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SUPPURATION OF THE MAXILLARY ANTRUM; WITH SPECIAL REFERENCE TO DIAGNOSIS AND TREATMENT.*

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Mr. President and Gentlemen:—It would be difficult for me to adequately express my keen appreciation of the honor your council conferred on me when they asked me to address you this evening upon the subject of Antral Suppuration. It is so easy to accept the compliment; so difficult to make the occasion worthy of the confidence you have reposed in me. My task is rendered none the easier when I find that others of high repute have covered somewhat similar ground before me, and with a thoroughness which suggests that their ideal must have been, once and for all, to say the last word upon the subject. But, fortunately for my purpose to-night, the various methods of diagnosis and modes of treatment, which may have seemed all-sufficient a few years ago, are in one respect like ourselves, in that "they have their day, and cease to be," but only to give place to others, which owe their greater perfection not only to increased clinical experience, but also to our being able to make use of those advances in scientific knowledge which characterize the age in which we live.

Another consideration which makes my position to-night a difficult one is the fact that the dental and nasal surgeon do not meet on what is quite common ground, or rather, the type of cases

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which consult the one differ in their general symptoms from those which come under the notice of the other. In fact, the antral cavity has been a kind of buffer territory separating the domain of the dental surgeon, on the one hand, from that of the nasal surgeon on the other, although I am inclined to think the latter has lately been pegging out claims with considerable energy in the neutral zone.

On such an occasion as this, and with limited time at my disposal, it would serve no useful purpose were I to review the history or methods of treatment of chronic antral suppuration which have been described from time to time by surgeons at home and abroad. For nearly ten years I have enjoyed those priceless advantages which the large clinics of a special hospital afford for the study of diseases of the upper respiratory tract, and as the subject of purulent nasal discharges is one which has particularly interested me, it seems more fitting that I should bring before you some of the results of my own experience, but on this occasion only in so far as they refer to antral suppuration. Furthermore, and in order to provide some sort of basis for my remarks and any conclusions which may be drawn from them, I shall deal mainly with cases which have occurred in my private practice, only including with these certain others which were admitted for treatment into the Golden Square Ear and Throat Hospital, and concerning which my notes are fairly complete. My reason for doing this is that one is able to follow up the history of private patients, whereas it is practically impossible to keep in touch with the out-patients of a hospital—relief with them is often tantamount to cure, and the exigencies of work and loss of time involved in visits to the hospital lead them to cease attending before one can ascertain the final result of treatment.

Moreover, and since the material will suffice for my purpose, I shall yet further limit my cases and only make use of those which have come under my notice during the past two years, or, to be more accurate, since January 1, 1902. During this period it has been my privilege to meet with 64 cases of antral suppuration in private practice, and 18 have been admitted under my care in the hospital, making a total of 82 cases. Of the 64 patients occurring in private practice, 27 were treated by alveolar puncture, 3 were acute cases, 20 were only seen in consultation, and either refused treatment or the latter was carried out by the patients' own medical attendant, 19 were submitted to radical operation.

If these figures be added up, you will notice the total comes to 69; that is, because of the 27 patients treated by the alveolar method without complete success, 5 elected to have the radical operation performed, and hence they have been counted twice over.

The 18 cases admitted into the hospital were each of them operated on by the radical method. In 19 of the 82 patients the frontal and ethmoidal cells were also in a state of chronic suppuration, and these sinuses were radically dealt with, either simultaneously with the antrum or at a former or subsequent operation.

In 4 patients the sphenoidal sinuses as well as the afore-mentioned accessory nasal cavities were also discharging pus.

Of the 64 cases, the antral suppuration was bilateral in 12. For further details respecting many of the patients, I would refer you to the "Synopsis of Cases" which will be found accompanying this paper.

Anatomy and Development.—Before passing on to the causes of antral suppuration, let me bring one or two anatomical and developmental considerations to your notice, for they will assist us in understanding many features in the symptoms, pathology and treatment of the disease.

Although the antrum exists at birth, yet it is so small that, as Logan Turner says, "it is merely a slit-like indentation upon the outer wall of the nasal chamber, and the floor of the orbit and sockets of the teeth are quite close to one another." With the growth of the face the antral cavity increases in size by absorption of the cancellous tissue in the body of the bone, until, by the twenty-fifth year, when growth ceases, we have the adult antrum hollowing out the upper maxillary bone.

Well-marked depressions and recesses are nearly always found upon the internal walls of the antrum, and in these it is very easy for the membrane to escape the curette of the surgeon.

It is almost unnecessary to remind you of the close proximity of the roots of the second bicuspid and the molar teeth to the floor of the antrum, while in exceptional cases even the first bicuspid and canine may approach the lumen of the sinus.

The floor of the nose and antrum are upon the same level, a fact which is of practical importance in any operation in which it is desired to secure free drainage from the antrum into the nose.

The natural opening of the antrum into the nose is situated in the membranous upper portion of the inner antral wall. Seen from within the nasal cavity, it will be noticed that it opens into the channel of the infundibulum in the middle meatus of the nose. The high situation of the opening renders it very unsatisfactory for purposes of drainage. (Diagrams were shown illustrating these points.)

I would ask you to particularly bear in mind two anatomical features which have an important bearing upon the pathology and treat-

ment of nasal accessory sinus suppuration. The first is the relation of the maxillary antrum to the frontal sinus. It will be noticed that the infundibulum terminates at or in the antral opening, and that a fold of mucous membrane extends upwards from the foramen forming a pocket, at the bottom of which is the antral foramen, the fold referred to being on the inner side.

It results from this that a discharge issuing from the frontal sinus would tend to fill the antrum before the latter began to overflow into the nose, and hence the lower sinus may act as a reservoir for discharges from the ethmoidal cells or frontal sinus, without being itself primarily diseased.

Again, Tillaux has shown that if water be injected into the frontal sinus a considerable quantity of it flows into the cavity of the antrum. Hence, the fact that an antrum contains pus does not necessarily mean that it is produced there, for it may be merely acting as a reservoir rather than as a generator of the discharge. The following case will illustrate my meaning:

Mr. F., aged 54, had for five years suffered from a purulent nasal discharge, associated with nasal obstruction due to large polypi within the nasal cavities. On several occasions the polypi were removed, but the discharge continued as freely as before, and it was ascertained that it proceeded from the frontal, ethmoidal, sphenoidal and antral sinuses. Both maxillary antra were drained by the alveolar method, and for two years were irrigated twice daily with antiseptic lotions. The purulent discharge, although lessened in amount and robbed of its fœtor, continued to flow, and the patient used on an average fifty handkerchiefs a week. He finally decided to submit to radical operations upon the different sinuses, with a view to the discharge being entirely cured.

Last June I operated upon both frontal sinuses, and to my astonishment found that it was not necessary to further treat the antra, for from the day on which the operation on the higher sinuses was performed not a single drop of pus could be washed from the antra. Surely it is a remarkable thing that these sinuses (antra) could have merely acted as reservoirs of pus for so long a time without themselves becoming actual generators of the same.

The last anatomical feature to which I would like to draw your attention is that sometimes, as is shown in the diagram, some of the lower anterior ethmoidal cells spread outwards in the bony floor of the orbit, and infection may spread from these into the antrum. It is of the utmost importance in the radical operation for the cure of chronic suppuration to see that these cells (if they exist) are not

overlooked; for if left behind in a septic condition they would reinfect the antral cavity.

Causes of Antral Suppuration.—As many of you are aware, it used to be thought that all cases of antral suppuration were caused by diseased teeth, but during recent years it has become an equally well-established fact that many cases arise by infection from the nose, and this is especially likely to occur during the course of one of the acute specific fevers. Influenza has proved a prolific parent of suppuration within the nasal accessory sinuses, while in a smaller number of cases erysipelas, scarlet fever, measles, diphtheria, typhoid and pneumonia have been definitely proved to be the cause of the infection. A certain amount of catarrh of the nasal mucosa is frequently present during the course of these diseases, and since the nasal mucous membrane is continuous with that lining the accessory cavities, the latter are very prone to become affected by simple extension of the catarrhal process. Hence we can easily understand that an acute nasal catarrh may be followed by a similar condition, with retention of the secretions in the accessory sinuses, a condition possibly accounting for some of the frontal discomfort experienced during an acute "cold in the head." If owing to inefficient drainage such secretions be retained under tension, an increase of inflammation may result, and should certain micro-organisms gain access to the suitable medium thus provided, suppuration may occur—it may be in the antrum, in a single ethmoidal cell, in a frontal sinus, or in any combination of these cavities.

If we suppose an ethmoidal cell to be affected, and to have become the focus of suppuration, it is at least possible that the contained pus may find its way into the maxillary antrum, or even into a frontal sinus, and *vice versa*. So that—given an acute or chronic catarrhal condition of the mucous membrane acting as a predisposing cause—the exciting cause of empyema may be organisms associated with influenza, syphilitic nasal lesions, insanitary surroundings, or convalescence from long illnesses, especially acute infectious diseases; while, as will hereafter be stated, most cases of antral suppuration are due to septic infection starting from the root of a diseased tooth, especially the second bicuspid or one of the molar teeth.

Traumatisms will account for a certain number of cases—possibly more than we are inclined to admit—and I fear that the dental as well as the nasal surgeon is not always free from blame. For example, I have a vivid recollection of three or four cases where symptoms of empyema have immediately followed the attempt at extraction of a tooth, in which the history would seem to suggest that a portion of

a dental root was broken into the antrum. Or again, the symptoms appeared shortly after a tooth had been "filled," and were preceded by intense toothache, followed by a sudden relief which was associated with a foul smell within and a purulent discharge from the nose. Under such circumstances it is probable that the cavity within the tooth had not been rendered perfectly aseptic before the "filling" had been inserted, and the resulting suppuration had followed the path of least resistance and found its way into the overlying sinus.

On the other hand, I have known antral suppuration to follow upon the careless use of the galvano-cautery in the middle meatal region of the nose; and in two other instances it complicated the convalescence of an operation undertaken for the removal of an outgrowth from the nasal septum. Under the latter circumstances, when the nasal mucosa is in an irritable condition, and septic accumulations lie within the nasal cavities, it is particularly easy for a patient in blowing the nose to force such material into the neighboring sinuses and thus to start a chronic suppurative condition.

The question, however, which I feel sure many of you will ask me will be, what proportion of cases of chronic antral suppuration do you consider arises from dental causes?

I am afraid it is impossible for me to give you anything like a direct answer, but this statement may interest you, namely, that with one exception, in each of the sixty-four cases upon which this paper is based, diseased bicuspid or molar teeth were present (or by their absence implied previous removal for disease) upon the side corresponding to the antral suppuration. I would even go further, and say that during the past ten years, during which I must have seen at least three hundred cases of "antral abscess," I have only met with one patient (a girl, aged 12) in whom the teeth were quite healthy.

These are somewhat startling facts, but I am able to substantiate them, even though there rings in my ear the statement of Grünwald of Munich, that, out of 98 cases of antral suppuration, in 14 only could he trace with certainty their origin from diseased teeth. How does this curious difference in large experiences arise? Possibly in this way. You will notice that in my statement it is asserted that "diseased" teeth were present in all cases, and by "disease" is meant any departure from the normal, ranging from a tinny carious cavity in the crown of a tooth to a septic condition involving the crown, roots and surrounding alveolar sockets. In a few of my cases it was difficult to believe that the antral suppuration had been influenced in any way by a small carious cavity in the crown of what (with this exception) was a sound tooth, and it is probably all such mild cases

of dental disease which Grünwald excluded from his statistics. Nevertheless, the constancy of the association between the diseased teeth and the sinus suppuration would seem to me to be more than mere coincidence.

Or can we explain the facts in this way? That in this country there are very few people beyond the age of puberty whose teeth are absolutely sound, and therefore the chances of any one individual who is suffering from chronic antral suppuration (relatively a much rarer condition) having unhealthy teeth on the same side are very great.

Or again, may we not reasonably suppose that a small amount of disease, limited even to the crown of a tooth, will probably set up a certain degree of irritability of the mucous membrane of the antrum in the neighborhood of the root of that tooth—shall we say an increased vulnerability, which renders it more liable to infection from the nose? Unless it be assumed that my figures are the result of mere coincidence, I fear we must adopt some such explanation as this, and in this connection would quote what Grünwald says, in spite of his opposition to the frequency of dental disease as a cause of antral suppuration. He says: "I would especially emphasize the fact that a tooth must not be considered harmless because the socket is not diseased. Infection creeps along the lymphatics of healthy bone, and a focus of infection in the crown of a tooth is by no means to be despised, for even if an empyema of the antrum be due to another cause, yet disease of the crown of a tooth is calculated to maintain such a state of irritation in the mucous membrane as may frustrate all attempts at cure."

Symptoms.—The symptoms of acute antral suppuration are so well known to you that I need scarcely do more than mention the acute throbbing pain in the cheek and supraorbital region, tenderness of one or more teeth and their immediate neighborhood, especially that of the canine fossa. Sometimes the soft tissues of the face and cheek are also swollen and tender, while fever and the constitutional symptoms associated with it add to the sufferings of the patient. Relief comes when the abscess bursts into the nose, or is relieved by extraction of the inflamed tooth and (if necessary) perforation through the alveolar socket.

A patient suffering from chronic antral suppuration will, I take it, consult the dental surgeon only when dental symptoms are prominent, but the medical attendant is often appealed to for the relief of symptoms which do not at first sight suggest the antrum, *e.g.*, "an offensive discharge from the nose," a frequently recurring "dis-

agreeable taste," "increasing difficulty in breathing through the nose," due to the formation of polypi, "chronic nasal catarrh," "headache," "brow ague," feelings of "weight over the forehead," or "round the eyes." In other cases the digestion is impaired owing to more or less severe forms of gastritis, brought about by the swallowing of pus into the stomach; while absorption of the purulent material into the general circulation has a very subtle effect on the nervous system, inducing a lack of energy and general condition of depression, which may perhaps be best exemplified by the following passage taken from a patient's letter two months after the antrum had been drained. She says, "Before the operation I was always depressed, and often cried several times a day; if I walked a mile I was tired out, but now I can walk eight miles without any fatigue whatever," etc., etc.

If the dental symptoms be associated with a "discharge of offensive matter from the nose," coupled with a "sickly taste" in the mouth, and at the same time there are frequent attacks of supra-orbital headache—possibly of greater severity during the earlier hours of the day—especially if these symptoms should be associated with any of those I have already mentioned, under such circumstances you may reasonably entertain a strong suspicion that the antrum is diseased, either alone or in combination with the other accessory sinuses.

Diagnosis.—Here, again, we must not dwell upon fine details, because, in order to recognize the chief diagnostic features of chronic antral suppuration as seen within the nose, I should have to presume that you had an intimate acquaintance with the appearances of the nasal cavities both in health and disease. Still less is it necessary for me to discuss the diagnosis of those difficult cases in which more than one of the accessory cavities are simultaneously affected. Two tests, however, which you may often apply with advantage are the following:

(1) Ask the patient to blow his nose thoroughly upon the affected side until no pus is expelled. Then let him rest for from three to five minutes with the suspected antrum uppermost, during which time the pus will probably flow into the nose. On again blowing the nostril the yellow, and often offensive discharge may once more be seen upon the handkerchief.

(2) Let the patient place the feet close together and endeavor to touch his toes without bending the knees. If this position be maintained for from one to two minutes, considerable congestion of the head will be caused, and aching of the inflamed tooth or diseased antrum, or corresponding frontal region, may be induced.

As I stated just now, the appearance of pus in the middle meatus of the nose (diagram), the presence of polypoid granulations or hypertrophies in this position, or the well-known swelling of the mucosa covering the uncinate process of the ethmoid ("Kaufmann's cushion"), cannot be discussed with any advantage upon this occasion.

Presuming we are dealing with an uncomplicated case of unilateral suppuration, there is one test which whilst not by any means infallible, may give you strong confirmation of your suspicions of antral mischief, while it is painless and usually of considerable interest to the patient. I refer to transillumination by means of a small 6 to 10-volt electric lamp placed within the patient's mouth, while the room is darkened or the head covered with a dark cloth, in order to obtain the fullest contrast between the lights and shades provided by the test.

If there be pus within the antrum it will be noticed that there is no infraorbital "light crescent" upon the diseased side, or a much less definite one than on the healthy side. This infraorbital opacity is due, in my opinion, to a chronic inflammatory process in the bony walls of the antrum, because not only it is present immediately after the pus has been washed out, but may sometimes be seen forty-eight hours after the radical operation has been performed, and when the sinus cavity is without any membranous lining at all. Unfortunately the test is not always reliable because a similar opacity may be noted in healthy but thick-walled antra, and of course its value is diminished when both sinuses are diseased. Other conditions may also modify its reality, but in the great majority of cases it may very materially assist you in *confirming suspicions* founded upon other symptoms presented by the case.

(A practical illustration of transillumination in a patient suffering from chronic antral suppuration was given.)

There is only one absolutely certain means by which you can demonstrate the presence or absence of pus in the antrum, and that is by exploration of the cavity. Formerly it was (and I fear, in many quarters still is) the custom to perforate the alveolus under nitrous oxide anæsthesia and if necessary to remove a tooth for the purpose. Should the exploration demonstrate the absence of pus, the patient will possibly have lost a useful tooth, to say nothing of the inconvenience of the anæsthetic, and of—not improbably—a considerable amount of after-pain and discomfort in the jaw.

All these disadvantages can be obviated by making a puncture within the nose. This little operation is practically painless. It needs no general anæsthetic, it may be done in the consulting room, and its evidence is absolutely reliable.

A small dossil of wool is moistened with a 10 per cent solution of cocaine and applied by means of a probe to the inner wall of the antrum underneath the anterior end of the inferior turbinal bone. In a few moments a (Lichtwitz's) fine trochar and cannula are passed outwards, backwards, and slightly upwards, through the inner antral wall. The trochar is withdrawn, leaving the cannula in position, and to its proximal end is fitted a rubber tube through which some warm boracic or normal saline solution can be injected. If there be any pus in the sinus it is at once demonstrated by this simple, bloodless, and absolutely reliable method. Curiously enough, in a number of cases in which I have used it, immediately the antrum had been perforated the patient at once complained of aching in one of the diseased teeth upon the same side. This was very valuable information, for it at once suggested which one, of perhaps several unsound teeth, was the real cause of the trouble.

Treatment.—The treatment of acute antral suppuration need not detain us long. The painful symptoms rapidly subside if free drainage be provided, either through a tooth socket in the alveolus, or through a large opening in the inferior meatus of the nose. If the antrum be irrigated daily with some mild antiseptic for ten days to a fortnight, the suppuration will cease and the opening in the alveolus may be allowed to close. Very occasionally one irrigation will suffice and the insertion of a drainage tube will be unnecessary. It is a moot question whether any tube is necessary in acute cases or whether they will not do better if only a moderate-sized alveolar perforation be made. Personally, I prefer a tube because we can be sure of efficient drainage until it is certain that suppuration has ceased, whereas, should the opening close before the discharge has quite disappeared, it might be necessary to open up the alveolar perforation for a second time.

With regard to chronic suppuration, you will gather from what has already been stated that in the treatment of every case the first desideratum is that the teeth be attended to, and this even when the history may seem to indicate that the primary infection entered by way of the nose. However clear such a sequence may be, a diseased tooth may add such irritative factors as to rob any other methods of treatment of complete success, and hence the reason why your services should be requisitioned.

Next will come the question, what form of local treatment shall be adopted for checking the suppuration within the antrum? Will you pardon me if I presume to remind you that we are dealing with a bony-walled cavity which is lined by a pyogenic membrane and that

our first endeavor should be to restore the latter to its natural condition, or failing this, we must adopt other means to cure the patient's symptoms. In any case we must be guided by those well-known principles of surgery which are adopted in other regions of the body in the treatment of abscess cavities. I would not emphasize this point had my experience not amply proved to me that such principles are often more honored in the breach than in the observance. Now there are three principles which should influence us in the treatment of all our cases:

(1) *Efficient Drainage*, the ultimate success of which will be accelerated by frequent irrigations of the unhealthy mucous membrane with mild antiseptic washes.

(2) *More or less Obliteration of the Diseased Cavity*. This last method will be the final one if failure attends a fair or lengthy trial of simpler measures.

(3) *Attention to the general health of the patient*. We must never forget that defective hygienic surroundings and excesses in eating, drinking and smoking have a very great influence for evil upon the general progress of the case. Immoderate use of alcohol or tobacco have a great tendency to induce congestion and chronic catarrhal conditions of the mucosa of the upper air passages, conditions which are very adverse to rapid recovery after operative interference in these regions. Occasionally two or three grains of calomel over night, followed in the morning by a saline draught, will produce more improvement than all those new antiseptics of "high destructive power," the advertisements of which form an increasing constituent of our waste-paper baskets.

(1) *Drainage (Alveolar Method)*. Since efficient drainage can only take place when our opening is situated at the lowest level of the abscess cavity, it need scarcely be said that an alveolar perforation is better than drainage through the canine fossa, or through the inferior meatus of the nose. Drainage through the canine fossa is inefficient, and the tube or plug often causes great irritation of the mucous membrane of the cheek or gums, while any but a large opening in the inferior nasal meatus has a very great tendency to close, in addition to which the patient nearly always finds a difficulty in carrying out the necessary irrigations.

You all know the many and ingenious alveolar drainage tubes which from time to time have been invented. Those seem to answer best in which a plate fixed to adjacent teeth supports a metal tube, the lumen of which is about the size of a crow-quill, and which is occupied by a split plug which can be inserted during meal-times in

order to prevent access of food to the antrum. I have also seen cases do equally well in which a solid plug takes the place of the tube. Whichever form of tube you adopt, be careful that its upper end, when it is in position, does not stand high above the level of the antral floor, under which circumstances its very function as a drain will be destroyed.

As to the irrigating lotion which the patient shall use, I can only say that I am wedded to no one in particular, and am certain that the best results will be attained by constantly changing the nature of the antiseptic. A saturated solution of boracic acid, chlorate of potash (grs. xx. to the $\bar{5}$ i), carbolic lotion (1 in 60, for the early treatment of offensive cases), lysoform, the active principle of which is formalin, in strength min. v. to a tumberful of water, peroxide of hydrogen, 10 per cent solution, sulphate of zinc (grs. ii. to $\bar{5}$ i.), and finally normal saline solutions—all these may be found useful. In the later stages, after washing out the antrum, it may be well to inject and leave within the cavity $\bar{5}$ ss. of an alcoholic solution of boracic acid (pulv. ac., boracic, grs. x., spir. vini rect., aq. destill. aa $\bar{5}$ ii.).

At the outset the patient should wash out the antrum twice daily. As the discharge lessens, once daily, with further improvement, every second or third day; and finally, if after an interval of ten days no pus returns upon irrigating, then the case may be considered cured and the tube removed.

Remember: (a) Always use the solution warm, (b) never use warm water alone, even when sterilized. Its density is different from that of blood serum, and will often induce a free discharge of mucus, and sometimes cause pain.

Three questions now suggest themselves:

- (1) What is the result of such treatment?
- (2) How long should it be continued?
- (3) To what class of case should it be applied?

(1) With regard to the result, my experience is that in nearly all cases—even those of long duration—alveolar irrigation rapidly diminishes the amount and foetor of the pus, together with those more general symptoms which have been described; but that in cases of more than a few months' duration, it is extremely difficult to get rid of the last trace of discharge, so that you can feel justified in removing the tube altogether. I have recently ascertained that out of 27 of my patients in whom the alveolar treatment was adopted and irrigation patiently persevered in, only 5 have been able to give up their tubes. The rest still find a small amount of purulent secretion

comes away on irrigation and if they fail to carry on the treatment an increase in the amount of discharge is rapidly noticed.

(2) How long should the treatment be continued? Until the discharge entirely ceases, or until the failure of simple measures renders it obvious, that if the patient desires an absolute cure some further and more radical treatment will be necessary. Out of my 27 alveolar cases seen during the past two years, 15 of them have worn the tube and carefully irrigated for at least six months. One patient had been doing so for ten years, another three and a half, and a third for two years. Many of them found the tube caused no inconvenience and preferred to go on with the irrigation. Five, however, elected to have the radical operation, and I am glad to say that they have without exception been cured, and by the term "cure" I mean that not a trace of pus can be found within the nose.

(3) To what class of case should the alveolar treatment be applied? Certainly to all those the duration of which has been a matter of months rather than of years, and possibly as a first measure in most of the chronic cases, because now and again, even in these, alveolar drainage and irrigation have resulted in a rapid cure.

The advantages of the method are its simplicity, and in this respect it is scarcely a more serious operation than the removal of a tooth. The after-treatment can soon be carried out for long periods by the patient himself and the general improvement which is effected is very great, even if the measure be not an entirely curative one. To the very old, the broken in health, the nervous, the busy man with the cares of a family and an exacting occupation and to whom a week or ten days' lying up is a very serious matter, the alveolar method has many advantages. On the other hand, we meet with cases of long-standing suppuration, in which—no matter how persistently or with what variety the irrigating lotions are used—still the discharge of pus from the nose into the mouth is profuse, the patient becomes tired of irrigating, and wants to know "if something can't be done to cure him once and for all?" Or, perhaps, he or she will be one of those impatient individuals who "do not want to be bothered with tubes," but fret day by day because they "can blow matter from the nose, and always have a nasty taste in the mouth." For this class of patients we may adopt other and more radical measures.

Apart, however, from such reasons as I have just quoted, there are yet others which may necessitate our advising more radical measures than alveolar irrigation. I refer to those cases in which, in spite of constant irrigation, the ethmoidal and the frontal sinuses

tend to become involved in the suppurating process. Under these circumstances the patient is certainly not in a safe condition, a fact of which I have only recently been reminded by the reports of two fatal cases, in which meningitis supervened upon long-standing frontal sinus suppuration.

As an illustration of the type of case I may mention the following:

Mr. G. H. consulted me some seven years ago for bilateral antral suppuration. His alveoli were drilled and plugs inserted by his dental surgeon. He carefully irrigated his antra twice daily with varying lotions for seven months, and when I examined him at the end of this time the pus had lost its fœtor and was diminished in amount. However, I noticed that polypi were beginning to form in the middle meatal regions of the nose and that the mucosa over the uncinate processes of the ethmoids was swollen. Fearing an extension of the disease, I advised a radical operation upon both antra, but this course was not adopted.

I did not see the patient for three years, when he came to me with severe frontal headache, œdema of the right upper eyelid, and general symptoms of malaise. There was little difficulty in determining the presence of suppuration in the ethmoidal cells and washing pus out of the right frontal sinus.

The inability to cure such cases by simple alveolar drainage and irrigation and their chronicity are due to the fact that the mucous membrane of the antrum has in a greater or less degree undergone a polypoid degeneration. It is no wonder then, that mere cleansing by means of a mild antiseptic lotion once or twice a day fails to cure the suppuration. Neither would such treatment be considered efficient in the case of a chronic abscess in any other part of the body. For such conditions as these we have, fortunately, a treatment which gives the most satisfactory results. I refer to the so-called radical operation, with the evolution of which the names of Caldwell, Spicer, and Luc are associated, and the essential features of which are an opening in the canine fossa, curettage of the diseased mucous membrane and a counter-opening into the nose. In the particular operation which has given me my best results I have introduced a further modification which in the more advanced cases has very materially helped in effecting a rapid cure. Briefly, the radical operation, as practiced in my cases, is carried out as follows:

(2) *The Radical Operation.*—An aseptic sponge having been passed into the naso-pharynx and a second one placed between the cheek and teeth on the affected side, in order to prevent any flow of blood into the larynx, the anterior end of the inferior turbinal bone

upon the diseased side is removed by a pair of angular scissors and a wire snare. An incision is then made in the gingivo-labial groove and over the canine fossa parallel to the alveolar process of the jaw, and extending from the malar process of the superior maxilla to the canine ridge. The soft parts and periosteum are turned up and the anterior wall of the antrum, as represented by the canine fossa, is removed by gouge and mallet. An opening is made in the canine fossa, between the size of a sixpence and a shilling, the larger within reason the better, but care should be taken not to wound the infra-orbital nerve. The diseased mucous membrane is then carefully and thoroughly curetted away, the free hemorrhage which interrupts the procedure being checked by means of a good supply of sterilized strips of gauze. The same end may be more rapidly attained if, after having curetted away most of the diseased membrane, one or two strips of gauze be moistened in adrenalin chloride, or hydrogen peroxide solution, and tightly packed into the sinus and allowed to remain for three to five minutes. The time thus lost will be more than regained by the greater ease with which subsequent proceedings can be carried out.

At this stage we have to decide how much of the inner antral wall shall be taken away in order to provide free drainage from the sinus into the nose.

The following considerations should guide you. If the diseased mucous membrane be mainly confined to the lower half of the antrum and the middle meatal region of the nose be healthy, it will suffice if a counter-opening be made in the lower anterior region of the naso-antral wall; this opening should at least be as large as a sixpence because of the great tendency to cicatrization which characterizes wounds in this neighborhood.

If, on the other hand, the whole of the lining membrane be diseased, and especially if polypi or mucous membrane hypertrophies be seen in the middle meatus of the nose, the whole of the inner antral wall should be removed, and it is this modification of the simpler operation which has yielded me my best results. The reasons for this extensive ablation are twofold: the lower half being removed for drainage purposes, the upper half in order to destroy that membranous portion of the inner wall which is often in a polypoid condition, and also to gain access to any lower ethmoidal or maxillo-ethmoidal cells which are so frequently diseased, and which, if left untouched, will reinfect the antrum. The sinus cavity is finally mopped out with strips of gauze soaked in carbolic lotion (1 in 20), and the operation is completed. It is unnecessary to insert any packing unless the

hemorrhage be unusually free; in any case only a loose strip of gauze will be necessary, which should be removed forty-eight hours after the operation and not replaced. In a straightforward case the operation may be completed in from thirty to thirty-five minutes.

The after-treatment consists in douching out the nose, and by this means also the antrum, twice daily for two or three weeks with some mild antiseptic wash. The patient can sit up on the third day after the operation, and may usually go out within ten days. The bucco-antral wound heals very quickly (seven to ten days), and no deformity or falling in of the cheek occurs. I would particularly emphasize the latter point, because one of the objections which have been raised against the radical operation is the deformity which may result. During the past two years I have performed this operation thirty-seven times, and have kept myself intimately acquainted with the progress of each patient, and it is with no small feeling of satisfaction I can record 34 successful cases as against three imperfect results (*vide* "Synopsis of Cases"). The three patients to whom I refer were not operated upon by quite the same method as I have just detailed, and therefore cannot be said to detract from the value of the operation which I am advocating. The failure to produce complete cure in the patients referred to was due, I think, to the fact that no counter-opening was made into the nose.

Excepting for a troublesome neuralgia, which occurred in four cases and lasted for from four to ten days, I have met with no complication.

To the question, "What circumstances would guide you in advising a radical operation without preliminary trial of simpler measures?" we may answer, "The appearances presented by the middle meatus of the nose." If in a long-standing case this region be filled with polypoid granulations or swollen and cedematous mucous membrane, then it is fairly certain that the antral mucous membrane is also in an advanced state of chronic degeneration, and nothing short of radical treatment will effect a permanent cure.

You may quite naturally ask, "What is the condition of the antrum in a successful case, six months after operation?"

There can be no doubt that it is partially obliterated by the granulations which spring up over the bony walls uniting with those which grow inwards from the soft tissues of the cheek through the large opening in the canine fossa. This mass of granulation tissue becomes covered with epithelium which spreads inwards from the circumference of the naso-antral opening, because without this natural method of healing suppuration would inevitably continue.

It is only necessary to examine a patient four or five months after operation with a small mirror passed within the nose, or by means of a curved probe, to satisfy oneself that the original antral sinus is partially obliterated and is only represented by a concavity upon the outer side of the nasal fossa which is very much smaller than the original antrum.

Some of you may be aware that other operations of a radical nature have been recently advocated, and most of these aim at making a large naso-antral opening in the inferior meatal region. It is suggested that the manipulations can be performed under cocaine anesthesia and are especially suitable for the nervous and those suffering from weak hearts. But when I read that before commencing to operate "it is a good plan to fortify the patient with an ounce of whisky, 1/25 gr. strychnia sulph., and 1/15 gr. digitaline," and later on in the same article that "orthoform or cocaine may be used to limit the pain, or if we so decide, the curetting may be postponed until another day," I am bound to say that I think such nervous and weak-hearted individuals would be far better off in those regions of kindly oblivion through which they may be so safely and ably conducted by our skilled anesthetists, while at the same time the surgeon can do his work thoroughly, once and for all.

When we bear in mind the pathological condition present in cases of chronic antral suppuration, it will be obvious to you all how necessary it is that the surgeon should have the diseased areas in full view, in order that he may efficiently deal with them. Operations or manipulations which do not fulfill these requirements lead us to suspect that even in this year of grace "the world is still deceived with ornament" and that in our desire to be original we may lose sight of those great surgical principles which form the only sound foundation upon which truly valuable methods of treatment can be founded.

To sum up, we may say of chronic antral suppuration that, in the vast majority of cases, there is evidence to show that dental disease acts as an exciting, or at least a predisposing cause, and therefore it is to members of your branch of the profession that we must look for that prevention which is better than cure.

The diagnosis of antral suppuration may often be greatly assisted by transillumination, a method which most of you can easily adopt. It can be rendered absolutely certain by means of an intranasal puncture, which does not sacrifice a tooth, and is easily and almost painlessly performed.

Treatment will resolve itself into one of two methods:

(1) *Alveolar Drainage*, which may cure comparatively recent cases, and very occasionally a chronic one—it will give relief in all.

(2) *The Radical Operation*, which may be expected to cure all cases when the simpler method has failed.

In conclusion, Gentlemen, while thanking you for the kindly way in which you have listened to me, I regret that the exigencies of time have compelled me to treat in so cursory a manner this branch of surgery in which we are both interested. Such regret, however, is more than compensated by the feeling that—whatever may be the outcome of this meeting—it will at least be the means of introducing a friendly discussion, and, I hope, promoting the good fellowship of the members of two branches of the surgical profession who do not sufficiently often profit by an interchange of ideas. That the last word has been said upon the subject of chronic antral suppuration is more than improbable, for none of our methods can yet claim perfection, and it is only too likely that those who follow us will pity our ignorance and sympathize with our patients. Nevertheless, the surgery of the nasal accessory cavities has made brilliant progress during the past few years, and has achieved results of which we may be justly proud. The stepping stones upon the road to many of these successes have too often been anxiety, disappointment, painful experience, and even failures; but he who journeys long enough will soon verify the truth of Robert Louis Stevenson's saying: "To travel hopefully is better than to arrive, and the true success is to labor."

After the paper had been read, a practical demonstration of transillumination and intranasal exploration was given upon a patient suffering from chronic antral suppuration. Dr. Tilley also demonstrated the methods of transillumination and the puncturing and washing out of the cavity. He laid special stress upon the absolute necessity of being guided in transillumination by the infraorbital crescent of light.

DISCUSSION.

THE PRESIDENT said it was quite evident that the last word had not been said on the question, but the best word heard up to the present had been said by Dr. Tilley. It was interesting to hear of the frontal origin of the cases, which he had not known before. He asked Dr. Tilley whether the opening through which the pus went into the nasal passages was not frequently closed by inflammation and that possibly the escape of pus was not altogether a reliable sign. With regard to the contents of the bottles handed round, some of them appeared to contain teeth, and if those teeth were in the antrum they certainly must have been a source of trouble. He described a case that occurred some years ago in his own practice, where a patient

came from Scotland who had been condemned to have his upper jaw removed for an apparent growth. On examination, antral trouble was suspected, and the antrum opened, and there was removed from it some nine inches of lint in a very purulent condition, quite capable of causing any amount of irritation. That was a case where surgical zeal had been a little misplaced.

DR. SCANES SPICER considered that Dr. Tilley's paper was an admirable presentation of the present knowledge of the subject, and he thanked the Society for inviting him to be present that night to listen to it. The great point was as to when to be content with the alveolar method and when to go in for the radical operation. At one time, 17 years ago, he was in the unhappy position at St. Mary's Hospital of having about thirty cases of empyema of the antrum, which were practically regarded as incurable cases. In those cases the mouth and nose were simply washed out. After a year or so of that he thought something more active should be tried, and he began trying the alveolar method. Not one of the cases got well by that method of puncture and drainage, but they were all chronic cases. He had also had private cases with specially skilled dental surgeons to do the mechanical work with similar results. In acute cases he imagined it was only necessary to remove the source of the disease, the tooth, which was the usual cause, and then the case got well. In chronic cases which had lasted months or years, it was very little use trying alveolar puncture and drainage, for the reason given by Dr. Tilley, namely, that the antrum was found to be full of thickened granulation tissue, which was practically a mass of solid flesh. In a case he operated on within the last three months he removed eighty-nine distinct polypi. If simple alveolar drainage had been adopted in that case it could not be expected that a 2 oz. bottle full of polypi would atrophy and disappear by simple drainage and washing out. He had very rarely known of a chronic antral empyema getting completely well after alveolar puncture and drainage only. Therefore he was still rather shy of recommending alveolar methods in chronic cases, and he thought one should operate boldly and go at once for clearing out the disease and making the antrum drain freely into the nose in the way Dr. Tilley had spoken of. There was still a difference of opinion in the rhinological department as to whether a radical method should be gone for at once. His opinion was in favor of the radical measure directly in a chronic case. He desired especially to know from dental surgeons what were the best tests of a tooth being at the root of the trouble, because that was often the chief difficulty which presented itself in dealing with cases practically. For instance, he found a patient with pus coming from both his nostrils, with polypi under both his middle turbinates, and an upper jaw apparently perfectly sound and some of its teeth showing the most beautiful conservative dentistry. In such a case he felt in a most difficult position. What was he to tell the patient? Was he to advise him to have teeth, which were not at all tender, removed? They were antral teeth, and the patient had a history of toothache therein, perhaps seven or eight years ago, before his nasal discharge commenced. Was it the thing to operate on those antra and leave the teeth alone

and so imperil the results of the radical operation, or should the patient be advised to have suspected teeth sacrificed when as far as a surgeon could prove there was nothing the matter with them? Surgeons would be extremely indebted to the dental profession if they would state the modes by which infection passed from the teeth into the antrum and how it was possible to say whether a tooth was covertly exciting trouble.

MR. H. BALDWIN thought that dentists would all agree that carious teeth which had living pulps were not probable causes of septic infection or causes of antral suppuration, but that dead teeth on that side in the maxilla, say from the canine to the second molar, or almost any teeth in the whole of that row, might be a cause of septic infection of the antrum. Sometimes it would be possible to find the erring tooth among a number of dead ones by the signs of alveolar periostitis about the roots of the teeth. The tooth might be tender to percussion and pressure and so allow one to see which tooth it was. But in many cases where there were a number of dead teeth in a row and none of them showed any signs whatever of having inflammation about the roots, he did not see there were any methods of telling which of those dead teeth were causing the infection until the radical operation was performed. Then it might be possible to find through the large window made in the outer plate of the antrum actually exposed roots of dead teeth projecting into the antrum, and the tooth to which those particular roots belonged would be indicated. He did not think anyone would say it was possible for a tooth with a living pulp, even if it was filled and crowned, to cause any septic infection of the antrum. He desired to know if Dr. Tilley had had any cases under his notice of antral suppuration occurring in edentulous people. Although he had not had many cases under his care he had had one case of chronic suppuration of the antrum in a perfectly edentulous patient who had been edentulous for many years; but that patient had a very badly deflected septum to the diseased side. Curiously enough, the daughter of that patient had the same kind of septum and a year or two ago had a history of antral inflammation and probably suppuration on that side. At the present time there seemed to be no antral suppuration, but her antrum was absolutely opaque to transillumination. The patient had been examined by a specialist and his opinion was that there was no active disease of the antrum now.

MR. NORMAN BENNETT, speaking of the possibility of infection through a live pulp, said that anyone who did not agree with Mr. Baldwin might agree that a live pulp covered with a thick layer of dentine could not be the medium of infection, but cases had been quoted in which tubercle bacilli found their way through live exposed pulp into the glands of the neck through lower molars. The tubercle bacilli had been found afterwards in the glands and in the pulps, showing fairly conclusively that the live pulp had been the medium. Further than that, experiments had been made on animals in which the dentine had been removed from the teeth to expose the pulp artificially and liquids had been persuaded to pass through the pulp and had been found in the glands of the neck. If that could happen, it

was at least possible, or more than possible, that septic infection might pass in some way, and that therefore an exposed live pulp must be included as a possible cause of infection. There was clinical confirmation of that in the periostitis sometimes found in conjunction with inflammation of the pulp, the pulp being still alive. With regard to the immense benefit in general health that occurred to the patient as the result of the cessation of very slight suppuration of the frontal sinuses; it was most interesting confirmation of what was found in general hospital practice, where even a small amount of suppuration in the mouth had caused a very considerable general debility, and where treatment had very much improved the patient, even when the masticating machinery was entirely insufficient.

MR. PAYNE, in bearing out Mr. Norman Bennett's remarks with regard to live teeth possibly being associated with antral suppuration, reminded the members of the paper read by Mr. J. G. Turner a short time ago, on the subject of *pyorrhœa alveolaris* associated with suppuration of the maxillary antrum. He thought Mr. Turner satisfactorily proved that cases did arise directly in that connection, and personally he could quote one case in which the pulps were certainly alive and yet infection occurred through the alveolar dental membrane which was attacked by *pyorrhœa alveolaris*.

MR. W. D. C. PRIDEAUX: May I revert to "ancient history" and say a word about the neglected condition of the Highmore monument in Dorset? Dr. Nathaniel Highmore, of antral reputation, was the son of the Rector of Purse Caundle, a little village near Sherborne. He was buried in the chancel of his father's church in 1685, where a fine slab with suitable Latin inscription was placed to his memory, close to a pre-Reformation brass to a former rector, and other interesting brasses to members of Dorset families. This slab and the brasses were, doubtless, well cared for by his brother and executor, the Rev. Richard Highmore, and were there in 1870; now, alas! they are all gone from the church. While obtaining information for a contemplated history of Dorset Monumental Brasses, I discovered the latter loose at the Rectory, but the former, broken, is turned into the churchyard. Through the instrumentality of our Dorset Field Club, the Rector's and other brasses will be refixed before long; I believe if they found interest was taken by our profession in this celebrated anatomist (whose list of published works given in "Hutchings's History of Dorset" is a long one), the like care would be taken of his memorial.

MR. F. J. BENNETT said that although cases might theoretically be possible of infection with a live pulp, he took it that the surgeons present desired to know what dental surgeons considered the common cause, and of all causes through the teeth the most common was that resulting from chronic alveolar abscess or chronic periostitis. The acute form did not appear often to cause trouble in the antrum but to find its way through to the outer alveolar border. When the periosteum had become thickened, and granular tissue was formed near the apex of the root, there was a great tendency to absorption in that direction, and by absorption the opening into the antral cavity. Though there was not a root going actually into the antral cavity,

there might be a chronic thickening round the apex which would lead to absorption, and so make an opening through which the septic matter could get into the antrum. He thought that would form 90 per cent of the cases in which teeth were cause of the mischief.

MR. W. HERN noticed that Dr. Tilley made some distinction between diseased teeth as a cause of antral empyema. He spoke of teeth acting as a predisposing cause and an exciting cause, and the discussion hitherto seemed to lend color to that statement. Personally, he would side with Mr. Baldwin that a dead tooth with a septic pulp was an exciting cause, a tooth with a live pulp he could not even consider as a predisposing cause. If such were so, dental surgeons ought to see a great many more cases of antral empyema; but he could assure Dr. Tilley that in the very large number of cases of living exposed pulps seen in hospital practice year by year he had never been able to associate antral inflammation with one of them. This view was corroborated by the behavior of living and dead teeth in other parts of the mouth. Dead teeth caused glandular enlargements and adenitis, but living, though carious ones, did not. As regards treatment of antral empyema it seemed to him that, as Dr. Spicer had said, they divided themselves into cases which were acute and cases which were chronic. The acute cases, in his opinion, should be drained most effectually by the alveolar method; but in chronic cases the more radical operation was often necessary. Dr. Tilley had mentioned that the tubes frequently put into the plates were somewhat longer than need be, but dentists had a method whereby they could perforate the sides of the tube, and so allow the tube to be a drain, although it penetrated above the floor of the antrum. It was always desirable to be perfectly sure that the floor of the antrum had been perforated by the tube, for if the floor was just missed the tube was useless as a drain.

MR. BELLAMY GARDNER, speaking from the point of view of an anæsthetist, said that the operation for chronic inflammation was by no means a slight one; in many cases it lasted for half an hour or three-quarters, and was of considerable severity on account of the hemorrhage and the great care required to prevent blood and liquids passing down towards the throat. The acute cases were very easily treated, as all drainage was carried out in the usual dental posture and liquids were carried forward towards the teeth, and no difficulty was found in administering either gas and oxygen, or gas and ether. But where it was necessary for the surgeon to use as far as possible the accessories to which he was accustomed with a patient in his chair in the consulting room—a headlight and a number of small probes and instruments—it had been found convenient to have the patient more or less in a semi-recumbent position, and to make preparations to prevent the passage of the liquid backward. The communication between the maxillary antrum and the nose rendered it very possible for liquids to pass backward and to cause coughing or occlusion of the air passages during the operation. Dr. Tilley had mentioned the plan he had used of introducing a small sponge into the naso-pharynx directly the patient was anæsthetized, and it had been found to answer most admirably.

With that precaution the patient could be kept in almost any position the surgeon required, lying down, partly propped up, allowing the head to be moved from side to side. If that was going to be done, it was far better not to give gas or gas and ether owing to the amount of hemorrhage which was usual in the first ten minutes when those anesthetics had been used. He preferred to give a mixture of chloroform and ether to commence with, and continue afterwards with chloroform and Junker's inhaler. He had not found the maxillary antrum itself very greatly sensitive, and a light anesthesia was quite sufficient. If at the end of the operation, or during any part of it, the septum of the nose was approached, a very much higher degree of sensitiveness was found. He asked the Society for some suggestions with regard to the running back of blood upon the sponge and the filling up of the sponge in the nasal cavity during the operation, as he desired some information as to the possibility of the attachment of a cannula and tube to some such apparatus as the saliva ejector, by which it occurred to him that the blood might be drawn away.

MR. CANTON thought it would be agreed that the majority of the cases undoubtedly were due to a diseased tooth or pulp. He did not suppose any one could answer Dr. Spicer's question as to how he was to know what was the cause of the antral trouble. All teeth and fillings and crowns might appear to Dr. Spicer perfectly sound, and a dental surgeon, after more carefully examining the teeth, together with the history, would be more likely to arrive at the cause. These cases were those in which the surgeon and dental surgeon should work together. He was assisting at such a case a little while ago and the surgeon applied adrenalin to the nostrils before he operated, and just before the patient was thoroughly under the anesthetic, in order to prevent hemorrhage, and certainly there was no excessive hemorrhage in that particular case.

MR. GEORGE THOMSON said that in the usual way a tooth which was believed to be a dead tooth and inflamed was painful upon pressure or percussion, but when the tooth had perforated the antrum, and was the cause of antral trouble, it did not respond to the usual tests for periodontitis.

DR. HERBERT TILLEY in reply said: "With reference to your question Mr. President as to whether the teeth which I handed round in a bottle (which also contained a quantity of diseased mucous membrane) were found in the antrum, I can answer at once in the negative. They were removed at the time I performed the radical operation, and were placed in the bottle with the contents of the antrum, as I thought the specimen might interest the members of the Society.

With regard to the presence of foreign bodies in the antrum, I once removed from this situation a piece of drainage tube one and a half inches long, which had kept up a chronic suppuration for four years. The patient was a medical man.

The President had referred to chronic suppuration occurring in edentulous patients, and, if I understood him rightly, suggested that such cases illustrated the absence of relationship between diseased

teeth and sinus trouble. My own version of such instances is that the teeth have been removed on account of disease, and the antral suppuration which they had previously caused persisted. Two such cases in old ladies over 70 years of age will be found in the Synopsis of Cases. One must always be very careful in accepting statements as regards the time of onset of antral symptoms because in the first instance they are often slight and pass under other names, *e.g.*, nasal catarrh, chronic cold in the head, etc.

With regard to the interesting question as to how far a live, dying and dead pulp may be responsible as factors in causing antral suppuration, I have come to learn rather than to instruct, and as the result of the discussion I gather that the majority of you incline to agree that a live tooth never acts as the exciting cause, but that only a "dead" tooth can exert this evil influence.

The question which I was anxious for your opinion concerning, was, "Can a live tooth with a small carious focus in its crown act as a predisposing cause of antral suppuration by reducing the resistance of the antral mucous membrane in the immediate neighborhood of that tooth? I understand the majority of you say No! and, that being the case, I must look for another explanation of the fact that in my 82 cases dental disease, of greater or less degree, was present in every case upon the side corresponding to the affected antrum.

Possibly, after all, the simplest explanation is that which I have already adduced in my paper, *viz.*, that nearly everyone beyond the age of puberty has one or more carious teeth, and that in a relatively rare affection, such as chronic antral suppuration, the probability of diseased teeth coexisting with the antral mischief is very great.

Before leaving this matter, however, I would just like to point out, as tending to support Mr. Norman Bennett's remarks, that in other parts of the body it is well known that pathogenic organisms can pass through comparatively healthy tissues without affecting them, and produce very morbid and disastrous results in the neighboring lymphatic glands. I need only exemplify this by referring to tubercle bacilli, which will pass through the faucial tonsils to the neighboring cervical glands and there induce inflammation and suppuration. The mesenteric glands may be similarly affected by way of the lymphatic patches in the intestinal canal. Whether dental tissue would permit of this, I am not in a position to say.

With regard to the use of antral drainage tubes which are too long, I need scarcely say, Gentlemen, that I was far from suggesting this was a general rule. It was only because I have seen a good many in my practice, that I thought it would be worth my while to give the matter passing notice in my paper. My desire was to suggest that as a general rule the tube should not project more than one-eighth inch above the level of the antral floor.

THE PRESIDENT, having thanked Dr. Tilley and the members who had brought forward casual communications, and the speakers in the discussions, adjourned the Society to January 25.