base is represented by the nasal or internal surface of the superior maxilla; the apex corresponds to the malar process. The four walls are thus composed:- The superior is formed by the orbital plate; the inferior by the alveolar ridge; the anterior wall corresponds to the facial surface; the posterior to the zygomatic surface. The base or inner wall has at its posterior part a very irregular shaped orifice, this is partially filled in by the vertical plate of the palate bone, the uncinate process of the ethmoid, the maxillary process of the inferior turbinate and a small portion of the lachrymal bone. When the mucous membrane which covers these bones is in situ the previously irregular hole is converted into a small round orifice known as the opening of the antrum or, ostium maxillare. The floor of the antrum is, as a rule, very uneven, due for the most part to prominences caused

by a thin layer of bone covering the roots of the teeth which is in some cases perforated. It is well to remember that the teeth which have the closest relation to the cavity of the antrum are the second bicuspid and the first and second molars, more especially the latter two. The antrum varies in other ways, for in some cases it is partially partitioned off into compartments. Along its roof the infra-orbital nerve runs encased in a bony tube. The chamber first appears about the fourth month of foetal life as a very small cavity indeed. When puberty is reached it quickly enlarges and goes on doing so more or less throughout life. Now is also the time to consider how the secretions from the antrum reach the nose, and the position of the opening in the nasal cavity. In describing this we must necessarily observe the openings of the frontal sinus and the anterior and middle ethmoidal cells, for they all lie in intimate association. On looking into a healthy nostril illuminated by a good reflected light through a speculum, one ought to have one's attention arrested by three important landmarks:--

1. The septum nasi.
2. The inferior turbinate body.
3. The anterior end of the middle turbinate, which is placed higher up, and does not come so far forward.

Now between numbers 2 and 3 is the middle meatus into which open, as we have previously stated, the maxillary antrum, the frontal sinus, the anterior and middle ethmoidal cells. These three accessory cavities open by three or four small apertures into a crescent shaped depression, known as the Hiatus Semilunaris, on the outer wall of the middle meatus, and in order to see this depression thoroughly, it is necessary to remove the anterior end of the middle turbinate, for the latter just covers the apertures. Now this being so, it will be quite understood how a hypertrophied and diseased middle turbinate may block up the apertures which form the means of drainage of the cavities above mentioned, consequently removal of the anterior end of the middle turbinate forms a preliminary to the treatment of accessory sinus disease with many rhinologists. The drainage from the frontal sinus just requires a little further explanation. Each communicates with the nose by means of a passage, the infundibulum, and this latter terminates at, or in the antral opening; but a fold of mucous membrane lies above the foramen forming a blind recess at the bottom of which is the ostium maxillare, the fold being on the inner side. The importance of such an arrangement was first/



~~Since~~ pointed out to me by Dr Tilley, namely,

1st That a discharge from the frontal sinus would tend to fill the antrum before it began to run over into the nose, so that the antrum might easily act as a reservoir for discharge from the ethmoidal cells or frontal sinus without being itself actually diseased. Another fact to be kept in mind is that the infundibulum to gain the nose has to pass through the region of the ethmoidal cells, consequently what is more likely than ~~that~~ frontal sinus suppuration should affect the ethmoidal cells and vice versa. I therefore think the anatomy of the sinus region amply explains why more than one cavity is usually affected at the same time.

#### ETIOLOGY.

On looking at Antral Disease from an etiological standpoint, we find that rhinologists are more or less divided into two schools; first, those who attribute it to spreading of catarrh from the nasal mucous membrane: secondly, those who regard the origin of the disease in the existence of periostitis around a carious tooth. With regard to the first hypothesis, one must remember that catarrhal inflammation of the nose results from a local condition/



which does not probably operate in the case of the antrum and we again must keep in mind the number of individuals who suffer from chronic rhinitis, and the very small proportion of these in which antral disease occurs. I have often noticed, however, that hypertrophic rhinitis is present in many cases of antral suppuration; perhaps the hypertrophic condition of the mucous membrane interferes with efficient drainage through the ostium maxillare an objection might be taken to this, for so many patients we examine have hypertrophic rhinitis without co-existing antral disease. But in answer to that, we have only to recollect the difference in size of the ostium maxillare in different individuals and a hypertrophy which would block up the ostium in one patient, would not do so in another. When we consider what results would follow closing of the ostium we see that they are hyperaemia and increased secretion and there being no exit the antrum soon becomes full of this discharge. The contents, however, do not long continue of a mucous character but soon become purulent. With regard to the second hypothesis, the origin from decayed teeth, when we remember that the first and second molar teeth usually project into the cavity

of the antrum and in some cases actually penetrate into it, it would not be out of the way to imagine suppuration to take place from this cause. Dentists affirm this to be the origin of the disease. Of course people suffering from carious teeth naturally go to a dentist and he finds perhaps in their case antral suppuration; whilst those suffering from nasal trouble go to the rhinologist and he asserts the nasal origin of the disease. More rarely antral empyema follows a blow.

#### SYMPTOMS.

Cases of antral empyema may be divided into two groups:

- 1st. Those in which there is no exit for the pus.
- 2nd. Cases in which the ostium is patent and allows the pus to escape into the nose.

The first class of cases is rarer than the second, and in the former the symptoms are usually more or less urgent. They are bulging of any one of the walls of the antrum; most commonly there is pressure on the floor of the orbit giving rise to eye troubles. Secondly, we have neuralgic pains, generally severe. Thirdly, there may be swelling, with/

with oedema and redness of the soft parts of the cheeks, sometimes very strongly resembling erysipelas. With these local signs there are usually constitutional symptoms, such as shivering or actual rigor, fever, furred tongue, malaise, etc.

Secdndly: Cases in which there is an exit for the pus.

Intermittent discharge of pus from the nose, usually only from one nostril but if both antra are affected pus may come from both nostrils. The amount is increased if the patient lowers his head, so as to make the ostium the most dependent part of the antrum. In chronic cases the pus may be foul smelling, the smell being especially noticed by the patient himself. The discharge usually appears anteriorly, but it may pass down behind the soft palate, thus simulating a naso-pharyngeal catarrh. Obstruction to nasal breathing: Some individuals complain of this more than anything else. It is no doubt due to the polypi and granulations on the middle turbinate blocking up one or both nostrils as the case may be.

Pain: This is a symptom which may be entirely unobtrusive or else it may be the one reason of the patient seeking advice. Very often I think its



in a severe form is evidence that drainage is deficient, or it may be absent, for the pain in some cases will disappear as if by magic if drainage is re-established. The pain may be referred to various spots, perhaps the commonest form is supra-orbital neuralgia. This often shows a remarkable periodicity, a patient telling you that his pain comes on at a certain time each day and after lasting so many hours will disappear, only to return again on the following day. Perhaps it is owing to this remarkable periodic character that this pain is often thought to be malarious in origin and under the diagnosis of Brow Ague is treated with quinine, but, needless to say, without benefit. Some authorities seem to incline to the view that supra-orbital headache is a symptom of frontal sinus empyema; but in my experience it is equally so in antral suppuration.

Cough: Patients may mention this: they generally give the history of the cough being troublesome, particularly in the morning. This is probably due to pus running down at the back of the pharynx during sleep and irritating the glottis.

General Symptoms: These result from the swallowing of pus, and are nausea, especially in the morning, distaste for food, indigestion, etc. In the neurotic you may get great depression and inability to perform their daily duties.



DIAGNOSIS.

The diagnosis of antral disease is not always so straightforward as the symptoms might lead one to suppose, for although there are several presumptive signs which, when taken together, may justify us in hazarding a diagnosis, there is only one certain sign.

First, the recognition of those acute cases where there is no escape for the pus is easy, for you practically always have swelling of the soft parts of the cheek with redness and oedema, pain more or less severe and signs of pressure on surrounding parts. In addition to this there are the constitutional symptoms, fever, shivering or actual rigors.

Second, as to the diagnosis of the more chronic cases. A history of an intermittent flow of pus from one nostril is suggestive. On examining the nostril by anterior rhinoscopy in a typical case, pus is seen in the middle meatus. It may be that before seeing it, however, we should have to remove polypi and granulations which in many cases choke the middle meatus. Now if this pus is thoroughly mopped away until the meatus is clear, and we then make the patient put his head between his knees with the/

72 suspected side uppermost, then on again inspecting the nostrils a re-appearance of pus there strongly suggests antral disease. In some chronic antral cases one does not see pus, but instead a pad of mucous membrane exists between the anterior end of the middle turbinate and the outer wall of the middle meatus. On pressure being applied to this pad a flow of pus is induced. I have more than once seen this condition of affairs exist in frontal sinus disease, although one authority thinks it pathognomic to Antral Suppuration. Recurrence of polypi after removal should always lead to a careful examination of the antrum, for it is probably the constant irritation set up by the pus which produces the polypi. The test which, if properly done, establishes the existence of pus in the antrum without a doubt is the exploration of that cavity by Lichtwitz's trocar. This little operation is carried out in the following manner.

A piece of cotton wool is dipped in ten per cent. cocaine and this is placed by means of nasal forceps between the anterior end of the inferior turbinate body and the outer wall of the inferior meatus and is thus placed against the nasal wall of the antrum which is here composed of very thin bone.

When the cocaine has had time to act, you take the Lichtwitz trocar and cannula and pass it into the nose in the same direction in which you pass the nasal forceps. You then support the patient's head with your left arm and hand and placing the tip of the instrument on the spot previously occupied by the cotton wool, you steadily press it on by a somewhat screw-driver like action. In this manner the nasal wall of the antrum is almost at once perforated and in most cases it is just like going through an egg-shell. Now withdraw the trocar with rapid movement, leaving the cannula in situ, and by means of rubber tubing and a syringe attached to the latter, you can wash out the antrum with warm boracic lotion (15 grs. to the oz.), the patient at the same time leans over a basin and breathes through his mouth. Examine carefully the washings. Should they contain pus you have established the fact beyond doubt that the antrum contains pus. The above procedure is practically painless and also without danger.

There is one slight accident, however, which may happen and of which I was once a witness, namely, in an individual with a very small antrum the trocar may be pushed through both walls, emerging in the zygomatic fossa. In the case to which I have



referred the injection of the boracic lotion caused the cheek to be pushed forward, giving rise to the appearance of swelling. This was relieved by pressure and an incision from the buccal surface.

Another means of diagnosis is trans-illumination of the antrum. This method has not produced the good results anticipated on its introduction, for deductions from it for diagnostic purposes are apt to be fallacious. In this method a small incandescent lamp is placed in the patient's mouth, a black cloth being held over his head to make the surroundings as dark as possible. On turning on the light if you are dealing with healthy antra, both cavities are equally illuminated, as shown by a light region below both orbits. If empyema exists on one side the light below the corresponding orbit is absent, the cheek being darker than on the sound side. But this is sometimes the case in the absence of disease and this, of course, constitutes a serious imperfection in the test: nevertheless if both sides are equally illuminated, we can conclude there is no pus.

#### TREATMENT.

The treatment of this disease varies among different rhinologists, some at once adopting rigorous methods/



whilst others prefer to try simpler and safer measures. I myself lean to the latter school, for we must always bear in mind that not even the rigorous methods are necessarily curative. The first thing to do when the diagnosis of antral empyema is established is to give the patient a cleansing nasal wash to use for a week, so as to get his nasal mucous membrane into as healthy a condition as possible. A very good lotion for the purpose is one containing the following ingredients:

Sod. Bicarb.	gr. v.
Sod. Chlor.	gr. v.
Acid Carbol.	gr. iii.
Aq.	ad.

This should be used three times a day. When the patient again presents himself the next thing to do is to remove polypi and granulations from the middle meatus. In doing so we shall often find that the anterior end of the middle turbinate is covered with polypoidal granulations; in these cases it is best to remove it en masse. This is preferably carried out in the following manner:

Apply cocaine, twenty per cent, against the turbinate; then divide the bone at its anterior attachment to the outer wall of the nose by means of Walsham's nasal

scissors. Then the wire loop of a polypus snare is passed over the semi-detached portion and the included bone cut through, taking care to avoid violence or pulling, owing to the proximity of the cribriform plate. To finish up, the nostril is again douched out by the surgeon and iodoform gauze is applied against the raw surface and removed in twenty-four hours. Having got the nostril into a satisfactory condition, we should now proceed to drain artificially in the following manner.

Remove the second bicuspid or first molar tooth of the upper jaw (one or other being preferred if it be carious) then the following day put the patient under dentist's gas and make an opening into the antrum by perforating the tooth's socket by means of one or other of the various patterns of drills made for the purpose. The antrum is then thoroughly washed out with a warm alkaline antiseptic solution (the fluid should return down the corresponding nostril). Then a drainage tube is inserted into the tooth's cavity, preferably a silver tube about an inch long and one eighth of an inch in diameter, fitted with a flange, by means of which it is attached by a silk thread to a neighbouring tooth; this is very quickly gripped by the soft tissues round about.

It must be impressed upon the patient that the drainage tube is not merely to act as a drain, but what is quite as important it serves to prevent the hole made by the drill from closing up. He should be taught how to remove and insert it, and when <sup>is</sup> this learnt he must take out the tube morning and evening and wash out the antrum with a warm anti-septic wash with a syringe constructed for the purpose (preferably Macdonald's). The kind of lotion used is not of very much importance, Condy's fluid, salt water <sup>3p</sup> to the pint, Creolin (one in a thousand) each has its advocates; but what is of vast consequence is to impress upon the patient the importance of a thorough flushing out of the cavity three times a day or oftener at first. As the discharge diminishes the number of daily douches can be proportionately reduced, becoming once a day, then once every other day and so on until <sup>in</sup> a favourable case it may be dispensed with altogether, as it will be found that pus will cease to appear in the washings. Another way of gaining entrance into the antrum is by perforating the canine fossa. This route should be taken when, on looking into the mouth, one can discover no carious teeth on the diseased side, which will be but seldom. One inserts/



~~sets~~ a drainage tube and pursues the same treatment as in an alveolar case. The disadvantages of drainage via the canine fossa are, first, that drainage is not so perfect, the fossa not being the most dependent part of the antrum; secondly, the drainage tube is apt to give rise to trouble by slipping under the mucous membrane over the canine fossa, as well as setting up a good deal of irritation. Of course, the teeth should be carefully seen to, for it would be futile to irrigate the antrum whilst it was allowed to be continually re-infected by carious teeth.

The question which will often be put to the practitioner by the patient is: "If I carry out your instructions, what likelihood have I of permanent cure and for how long shall I pursue the treatment?" The prospects of cure by the syringing method are, in my opinion, good; always provided that it is done thoroughly and systematically, and moreover in those cases in which a complete cure is not brought about they are certainly relieved. As to the duration of treatment, this is a difficult question; for it varies so much in different cases, averaging from two months to a year; instances are recorded, however, in which the discharge has ceased in three weeks. Another question which suggests itself sooner/



sooner or later to the practitioner is to what is failure in treatment by this simple method to be attributed to? On opening the antrum in such a case, we mostly find it lined by large polypoidal granulations. These secrete a purulent fluid and thereby keep up an incessant discharge. I have also noticed in one or two cases the antrum was abnormally partitioned off, so that pus seemed to be stagnant. Now there is a certain class of nasal surgeons who object to the simple treatment just detailed, asserting that it is tedious to the patient and surgeon alike, and, what is more important to the former, assert he runs a chance of not being cured after all, and therefore this school say it would be better to start on the more thorough and radical treatment first. To these I would reply that I prefer the simpler, but perhaps more tedious treatment for the following reasons:

I. That the simple treatment has cured many in the hands of various practitioners.

II. That it can be done under dentist's gas in one's own consulting room if necessary, the more radical operation requiring chloroform or ether.

III. That the so-called radical operation does not always cure and is a severe operation.

IV. That the simple treatment does not entail the patient discontinuing his usual occupation whilst it is being carried out. Therefore to sum up, I think we should first advise the simple procedure and if, after due trial, it fails then, and only then, recourse may be had to the more severe operation if the patient so desire.

Briefly, the "so-called" radical operation is done in the following manner:--

For two or three days the patient is advised to douche his nostril with a weak carbolic lotion (3 grs. to  $\mathbb{Z}$ j.) At the end of that time a small piece of cotton wool is dipped in 20% cocaine and placed against the anterior half of the inferior turbinate. When the cocaine has acted, remove the anterior end of the inferior turbinate with a snare, then pack iodoform gauze against the raw surface, removing it in twenty-four hours. Instruct the patient to go on douching his nostril with the carbolic lotion for a week. When he again presents himself he should be put under a general anaesthetic and an incision is made along the gingivo-labial fold, push up the soft parts and periosteum off the anterior antral wall and remove a disc of bone from the/

the latter by means of a chisel and mallet and then carefully curette away all the unhealthy granulations lining the cavity. An opening should now be made in the front part of the nasal wall of the antrum into the inferior meatus of the nose. After curetting away the granulations the sinus is mopped out with carbolic lotion (1 in 10) and packed with iodoform gauze, one end of which is passed out of the nostril, through the opening made from the antrum into the inferior meatus. The periosteum and soft parts are now drawn together with four or five horse-hair stitches. The pain and swelling of the cheek after the operation are sometimes considerable and are relieved by hot fomentations. The gauze should be removed in twenty-four to forty-eight hours by drawing it through the nostril. The antrum is then syringed out through the nostril and naso-antral opening with a warm alkaline and antiseptic lotion and this should be kept up daily as long as any discharge exists whatever.

#### FRONTAL SINUS.

The Frontal Sinuses are two triangular shaped cavities situated between the outer and inner tables of the frontal bone on either side of the base of the



nasal spine. They extend outwards from behind the glabella to a variable distance over the orbits, in some cases reaching as far as the temporal fossae. They are separated from one another by a bony septum which may be in the middle line or deviate to one or other side, or it may be perforated thereby, allowing one chamber to communicate with the other. The sinuses first make their appearance about the seventh year of life; they become enlarged about puberty, and continue slightly to increase in size to old age. They communicate with the middle meatus of the nose by means of a passage, the infundibulum, which opens into the Hiatus-Semilunaris, after passing through the region of the ethmoidal cells. They are lined by a prolongation of the nasal mucous membrane.

#### ETIOLOGY.

The nasal mucous membrane is particularly prone to catarrhal inflammation, and it is the spreading of this catarrh into the frontal sinus which is probably the starting point of disease there. The frontal headache and fulness which so often accompany a common cold are due to such an extension. Again, frontal sinus empyema is especially



occasionally a sequela of Influenza, and Syphilis of the nasal mucosa may sometimes spread into the sinus. A blow over the frontal region has given rise to empyema in the underlying sinus. The first thing that happens is swelling of the mucosa with increased secretion, the duct becomes occluded, the secretion accumulates, organisms gain entrance and suppuration ensues.

#### SYMPTOMS.

**Pain:** This may, as in antral disease, be very severe, or it may be almost entirely absent, and as in that case also, its presence depends on inefficient drainage. To illustrate this I may mention the case of a man who consulted me for a swelling over his right supra-orbital region, with severe neuralgia (so severe that he was unable to do his work). The swelling was very slightly red and oedematous, and on examining his right nostril I saw it was full of polypi and small granulations which quite prevented his breathing through that nostril. On removing the polypi, pus was seen trickling from under the anterior end of the middle turbinate. Drainage being thus re-established, the supra-orbital swelling and pain left the patient.

**Tenderness/**



Tenderness on Pressure. Pressure made upwards and inwards with the thumb on the floor of the sinus will in some cases elicit pain; this is especially the case if pus is pent up and was a marked symptom in the case above mentioned.

Swelling: In acute cases you may get redness, swelling, and tenderness of the skin over the sinus with high temperature and corresponding general symptoms. In those very acute cases in which the sinus becomes distended with pus, we have pain at the root of the nose, pedema of the upper eyelid, protrusion of the eyeball downwards and outwards. The swelling is at first hard, but afterwards becomes soft and fluctuating.

The discharge of pus: This is more or less intermittent and is not affected by posture to anything like the extent that is observed in antral disease, and the pus from the frontal sinus is often devoid of odour.

#### DIAGNOSIS.

To be able to say that we are dealing with a case of frontal sinus empyema per se, is of great difficulty. This, of course, is mostly due to the fact that the waste pipes of nearly all these sinuses open into a very small area of the middle meatus.

We/

We can generally, however, safely say that if the frontal sinus has been long the site of disease, then the ethmoidal cells will also be affected and very probably the antrum as well. In some cases no doubt the disease starts primarily in the ethmoidal cells. The appearances in the nose do not help us much for given (a) case with pus in the middle meatus with polypu and granulations, how are we to say which chamber is diseased. In by far the majority of cases such an appearance would suggest the diagnosis of antral empyema, and therefore after thoroughly mopping away the pus and douching the nostril, we should proceed to explore the antrum with Lichtwitz's trocar, then if on syringing out the antrum we get a large quantity of pus, and after such syringing see no more pus appear in the nose, the case is probably one of antral disease. But we must never forget that the antrum may contain pus when it is acting as an overflow chamber for the frontal sinus. This is the reason that stress should be laid on the fact that no pus re-appears in the middle meatus after washing out the antrum as a very strong evidence in favour of antral disease per se. If, on the other hand, very little or no pus is found in the antrum and after syringing that cavity pus is still seen/



seen trickling down into the middle meatus, then the presumption is that the disease was primarily in the frontal sinus. We must of course bear in mind that if we diagnose frontal sinitis, it nearly always means Ethmoiditis as well. An attempt may be made to pass a probe into the frontal sinus from the nose (pus having previously been removed from the middle meatus) and if upon its removal a free flow of pus occurs, then this practically clinches the diagnosis.

I may add to reach the frontal sinus through the fronto-nasal canal is always a task of great difficulty, and in many cases impossible, owing to the tortuosity of the canal. Great care should always be used, owing to the close proximity of the cribriform plate. In many cases after failure to reach the sinus by this route, I have seen it done after removal of the anterior end of the middle turbinate. Trans-illumination is not definite and in many cases misleading.

Mr Charters Symonds, of Guy's Hospital, thus sums up the appearance as seen by anterior rhinoscopy: "The most characteristic features of an uncomplicated case of frontal sinus suppuration is the formation of granulations at the anterior end of the middle turbinate and over this the pus flows." In several cases that I have examined this condition of affairs was present.

TREATMENT.

First let us take the acute cases in which we have supra-orbital swelling and oedema. The measures we generally adopt are hot fomentations to the part after painting with glycerine and belladonna, inhalations up the nostril of steam impregnated with Tinct. Benzoin Co., and of course we start the treatment with a brisk purge. Now and again after this routine the symptoms may settle down. In many cases, however, such a happy result will not be obtained, and under these circumstances we must adopt different measures. Briefly, further treatment is this, open the sinus, remove the pus, and thoroughly disinfect the lining mucous membrane, whilst a probe passed from the sinus into the nose will generally be quite sufficient to clear the canal. Stuff the cavity with iodoform gauze which is allowed to remain in for twenty-four hours and then removed. If at the end of that time the granulations appear healthy, the stitches are drawn together and the resulting scar is almost non-existent. But when we come to treat the chronic cases the task at once becomes tedious and requires patience. The first thing that has to be done is to find out by exploration if there is any pus in the antrum. If there is then this should be drained/

ed through an alveolar tube and the cavity washed twice daily for a fortnight before operative interference is directed to the frontal sinus. Then the nose should be thoroughly cleansed with an alkaline and antiseptic wash and this should be followed up by the removal of the anterior end of the middle turbinate, as described when dealing with the treatment of antral empyema. When removed the turbinate will be found soft and covered with large gelatinous looking granulations. Next some gauze should be inserted against the raw surface and when removed in twelve hours the nostril should be again douched with a cleansing lotion. We now give free exit to discharge from those cavities which open into the middle meatus. Again, it may be possible to pass up a cannula through the fronto-nasal canal into the frontal sinus and wash out this cavity with a warm antiseptic lotion and when we have thus thoroughly cleansed the sinus, we may inject from half to one drachm of sterilised iodiform emulsion into it, making the patient lie on a couch for twenty minutes with his head hanging over the end. I have seen one very successful result follow this procedure although the operation had to be repeated three times, but in most cases notwithstanding perseverance in this method the/



the discharge is still maintained and the patient gets but little if any relief. In these cases we must propose to the patient a more serious operation, opening the sinus from without. I shall now describe the operation, as I have seen it done.

First, one must get the nose into a more healthy condition by douching and removal of the anterior half of the middle turbinate, thus at the same time getting rid of many small polypi and granulations. In two or three days the patient should be anaesthetised (preferably with chloroform) and the surgeon should then proceed to plug the posterior nares on the affected side. From neglect of this precaution I saw one case in which the patient was nearly choked by blood passing into the nose and thus down the pharynx. The eyebrow having been shaved and the skin prepared in the usual way, an incision is made extending from just above the internal palpebral ligament upwards and outwards underneath the line of the eyebrow, but if possible, falling short of the supra-orbital nerve. The soft parts and periosteum are drawn back by an assistant and then a small disc of bone is removed by a chisel and mallet. The sinus being opened, the surgeon should carefully probe the interior of the sinus in all directions. This is important/

important for two reasons: first, in some severe cases the dura mater may be exposed in the posterior wall, and of course vigorous curetting of that would be attended with disastrous consequences; second, to gain some idea of the extent of the cavity and whether it communicates with the cavity of the opposite side or the orbital cavity of the same side. At the same time that the surgeon is ascertaining these facts he can also explore the patency or otherwise of the fronto-nasal canal. One now proceeds to thoroughly curette away the granulation tissue lining the sinus. This must be done with exceptional care for reasons to be presently mentioned. Free bleeding follows this, proceeding especially in those cases where the sinus leads into the temporal fossae. The fronto-nasal canal should next engage attention. This passage should be made large enough to allow the tip of the little finger to be passed into the sinus from the nose. Dr Tilley clears this canal by first passing down a fine uterine curette, then he enlarges the canal by means of a curved burr and finally he finishes up with a sharp spoon on a long curved shank. The operation is completed by swabbing out the cavity with 1 in 1000 perchloride of mercury, and a large rubber drainage tube is passed downwards and out/

of the nostril, its upper end being supported in the lower end of the sinus by transfixing it with a stitch, the end of which is used as one of the stitches for the soft parts. Iodoform is dusted into the sinus and the periosteum and soft parts are drawn together by horse-hair stitches and the wound is dressed in the ordinary way. The drainage tube is left in for three or four days,;\* at the expiration of that time it can be removed by cutting the stitch by which it is attached to the floor of the sinus and pulling it through the nostril. On now looking up the nostril one can see\*right into the sinus and syringe it out if thought necessary. As a rule such an operation as described above brings about a complete cure: but in some cases complications may arise which materially alter the prognosis. These are the following:--

(1) Recurrence of suppuration, breaking down of the wound and external fistula. This is a complication which ought to become less frequent as surgeons come to see the vast importance of freely opening the fronto-nasal canal.

(2) Supra-orbital fornication. This comes on from three to five weeks after operation and results from division of the supra-orbital nerve. It is an exceedingly/



~~exceedingly~~ distressing and troublesome symptom. The skin area supplied by the supra-orbital becomes anaesthetic and consequently scratching does not relieve the incessant itching. This complication usually passes off spontaneously within nine months. The faradic current is the best means of treatment, together with a belladonna and opium liniment which can be well rubbed in three or four times daily.

(3) Septic osteomyelitis of frontal bone. This is a rare complication, some eight cases having been described. I have myself seen two cases, both of which were operated on by able surgeons with due antiseptic precautions. I used to think too vigorous curetting had to do with it, but in one case which I saw the sinus was not curetted at all, and I am confident that osteomyelitis was present before the operation was decided upon.

#### DISEASE OF THE ETHMOIDAL CELLS.

The Ethmoidal Cells are arranged as previously stated into three groups, viz; Anterior, Middle and Posterior. They consist of several irregular spaces occupying the lateral mass of the ethmoid and are completed by the frontal, lachrymal, superior maxilla, and/

and palate bones. The anterior and middle set are larger than the posterior and open into the Hiatus Semilunaris by several small openings. The posterior open into the very back part of the superior meatus. All the cells are lined by a prolongation of the nasal mucous membrane and the dividing partitions between them are composed of very thin bone deficient in certain spots, whereby communication between the cells is effected. In dealing with disease in this region we shall first consider it as it affects the anterior and middle group of cells.

#### ETIOLOGY.

Any acute inflammatory condition of the nasal mucous membrane may spread into the ethmoid cells. As in the nose, so in the cells, the mischief may all settle down and the patient be none the worse; but in small proportion of cases a chronic inflammatory condition of the cells is set up; the mucous membrane lining them becomes spongy and swollen and then ensues hypersecretion and distension of the cells. In this condition they encroach on the middle turbinate and cause this body to be pushed before them until it presents in the nose as a large ovoid mass perhaps abutting against the septum and greatly encroaching on the middle meatus. This chronic inflammation of the/

the cells, or as some people are pleased to call it, "Chronic Ethmoiditis" eventually goes on to suppuration with all its attendant risks.

#### SYMPTOMS.

In the stage of chronic non-suppurative catarrh patients often complain of reflex symptoms such as,

I. Pain which may be referred to various spots, One place which is more common than the others perhaps is the root of the nose.

II. Severe and repeated attacks of sneezing.

III. Asthma.

IV. Constant thin watery discharge from the nose. On the advent of suppuration, we have the appearance of pus, generally in the middle meatus, together with granulations and small polypi in the same situation in addition to the above symptoms.

#### DIAGNOSIS.

To diagnose ethmoiditis per se is very difficult; more especially is this so for when the patient present themselves they nearly always have trouble in the neighbouring sinuses. The protrusion of the mid-turbinate as described above in the absence of any sign of disease in the neighbouring chambers is very suggestive.



TREATMENT.

The best method of treatment is to remove the anterior half of the middle turbinate in the way previously described. This allows us to get at the hiatus semilunaris and cells which lie immediately subjacent. All granulations should be removed with galvano-cautery, using very great caution for fear of intra-cranial complications. After this allow the patient to carefully douche his nostril for ten days with a carbolic lotion (2 grs. to ℥j). At the end of that time apply 20% cocaine thoroughly to the raw surface and carefully curette the parts, breaking down the partitions between the cells. This may be repeated again in a fortnight's time, if necessary.

THE POSTERIOR ETHMOIDAL CELLS.

Since the posterior ethmoidal cells open into the superior meatus, pus from them generally drips down the back of the nose into the pharynx and it often can be seen by posterior rhinoscopy between the middle turbinate and the septum, rather than in the middle meatus.

TREATMENT.

As a preliminary in these cases it would be necessary/

necessary to remove the whole of the middle turbinate and proceed to curette as in the last case.

### DISEASE OF THE SPHENOIDAL SINUS.

The sphenoidal sinuses are two irregular sinuses hollowed out in the body of the sphenoid and separated more or less completely by a thin bony septum. They open into the sphenoidal recess which as pointed out to me by Dr Tilley is really behind the superior meatus and not in the latter, as is so frequently stated.

### ETIOLOGY.

Suppuration in this sinus is generally a complication of suppurative ethmoiditis or else it is an accompaniment of nasal syphilis. It has also been observed, post-mortem, to exist in cases of tubercular meningitis.

### SYMPTOMS.

I have not, to my knowledge, examined a case of this disease. The symptoms, however, are said to be:

I. Pain in middle of head, radiating to occipital, upper cervical, and supra-orbital regions.

II. Purulent discharge trickling down the pharynx and coming from the upper lateral regions of the nasopharynx/

pharynx.

III. If pus cannot escape freely, we might expect visual disturbances.

TREATMENT.

Puncture has been suggested, but obviously it is a very dangerous proceeding. Perhaps after removal of middle turbinate, it would be possible to pass a cannula into the cavity and irrigate it.