

OBSERVATIONS ON THE DETERMINING CAUSE OF THE FORMATION OF NASAL POLYPI.¹

BY EUGENE S. YONGE, M.D.(EDIN.),

Honorary Assistant Physician Manchester Hospital for Consumption and Diseases of the Throat.

At the present time it is considered—I think by most rhinologists—that a *mucous polypus* of the nose is, essentially and in its earliest stage, a patch of mucous membrane which has become œdematous; and that the pedunculated appearance which a polypus commonly assumes is a character not peculiar to itself, but shared with many other intra-nasal swellings and new formations, and chiefly referable to physical causes acting on the primary patch of swollen, œdematous mucosa.

Since a mucous polypus—to which the term “nasal polypus” is now almost invariably confined—is a condition which possesses certain definite characteristics that differentiate it from other intra-nasal swellings, it may be as well to briefly define it. Mucous polypi may be described as new formations arising commonly from some portion of the mucous membrane covering the ethmoidal region of the nose and mainly composed, when fully developed, of a loose network of fibrous tissue. Essentially, however, they consist of the normal tissues of the mucous membrane, the component parts of which are present in varying proportions, more or less altered in character, and associated with serous exudation and round-cell infiltration, and the structures are covered by the epithelium of the parts from which they spring. It is generally recognised that, in the majority of instances, these formations appear in both nasal cavities, at or about the same time, without any manifest local cause which satisfactorily accounts for their occurrence; that they are usually multiple and recurrent; that they are associated, sometimes with accessory sinus suppuration, sometimes with lesions of the underlying bone, and frequently, if not invariably, with an inflammatory condition of the mucous membrane. Moreover, it is usually considered that the typical mucous polypus does not present the characteristics of a true tumour, in the ordinary significance of the term; that it is not composed of granulation tissue (œdematous or non-œdematous), and that it is not merely a pedunculated hyperplasia which has

¹ Introduction to a discussion in the Section of Laryngology and Otolology of the British Medical Association, Exeter, July, 1907, by kind permission of the Editors.

undergone a secondary serous infiltration. Clinical and pathological observations have shown, indeed, that the œdema of a mucous polypus is primary, and that, as already mentioned, the pedunculated appearance is secondary or, as in the case of broad-based or sessile polypi, is never developed. The question of etiology centres, therefore, on the determining cause of the initial œdema which represents the first stage of the condition. A number of theories have been advanced to account for this process, and several of them are based on the assumption that the œdema is of an inflammatory nature. In this category comes the supposition that the condition is due to the presence of septic discharges emanating, as a rule, from the accessory sinuses (Grünwald (1)), and the theory that the œdema is referable to disease of the underlying bone (Woakes, Lack (2)). It is impossible, on account of time, to discuss these interesting theories, both of which have gained a considerable number of supporters, but neither of which, in the opinion of many observers, present a complete explanation of the problem of polypus-formation, or one which is entirely free from logical defects.

It is well known, however, that an inflammatory condition of the mucous membrane, whatever its cause may be, is a very common antecedent and accompaniment of polypus-formation, and some observers have considered that this inflammatory condition, combined with the structural peculiarities which are known to exist in the regions in which these "growths" usually develop, is sufficient to account for the incidence of polypi. But in view of the fact that an inflammation of the mucous membrane is obviously present, in varying degrees of intensity and persistence, both in the "polypus regions" and elsewhere, in a great number of cases which do not, at any time, give evidence of polypus-formation, it appears reasonable to conclude that an inflammation of the mucous membrane does not, directly and of itself, lead to the production of polypi, but only indirectly and when it secures the intervention of another factor—the actual proximate cause—the presence or absence of which determines whether the inflamed mucous membrane does or does not undergo polypoid change. Since, therefore, we are concerned, in the discussion of this question, with an œdema of the mucous membrane which has not been shown to be due directly to an inflammatory process, it may be inquired whether any other probable cause of the production of œdema is capable of demonstration.

It is known that œdematous infiltration may occur, in a part, if

there exists an obstruction to the return circulation, the obstruction being capable, under certain circumstances, of bringing about the increased transudation of serum through the capillary walls which constitutes the œdema. I hold that a condition of this character is to be recognised in the early stage of polypus-formation, and my own view is that the *initial localised œdema*, which occurs in the nasal mucous membrane and is the first stage of the process in question, *is a serous infiltration of the tissues, the result of the obstruction of certain definite capillaries and veins*—in other words, that the œdematous infiltration is due to an obstacle in the efferent circulation which is in relation to the area in which the œdema occurs.

In connection with this hypothesis there are several points to which I must briefly refer: (1) The particular vessels which are believed to become obstructed; (2) the circumstance or process which would be capable of bringing about the obstruction of these vessels; (3) the manner in which the process referred to would effect this, and so lead to an œdema of the mucous membrane; (4) the evidence, derived from observation and experiment, that the process in question is the determining cause of polypus-formation, and the verification of this evidence by clinical and other facts.

(1) *The particular vessels which become obstructed* are the capillaries and veins which are arranged in a close network around the excretory ducts of the mucous glands and, to a lesser extent, those which are arranged around the subsidiary ducts and acini.

(2) *The circumstance or process which causes the obstruction of the vessels* is the distension or cystic dilatation of these excretory ducts and, in all probability to a lesser extent, the subsidiary ducts and acini of the glands, which process I believe, from my own observations, to be the initial essential lesion of polypus formation.

(3) In order to arrive at an explanation of *the manner in which obstruction of the vessels could be effected by mechanical changes in the glands*, and how the latter process would thus indirectly bring about an œdematous infiltration of the mucous membrane, it is necessary to refer to a point in connection with the anatomical arrangement of the blood-vessels in the nasal mucosa, as described by Zuckerkandl (3). The arrangement in the turbinal and meatal regions is, so far as it concerns the present subject, as follows: The arterial supply of the mucous membrane ramifies in three networks. One network supplies the periosteal layer, a second is dis-

tributed to the glands, and a third to the superficial epithelial layer. The glands, which are surrounded by a special capsule, are closely enveloped by their network of capillaries. Around the excretory duct there is a tube-shaped network of capillaries and veins which is so closely applied to the duct that, in Zuckerkandl's opinion, it helps to keep that channel closed when the gland is not actively secreting. When a mucous gland undergoes marked distension or cystic dilatation, the excretory duct is apparently the first to suffer. Recklinghausen has considered that it is the only part of the structure that participates to any conspicuous extent in the process, and my own observations have given me a similar impression, although some distension of the acini may be observed. When, therefore, the duct undergoes distension and enlarges, for example, to five, ten, twenty, or many more times its normal size, the pressure which is exerted on the closely-applied tubular network of capillaries and veins which surrounds that structure must obviously be very considerable, and have a great tendency to hamper, or altogether obstruct, the flow of blood through these vessels. This obstruction would raise the intra-vascular pressure in the associated capillaries and tend to produce transudation of serum through their walls into the loose tissues around, the process being materially assisted by the increased permeability of the capillary walls, the result of inflammation or of a passive hyperæmia.

The probable Sequence of Events in the Formation of a Mucous Polypus.

(i) *Chronic inflammation* of the mucous membrane.

(ii) *Dilatation of the glands*—more particularly the gland-ducts—going on to cystic distension, caused either (a) through marked inflammatory infiltration of the excretory ducts and sealing of their orifices, produced by the presence of septic discharges, as in mucous polypi associated with accessory sinus suppuration or with a malignant growth, or (b) through excessive filling of the glands (the result of their periodic over-activity due to nervous or other causes) combined with a partial obstruction to the exit of the gland-contents, the result of congestion and swelling of the mucous membrane, such as occurs in chronic catarrhal rhinitis. (This latter train of events appears to occur in the formation of polypi associated with certain of the reflex nasal neuroses.)

(iii) *Edematous infiltration* of the tissues, resulting from the passage of serum through the capillary walls, due (a) to increased pressure in certain of the capillaries owing to obstruction of the

capillaries and veins towards which they lead, (*b*) to increased permeability of the capillary walls, the result of inflammation, and (*c*) to the laxity of the surrounding tissues, which is relatively marked in the regions from which polypi usually take origin.

(iv) *The formation of folds* or projections on the infiltrated mucous membrane, produced either from folds which are normally present or, more commonly, by the widening of the sulci, formed by the dilated gland-ducts, which results in a projecting boss of œdematous tissue bounded by the broadened sulci.

(v) *The increase of œdema* in certain of the folds, formed in the manner described, combined later with a hyperplasia of the fibrous elements. This results in:

(vi) *The formation of flat, œdematous projections* containing the essential constituents of the mucous membrane (*broad-based* or *sessile polypi*), or the formation, through the influence of gravity or other physical causes, of œdematous projections, containing the same constituents but a greater amount of fluid and perhaps of hyperplastic tissue, and each possessing a base which gradually becomes relatively constricted or stretched until it constitutes a pedicle (*pedunculated* or *gelatinous polypus*). The pedicle connects the remainder of the structure, which has now become a globular swelling, with the mucous membrane from which it sprang.

(4) *The evidence in favour of the mechanical changes in the glands being the determining cause of polypus-formation* is based on pathological, experimental, and clinical observations.

Pathological evidence.—(1) The observation, almost invariably, in the numerous specimens examined, of a number of glands in a state of marked distension or cystic dilatation. By this is meant that the glandular changes were invariably found at various points in the mucous membrane when it was in an early stage of polypoid change; invariably in the tissues contiguous to pedunculated mucous polypi, wherever the tissues in question were œdematous, and usually, but not invariably, in isolated sections—that is to say, sections which were not cut serially—of the actual pedunculated growths themselves. (2) The observation of the particular glandular changes in instances of mucous polypi occurring under varying circumstances or conditions—the circumstances or conditions being in some cases common, in others exceptional. (3) The observation that these glandular changes were absent in those instances of inflammation of the nasal mucous membrane in which the characteristic œdema of a mucous polypus was also absent. (4) The fact that portions of inflamed mucous membrane removed

from the regions in which polypi develop, and similar portions in an early stage of polypoid change, removed from the same regions, appeared to resemble each other in all essential residual conditions except one—the condition of the glands.

From these observations it appears reasonable to conclude that these two pathological conditions—dilatation of the mucous glands and polypoid change—which are found to be present in such constant association, both when polypi develop under ordinary circumstances and when they arise under exceptional conditions, and which are also observed to be simultaneously absent—the non-occurrence of the one coinciding with the non-occurrence of the other—stand to one another in some way in the relation of cause and effect. In order to ascertain which of two phenomena is cause and which effect, recourse may obviously be had to the method of experiment, by setting in action the phenomenon which is assumed to be the cause, and by observing whether the remaining phenomenon is thereby produced.

Experimental evidence.—As cats are known to suffer from ordinary bilateral mucous polypi (4), that species of animal was selected for the experimental determination of this point. Without going into the details of the experiments, which I have already described in a monograph on the subject of “Nasal Polypus” (5), it may, in summing up the results, be said: (1) That the production of an inflammatory process in the nasal mucous membrane of these animals was not followed by any indication of polypoid change or of any changes in the glands of the character described. (2) That the production of an inflammatory process in similar animals, produced in the same manner and by the same agents, and lasting for a similar period of time, but combined with measures calculated to cause overloading and distension of the mucous glands, was followed by localised œdematous infiltration and polypoid changes in the mucous membrane, the latter showing marked distension of the glands on histological examination. (In the instances in which hyperstimulation of the glands alone was practised, without setting up an inflammatory process, no obvious ultimate effects of any kind were noted.)

The setting up of an inflammatory process alone was, therefore, not followed by œdematous infiltration of the mucous membrane, whereas the introduction of a fresh circumstance (glandular dilatation), which was thought to be the cause, was followed by another fresh circumstance (polypoid change), which was therefore assumed to be the effect.

With reference to the question of whether the glandular changes may not be secondary to the œdema of the mucous membrane rather than the indirect cause of it, as I myself believe, it may be said that, apart from the experimental evidence in favour of the latter supposition, it is not apparent in what manner an œdema would set up these glandular changes. It is, in fact, well known that an inflammatory process, of itself in some instances, and in others with the assistance of another known factor (viz. overloading of the glands due to hyperstimulation), is capable of producing these changes, quite independently of the presence or absence of œdema. Moreover, in some instances in which marked œdema has occurred (*e. g.* in the mucous membrane covering the anterior portion of the middle turbinate) apart from polypus-formation, and due to other manifest causes, these glandular changes have been absent, whereas if the œdema were the cause of the glandular changes the latter should, under these circumstances, have occurred.

Verification of the evidence by clinical and other facts.—It may be inquired whether the theory which I have advanced as to the pathogenesis of mucous polypus is capable of explaining undoubted clinical and other facts which have been observed. It is known, for instance, that polypi may occur under circumstances which appear to be extremely varied; yet although the conditions are frequently unlike, the structures themselves are essentially identical, and the question arises whether my hypothesis could explain and reconcile the pathogenesis of similar structures occurring under dissimilar circumstances. The following examples may be selected: Unilateral polypi occurring with a unilateral suppuration of an accessory sinus and apparently due to the irritation of the purulent discharge; bilateral polypi not associated with accessory sinus suppuration or with evident focal suppuration of any kind; polypi occurring in the course of the reflex nasal neuroses; and polypi which appear to be hereditary or which occur in several members of the same family.

In the case of unilateral polypi associated with a unilateral septic discharge, it is hardly disputed that an inflammation of the mucous membrane is set up by the purulent secretion, and that the glands may undergo cystic dilatation through obstruction of their ducts by inflammatory infiltration, or, perhaps, in long-standing cases, by the contraction of newly-formed fibrous tissue. I suggest that as the glands dilate the intra-capillary pressure becomes augmented (as described above), transudation begins to take place, and œdema supervenes.

On the other hand, bilateral polypi, occurring without any manifest local cause, must apparently be due either to a particular irritant or agent to which only some individuals are exposed, or to a common irritant or agent which, owing to inherent or constitutional peculiarities in the individual, can produce the particular effects which constitute the disease only in certain persons. With reference to this latter and more probable alternative, the question arises whether there is any known constitutional peculiarity, which is present in some individuals and not in others, and owing to which the particular glandular changes which have been described could occur in both nasal cavities under certain known circumstances. A "known constitutional peculiarity" of this description is an instability of the vaso-secretory mechanism of the nose, which leads, among other effects, to periodic hypersecretion and overloading of the glands; which frequently declares itself plainly as one or other of the reflex nasal neuroses, but which may exist in certain individuals—and according to Chiari (6) does exist, although usually to only a slight extent, in the majority of people belonging to the civilised races—without causing symptoms sufficiently exigent to attract special attention, until perhaps an intra-nasal irritant has manifestly upset the balance, or until actual polypi, which are usually assumed, without proof, to be the cause and not the effect, have developed.¹ Yet by no means every case which gives even obvious signs of this constitutional tendency to reflex hypersecretion on the part of the mucous glands, suffers from nasal polypus, although a considerable number of such cases do so. A superadded factor must therefore be present in certain cases of this description in order to produce the mechanical changes in the glands, which would lead to the obstruction of the periglandular vessels, and so to the initial œdema. A "common irritant or agent," which, combined with the above-mentioned "constitutional peculiarity," may (as indicated earlier in this paper) be regarded as capable of producing these specific glandular changes, could be supplied in the shape of an ordinary chronic inflammatory process, affecting, as is usual, both nasal cavities—a condition which is

¹ Judging from the histories of a considerable number of instances of bilateral polypi which I have collected, the evidence is decidedly in favour of the polypi being the result and not the cause of the periodical glandular hypersecretion or nasal neurosis. In nearly every instance there was a definite history of periodical, clear, nasal discharge, which preceded the onset of nasal obstruction by one to seven years, and in most cases had become less marked or had disappeared by the time the obstruction had become sufficiently pronounced to induce the patient to apply for relief.

apparently insufficient, of itself, to cause polypus-formation. It has, indeed, been shown, at any rate experimentally on the lower animals, that marked dilatation of the glands and a consecutive œdema can actually be produced by the conjunction of these two factors, viz. periodic overloading of the glands and a chronic inflammatory process (7).

The well-known, but hitherto unexplained, relationship that exists between certain of the nasal neuroses, which are characterised by periodic reflex hypersecretion, and polypus-formation, is thus rendered intelligible, and I believe, moreover, that this affinity also renders intelligible the occurrence of a hereditary, family, or constitutional tendency to polypus-formation (of which many observers (8) (9) (10) consider there is abundant evidence), since one of the factors in the production of ordinary bilateral mucous polypi may be of a hereditary or constitutional nature. The correspondence of the usual age-incidence of the two conditions (fifteen to fifty) may also be capable of explanation on similar grounds.

The remarkable frequency with which nasal polypi have been found in bodies examined *post-mortem*,¹ by several well-known observers who have investigated this point, and the relative infrequency with which these growths are detected on clinical examination in the living, seem to be explicable on the supposition that polypoid changes (when bilateral, and not due to accessory sinus disease), although usually of minor degree, are extremely common, as would be expected if the disease were referable, as I contend, to the conjunction of two very common conditions, viz. a condition of reflex hypersecretion on the part of the mucous glands and a chronic catarrhal inflammation; but that the subsequent evolution of the condition, in a large number of cases, is so slight as not to cause any marked symptoms, or the latter are referred by the patient to a chronic nasal catarrh.²

With reference to the question of *recurrence* after removal (by

¹ Zuckerkandl found nasal polypi in one out of every eight or nine bodies examined; Heyman found the condition in one of every twenty-eight bodies. Recently, Oppikofer has made a number of investigations and found polypi in one out of every sixteen bodies.

² The writer wishes to make it clear that he considers unilateral polypi, associated with nasal suppuration, and obviously due to the discharge, and bilateral polypi not so associated, to be both referable to the same proximate causes, viz. mechanical changes in the glands leading to a local obstruction in the efferent circulation, but that the factors which set in action these proximate causes are different in the two groups (*vide* "The probable Sequence of Events in the Formation of a Mucous Polypus").

which I mean a veritable reproduction, and not a further development merely, of polypoid outgrowths which have escaped removal), I may say that the known differences in the behaviour of polypi in this respect appear, generally speaking, to be explicable by the suggestion which I have advanced—that the growths are due, in some instances, to an obvious local cause (*e.g.* accessory sinus suppuration), the effective removal of which would be likely to result in the cessation of the effects and therefore in non-recurrence; but that they are chiefly referable, in other instances, to a general, constitutional cause which is not removed and continues to produce its effects, and would therefore be likely to be followed by recurrence.

The customary location of polypi in certain special intra-nasal regions and in certain of the accessory sinuses is to be explained chiefly by the known structural peculiarities of these regions. Concerning the question of whether the usual non-occurrence of mucous polypi in other nasal areas might be due to the usual absence of cystic dilatation of the gland-ducts in those areas, or whether, the condition being present, it is unable to bring about the primary œdema, owing to the firmness and relative thickness of the tissues, I may say that my own observations have led me to believe that these changes do not occur in the aforesaid areas, apart from those exceptional instances in which new formations, possessing the structure of genuine mucous polypi, develop there. In such cases the glandular changes have been found to be present in the instances which the writer has had an opportunity of examining.

In conclusion, I wish to point out that my theory is not advanced as an explanation of all instances of œdema which may occur in the nasal cavity, whether in the “polypus areas” or elsewhere, nor of all pedunculated intra-nasal swellings, many of which, although not mucous polypi, undergo, secondarily, a serous infiltration from pressure on their pedicles and from other causes. My contention is simply that the glandular changes, which have been described, are capable of explaining the initial œdema of the mucous membrane which represents the essential primary stage of one particular pathological process, viz. mucous polypus-formation.

REFERENCES.

- (1) GRÜNWALD.—“Nasal Suppuration.” Translated by Lamb from second German edition, London, 1900.
- (2) LACK, L.—“Diseases of the Nose and its Accessory Sinuses,” chap. xi, p. 173, London, 1906.

- (3) ZUCKERKANDL.—“Anatomie Normale et Pathologique des Fosses Nasales,” Traduit par Lichtwitz et Garnault, Paris, 1895.
- (4) HOBDAV.—“Surgical Diseases of the Dog and Cat,” London, 1906.
- (5) YONGE.—“Polypus of the Nose,” Manchester and London, 1906, p. 67.
- (6) CHIARI.—“Maladies du Nez,” Traduit par Breyre, Liège et Paris, 1905, p. 58.
- (7) YONGE.—*Loc. cit.*, pp. 64, 70.
- (8) HEYMAN.—“Die gutartigen Geschwülste der Nase,” *Handbuch der Laryng. und Rhinol.*, Bd. iii, H. 2, Wien, 1900, p. 819.
- (9) JACQUES.—“Nature, Causes, et Traitement des Polypes du Nez,” *Rev. heb. de Laryngol.*, October 31, 1903.
- (10) BALL.—“Diseases of the Nose and Pharynx,” fifth edition, London, 1906.

Dr. WATSON WILLIAMS expressed his opinion that the nasal polypus was produced by obstruction of the lymphatics—that the occurrence of the localised œdema was due to an infective lymphangitis, in consequence of which the vascular supply was kept up as before, but the lymphatics were obstructed, and various hypertrophic changes were thus brought about. Mere vascular conditions were not the cause of the polyp. Small polypoid forms, œdematous polypi, were present long before the question of gravity came into play, which causes the growth to fall down as it grows larger. At first the polyp projects horizontally. Many infective conditions were not associated with suppuration. The mucous polyp, in his opinion, was due to an infective process which involved the lymphatic vessels, and not the arteries or veins directly. The vascular supply continued much as before.

Dr. SCANES SPICER put down the origin to degeneration of the mucous glands, and believed that the condition was a passive and not an active œdema. Reflex neuroses were very frequently due to pathological changes. Sneezing and lacrymation were merely of a temporary nature.

Dr. STUART-LOW was of opinion that the polypus depended upon the relative thickness of the mucous membrane. This was apparent from certain facts that Dr. Yonge had mentioned, one of which was heredity. Persons inherited thick skins and thin skins, thick mucous membranes and thin mucous membranes. Irritation and inflammation in susceptible persons with a thin mucosa, that is, with a silky lining, instead of a velvety one, tended to set up polypi, or the condition might be acquired on account of vicious surroundings. Inflammation was doubtless brought about by irritation of the mucous membrane. Some animals, the cat for instance, got polypi, because it has a thin nasal mucous membrane: the dog did not, its mucous membrane being thicker and velvety. Two-thirds of the nasal cavity of the cat was given up to smell, and Dr. Stuart-Low said he was pleased to see the beautiful diagram which Dr. Yonge had passed round to illustrate a polypus produced in the cat. It lent a great support to his theory, that wherever there was a naturally thin mucous membrane the animal would be subject to polypi.

Dr. ADOLPH BRONNER thought that polypus began with inflammation of the lymphatics or blood-vessels, and to a large extent depended upon the formation of the nose and the largeness of the turbinates. This he thought was proved by the absence of polypi in the negro races.

Dr. LAUZUN-BROWN thought that Dr. Bronner was misinformed with regard to the absence of polypi among negroes; he had worked a good deal among the African negroes, and he had seen them affected with polypi just as frequently as Europeans.

Dr. BALL said he had been accustomed to regard polypi as arising

from inflammatory conditions—acute rhinitis, and thus having a catarrhal origin. Another cause was paroxysmal sneezing, or coryza, which was not inflammatory, and a third cause was excessive suppuration in the accessory sinuses. Generally speaking, polypi could be grouped as arising from one or other of these causes, an arrangement which would fit in fairly well with Dr. Yonge's views. Certainly the paroxysmal sneezers who suffer from rhinitis do, in the course of time, develop polypi.

Dr. MILLIGAN said that Dr. Yonge had done great service in treating of the subject of the actual formation of the mucous polypus. The present classification did not go to the root of the question, or explain its underlying pathological conditions. The monograph, however, is not convincing. He associated himself with the remarks of Dr. Watson Williams and the lymphatic theory of origin. Further investigations should be made regarding the normal lymphatic supply of the nose, especially of the return currents. If someone could take up this subject and work out the lymphatic condition in cases where there had been polypi, a great service would be rendered. If mere irritation were the cause of polypi, how came it about that the condition was hardly ever found in snuff-takers? Of all irritants, snuff was the greatest, and one would expect that under these circumstances changes would have been found in the mucosæ of these persons, but he believed they did not exist.

Dr. WHITEHEAD thought they were still groping in the dark with reference to the pathology of nasal polypi. He could not accept Dr. Yonge's theory to the extent the author did. He thought Mr. Stuart-Low had indicated a very important factor, a peculiar susceptibility of the mucous membrane which some people possess, and which sometimes seems to run in families. One is accustomed, as Dr. Ball says, to divide cases into certain classes. Putting aside those cases of accessory sinus suppuration, he had always found present a susceptible mucous membrane. He had a lady patient who in the summer time had a perfectly healthy mucous membrane, but in the winter this got into a condition of solid œdema, and the patient had to pass the winter in the South of France or in some other warm climate. The infective theory was a very important one, but he could not quite see how the infective process could account for the production of numberless small polypi in some cases, and a single large one in others.

THE PRESIDENT OF THE SECTION (Dr. MCKENZIE JOHNSON) thought they had had an interesting and important discussion. Personally, he rather favoured what Dr. Watson Williams had said with regard, at any rate, to a very large number of the cases, though he did not consider that his view would be a universal cause, though it has clearly something to do with a very large number of nasal polypi. Others seemed to date their origin to some severe infective inflammatory condition of the nose. With regard to Dr. Yonge's paper, the author seemed rather to base his theory on some experimental work, and he had sent drawings round to support this. The President did not know that he could follow all the details of this experimental work. He would like to know whether, and by what means, the nasal cavities of the cat had been examined prior to the experiment.

Dr. YONGE said he had always examined the nose of the animal and observed its patency, and when possible he had tried to examine the cavities.

THE PRESIDENT: "Well, I should prefer that someone other than myself should do that." One could hardly expect definite conclusions

from conditions to be found in the cat on the post-mortem table to be of much value, unless there had been an opportunity of satisfying one's self beforehand as to what the conditions were prior to the experiment. He only mentioned that as one of the things that had struck him, as rather invalidating the importance of the facts derived from this experimental work, and the implied evidence following therefrom. He quite saw the difficulty of carrying it out. Otherwise, he had an appreciation for Dr. Yonge's work, and thanked him cordially for bringing it before the section. He asked what method he had adopted for applying the irritation.

Dr. YONGE said he had two methods. In some he injected through a special little tube placed in the nose a little of the diluted oil of mustard, until it caused a certain amount of sneezing. Another method was to put the animal in a chamber with a very small quantity of pepper on the floor, sufficient to set up sneezing within about ten minutes. None of the experiments had lasted beyond a period of twelve weeks.

THE PRESIDENT: Perhaps you will be able to instruct Dr. Milligan how it is that persons who take snuff are not similarly affected.

Dr. YONGE, in his reply, stated that with regard to Dr. Watson Williams and his theory of reflex neuroses, he thought that they were not a cause of the polypi which were rather the effect of local changes. He could not think for an instant that polypus was due to a reflex nasal neurosis; but he thought that a great number of cases suffered from a reflex condition of hyper-secretion set up, partly by the susceptibility of these neuroses, and partly by an irritant or a deflected septum or some other local condition. One of the signs of these neuroses was a tendency to increased glandular activity, one of the factors in the production of the mucous polypus. Hyper-secretory conditions might be present without any cause except a slight abnormality, which could not be considered pathological, or be regarded as the cause of the neurosis. Dr. Watson Williams asked how the condition could be due to obstruction of the circulation when there was evidence of vascularisation in the polypus. Obstruction in the vessels started a primary cedema, and physical causes made it become a polypoid swelling afterwards. The polypus had the same structure as the original mucous membrane which was inflamed and very vascular. The theory of lymphatic obstruction was interesting, and had a certain amount of verisimilitude, but it was merely conjecture—merely a possibility which, until some proof was brought forward, one need hardly criticise. On the other hand, Professor Coates pointed out that obstruction of the lymphatics was a most uncommon cause of passive cedema, except in the comparatively rare condition of elephantiasis, whereas the kind of obstruction which he advanced was exceedingly common and well known. Another objection to Dr. Williams' theory was that certain people showed a constitutional predisposition to this "lymphatic obstruction." It seemed also that some cases of polypus arose without the slightest evidence of a septic condition whatsoever, and therefore this cause would hardly act in the lymphatic obstruction theory, and in this respect the theory was defective. With regard to Dr. Stuart-Low's question, there was not the slightest doubt that structural peculiarity was a factor in the cause of polypus, but if the history of a polypus case was noted it was seen that these cases occurred at different periods of life. Why should one person develop polypi at the age of twenty, another at the age of seventy? Structural peculiarities, therefore, would not explain the whole thing. There was no doubt about its being a factor, but it did not explain all. As regards Dr. Bronner's question as to the formation of polypus not always

being preceded by a hypersecretion, it raised a very interesting point. In something like ninety per cent. of cases there was a history sometimes for months, sometimes for two or three years, of increased running at the nose which preceded the obstruction, which occurred when the polypi became fairly large. He had examined about thirty cases, and would continue to examine others to ascertain how many cases gave a history of hypersecretion before the formation of polypus. Irritation might explain the occurrence of polypus in the sinuses, but it would not explain the whole gamut of polypus in the nose, and neither would inflammation if taken alone. In conclusion, he added his theory was not based on experimental evidence alone, but on the verification of experimentally acquired evidence by clinical facts.

A STUDY OF THIRTY-SIX SUCCESSIVE CASES OF OPTIC NEURITIS. NASAL ACCESSORY SINUS DISEASE PRESENT TWENTY-SIX TIMES.

TREATMENT OF THE SINUSES FOLLOWED BY IMPROVEMENT OF THE OCULAR CONDITION IN FIFTEEN CASES, INCLUDING THEREIN THREE BILATERAL CASES RESTORED TO NORMAL.

BY HENRY MANNING FISH, M.D.,
Chicago.

(Continued from page 448.)

CASE 6.—*Bilateral Chorio-retinitis and Partial Optic Atrophy, due to Polysinusitis following Influenza.*

In December last Mr. R—, of Aurora, aged fifty-six, consulted the writer. The vision in each eye was so reduced it was with difficulty he could decipher large print by means of a good-sized magnifying glass that he always carried with him. He was a travelling agent and signed his name mechanically in the space allotted therefore on his order blanks. Ophthalmoscopic examination revealed an old, disseminated choroiditis with large atrophic areas, brownish spots from old hæmorrhages, and scattered heapings of pigment. Each optic nerve was atrophic. He related that he had long suffered from catarrh, and during and after an attack of influenza, several years before, the yellow nasal discharge had been continuous and abundant, and that his vision had become reduced. The left eye was first affected—he had been told there were intra-ocular hæmorrhages—and later the right eye had suffered in the same way. This patient himself spoke of his long-standing catarrh:—"One would think from the amount of corruption I have blown from my head that it would be empty." Nasal examination showed