

**Nasal polypus with neuralgia, hay fever, & asthma in relation to ethmoiditis
/ by Edward Woakes.**

Contributors

Woakes, Edward, 1837-1912.

Publication/Creation

London : H.K. Lewis, 1887.

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POST-NASAL CATARRH AND DISEASES OF THE NOSE
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NASAL POLYPUS

WITH

NEURALGIA, HAY FEVER, & ASTHMA

IN RELATION TO

ETHMOIDITIS



BY

EDWARD WOAKES, M.D. LOND.

SENIOR AURAL SURGEON AND LECTURER ON DISEASES OF THE EAR AT THE
LONDON HOSPITAL; SURGEON TO THE LONDON THROAT HOSPITAL

WITH ILLUSTRATIONS

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P R E F A C E

THE facts set forth in the following pages came primarily under the author's observation whilst studying the states of the nose and adjacent organs associated with, or provocative of, affections of the ear.

These studies had of late been prosecuted with a view to the completion of a treatise on the latter subject—one-half only of which has yet been issued; but for many reasons the author decided to interpolate the present volume, before concluding his unfinished work.

A chief reason for the adoption of this course is that some of the reflex nasal symptoms which form part of the subjects herein discussed, occur in regions which can be inspected by the unaided sight, or by the assistance of simple scientific appliances: so that no doubt can exist as to the nature of the changes thus brought about in them. From these definite observations it may be inferred that corresponding changes take place in organs similarly irritated, but which, owing to their anatomical situation, are more difficult of investigation.

Thus it seems reasonable to expect that when this

evidence has been duly considered, it may serve to throw light upon some affections of the auditory apparatus concerning which comparatively little is at the present time with certainty known.

In the meantime the author claims for the disease which it is the chief object of this treatise to discuss, viz. *Ethmoiditis*, a pre-eminent importance—because, if his conclusions concerning it be correct, they render effete much that had hitherto been accepted in this relationship, whilst assisting to place the more important affections of the nose on a sound pathological basis, and enforcing on their behalf a more radical system of treatment.

He willingly grants that many contemporary workers in this field have, by their conscientious labours, rendered such a result practicable. He has endeavoured in the context to do justice to such contributory work: and he would take this occasion of saying that it is only in the Ethmoidal tract of the nose—hitherto the most neglected, notwithstanding its wide pathological bearing—that he lays claim to having accomplished original work.

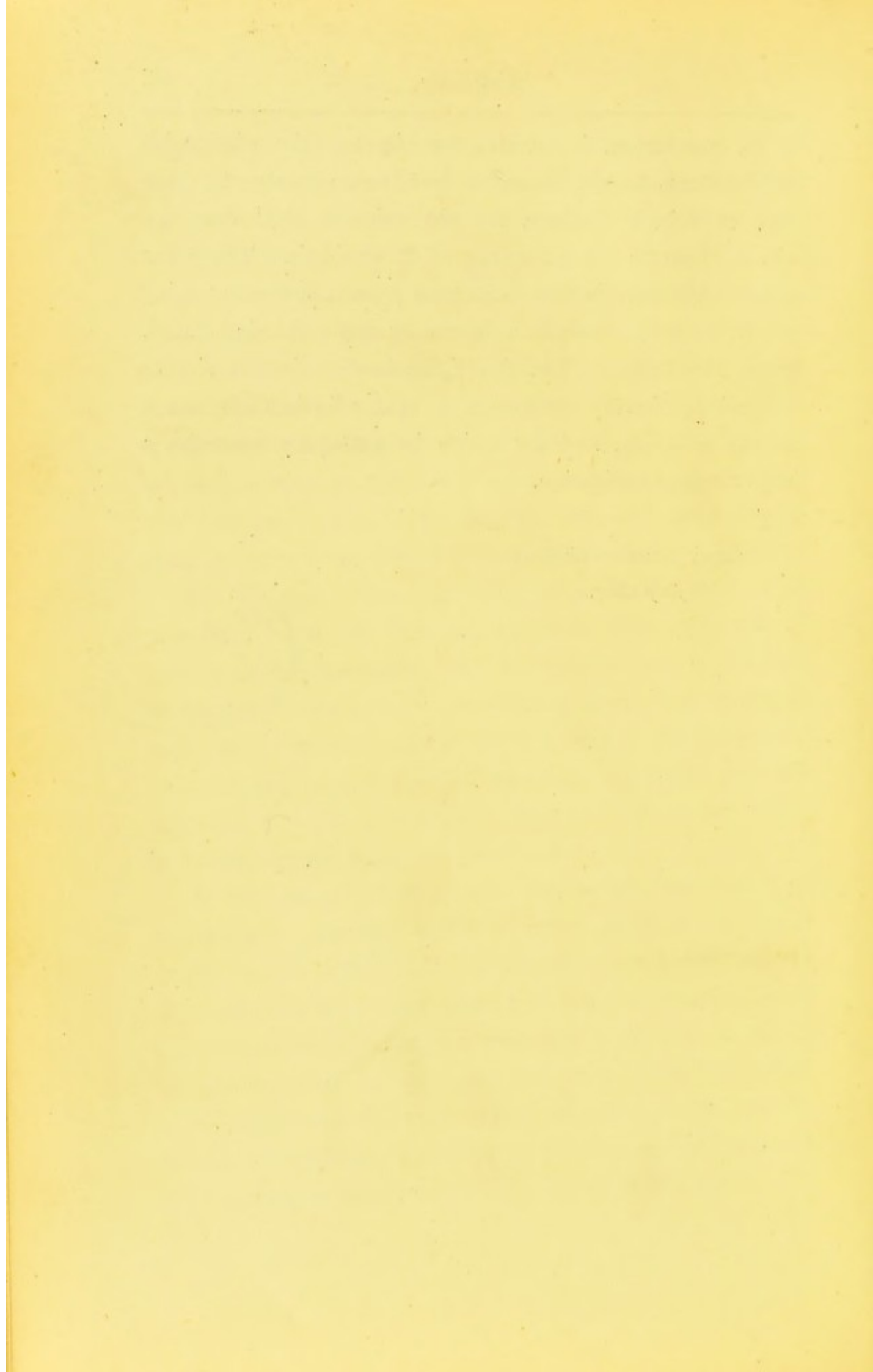
In the pages which follow, the author has aimed at imparting a practical utility to each topic as it comes under review. Should it happen that any assistance has been afforded the reader—either by enabling him the better to understand the tangled web of symptoms to which morbid states of the nose give rise, or to apply the results of his experience for their relief—he will feel the less diffidence in claiming some share of forbearance for the many shortcomings of the brochure now placed in his hands.

In conclusion, it remains for him to acknowledge his indebtedness to Mr. Thurston, late Demonstrator of Pathology at King's College, for the microscopical drawings which illustrate the pathology of Ethmoiditis. These are quite elementary in character, and from a low magnifying power, so as to exclude unnecessary and confusing detail. From his colleague, Dr. Jewell, he has received a similar amount of literary assistance to that afforded him on a former occasion, and for which he gratefully concedes a large share of obligation.

HARLEY STREET, LONDON,

July 1887.





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INTRODUCTORY

THE unsatisfactory state of our knowledge of the pathological relations and the conditions of development of Nasal Polypus has for some years occupied the attention of the author, as, doubtless, it must have done with many others. The natural interest of the subject is emphasised by the fact of the frequent occurrence of the disease. Single or multiple polypi, more or less easy of removal, come with a continual repetition under the notice of the surgeon; and in most instances the affection constantly recurs within a longer or shorter period after operation. Thus two questions naturally suggest themselves for consideration—What are the morbid conditions antecedent to its development? and what are those persistent factors of the disease which may elucidate its recurrence?

Finding no satisfactory answer to these questions to be obtainable from existing sources, the studies of the author became more and more identified with the task of investigating these matters, and with the endeavour in particular to discover at least such a solution of them as might be of practical value from the point of view of effective treatment.

Abundant as were the facilities for the observation of this class of cases, afforded in the out-patient departments of two hospitals where examples were of almost daily occur-

rence, the author found himself confronted at the outset with unusual difficulties. In the first place, no canons of investigation had been established in reference to ailments of any kind situated within the nose; and secondly, suitable instruments were wanting for the examination of the recesses of the nasal cavities.

The first clue towards the elucidation of these subjects was obtained whilst observing the catarrhal accompaniments of ear disease as manifested in the nose. In these cases the middle spongy bone was frequently noticed to become much enlarged,—extending, in fact, from the septum to the outer wall, and dipping deeply into the middle channel of the breathway.

These swellings, which at first appeared quite firm and smooth, were in some instances observed, when examined week after week, to put forth from their surfaces small reddish granular masses. These became gradually larger, but their appearance did not at the time suggest any relationship with myxomatous growths. Later on, however, cases were met with in which these superficial granulations gave distinct signs of a tendency to become developed into mucous polypi.

In other examples a quite unexpected phenomenon was seen to take place: the hitherto uniform mass became divided along its longitudinal aspect in such a way that two tumours in close contiguity with each other presented themselves where previously one only had existed.

At this time the author was using fine canaliculus probes for exploring the fundus of the ear in certain states of disease, and happened to introduce one of them along the line of division of such a tumour as has just been described. The probe passed readily into the swollen tissue, and at a short distance grated against what was evidently exposed

bone; it was also freely movable upwards and downwards along the dividing sulcus, which was thus recognised to be coextensive with the long diameter of the mass.

In the course of further observation of these divided growths, it was not long before reddish proliferations similar to those above mentioned were seen to make their appearance from between the apposed surfaces of the cleavage line of the tumour, and these in time assumed the aspect of ordinary mucous polypi.

Searching in new subjects for still earlier indications of this morbid process, it became apparent that small bosslike projections were common enough on the presenting aspect of the middle spongy process. These in some cases disappeared under the treatment to which the patient was submitted for other symptoms, but in some the enlargement progressed until it involved the whole visible surface of the structure affected, and attained at length the proportions of the smooth firm tumour which first attracted attention.

Throughout the time occupied by these observations frequent explorations were made with the fine probe, the result being that indications of exposed bone were met with prior to the stage at which it was first detected, and which one now knows to represent *cleavage* of the mass,—and in other parts of the tumour than was then noted.

From a clinical point of view, then, all the foregoing features had been established before any knowledge of the exact nature of the morbid processes operating to cause them—their true pathogenesis, in short—had been more than surmised. On this clinical basis, however, the author felt justified in calling the disease whose early characteristics have just been traced, *Necrosing Ethmoiditis*. Sometimes he spoke of it as *Proliferating Ethmoiditis*, or, shortly, as *Ethmoiditis*. The connectivity of these observations only

suggested itself very slowly, and was not fully realised till the close of the year 1884, some months subsequent to the publication of the author's treatise on *Post-Nasal Catarrh*. At this time, therefore, the first of the queries, "What are the antecedent states which lead up to the development of Nasal Polypus?" seemed in a fair way of solution. The probable answer to the second query will, it is hoped, be equally apparent in the sequel.

In the meantime he had occasion to remove portions of these tumours in order to diminish the obstruction to nasal respiration occasioned by their presence in the breathway of the nose. These were preserved, and ultimately submitted to a competent and independent pathologist for microscopical examination, with the results described in a succeeding chapter. These may be to some extent anticipated by remarking that they offer a complete explanation of all the foregoing clinically-observed phenomena.

It will be conceded that the outcome of this long-continued study of the pathogenesis of polypous disease of the nose has been to place the subject in a very different aspect from that which it previously occupied. The author therefore felt justified in publishing as much of the subject as appeared to him to rest upon an indefeasible basis. This was done in the first instance in a paper read at the London Medical Society in March 1885, entitled "On Necrosing Ethmoiditis: its relationship to Nasal Polypus, etc.," and which was subsequently printed in the *Lancet* for July of the same year. Though some have objected to the views therein advanced, the *facts* have never, so far as the author knows, been contravened by any competent authority on diseases of the nose.

As regards the associated symptoms of the disease, the author finds himself for the most part in accord with the

authorities abroad who have treated of them, and who will be referred to more particularly in the context. What divergence of views there may be, resides in the recognition by him of a wider import to the term "Chronic hypertrophy of the middle turbinated bones" than these observers have yet assigned to it. As will be inferred from the standpoint of this treatise, the phrase in question is equivalent to *Progressive Ethmoiditis*, which, so long as any portion of it remains, possesses all the proliferating and necrosing potentialities proper to the disease in its original state, and unattacked by treatment.

Respecting the mechanism through which the reflex symptoms are evoked, and the principles involved in their production, these will be duly examined and elucidated in their respective connections.

It will be convenient to describe here the system of representing diagrammatically the contents of the nasal cavities adopted in the following pages. Finding it impossible to execute a complete drawing of these regions capable of conveying an intelligible idea of the condition intended to be portrayed, the author has for some time made use of the appended diagram or scheme, whereby it is possible to see at a glance and to record the situation and character of any abnormal appearance within the nose.

Such a diagram transferred to an india-rubber disc furnished with a backing and handle, forms a die, which, when moistened with a colouring material, can be impressed on the pages of the notebook. When filled in as about to be described, this diagram greatly facilitates note-taking, and when affixed to the case-history affords

almost as much information as would the reading of lengthy notes.¹

Of the two diagrams one is intended to represent the appearances seen in anterior, the other those observed in posterior rhinoscopy. The former, Fig. I., shows a vertical section through the nose, in front of the anterior presenting margins of the middle turbinated bones. The situation of

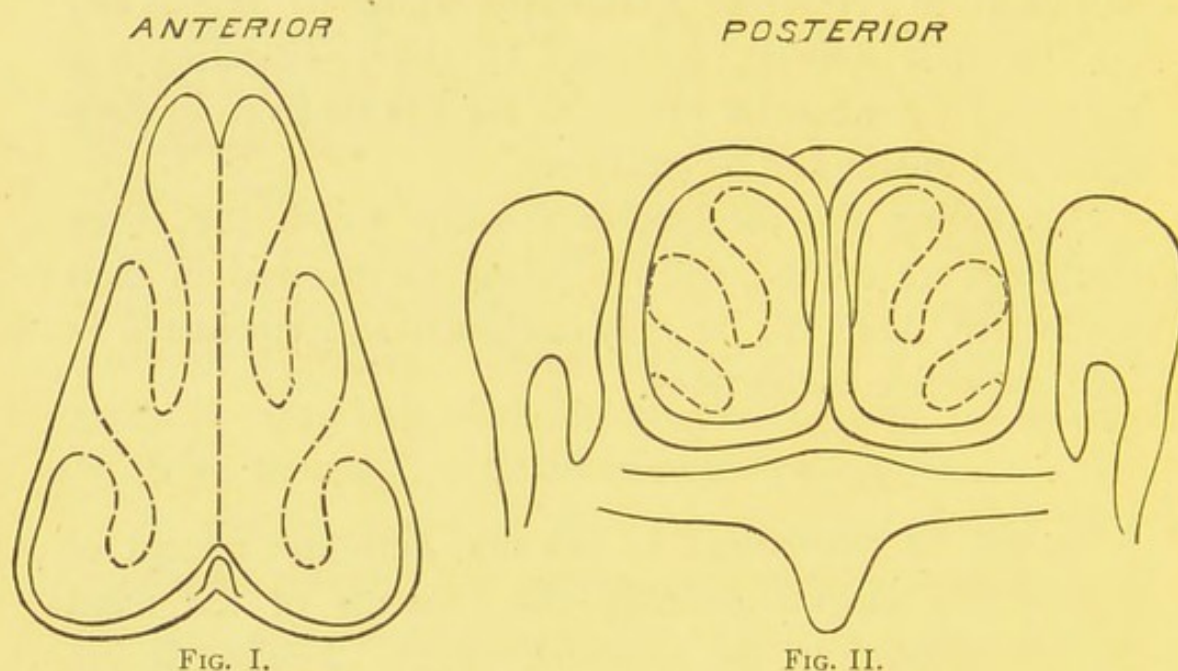


FIG. I.

FIG. II.

Author's blank diagram for indicating condition of nasal fossæ, from anterior and posterior aspects.

these, as of the corresponding inferior spongy bodies, is indicated by dotted lines, as is the case also in Fig. II., the posterior view. The septum in I., which indicates its anterior cartilaginous portion where it is most liable to deviation, is also dotted in. The diagram II. is an outline sketch of the choanæ, composed of the combination into a whole of the partial views seen at different angles of the mirror when used in observing this region. The septum in this aspect is not subject to distortion, though its contour

¹ A similar system for mapping out the lesions of other anatomical regions has long been in use at the London Hospital, and doubtless elsewhere. The above is supplied by Krohne and Sesemann.

may be obscured by outgrowths. It is therefore indicated by continuous lines.¹

To fill up these diagrams so as to present a picture of any given case, it is necessary to alter or enlarge the dotted outline with a pen, giving at the same time the shape and space, occupied relatively to the adjacent parts, of any appearance that may present itself; and to lightly shade in the new outline so as to make it sufficiently prominent. It will add

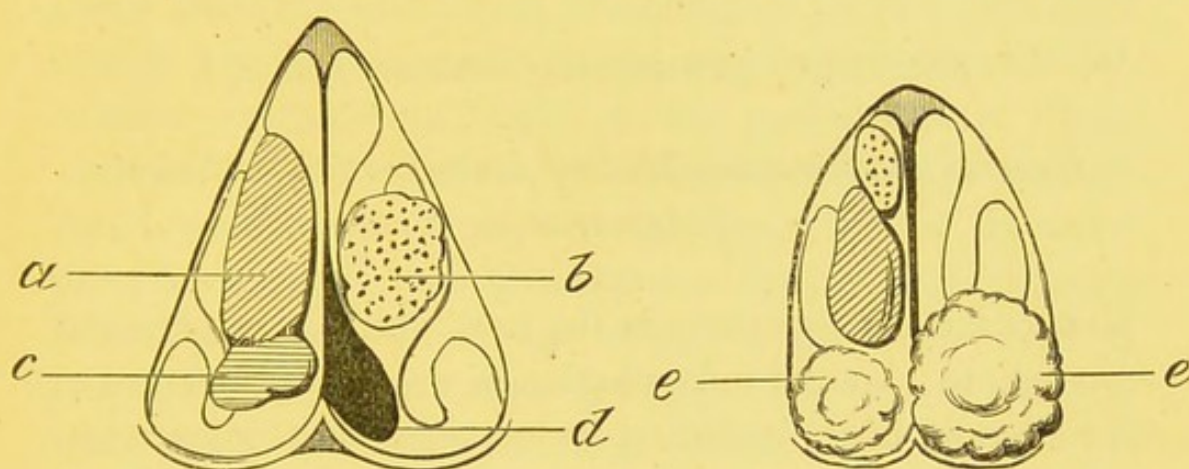


FIG. III.

FIG. IV.

Method of filling up the above in case-taking. For description see context.

to the usefulness of the diagrams in case-taking to adhere to the same kind of shading for corresponding pathological conditions. Thus, diagonal lines indicate that the portion so shaded consists of the enlarged spongy body (*a*) Fig. III.; dotted shading points to mucous polypus, myxoma (*b*); horizontal lines refer to granulation or lymphoid tissue (*c*); solid outgrowths of the septum are indicated by dead black (*d*); erectile tissue tumours are represented as at (*e*) Fig. IV. etc.

¹ The methods of examining the nose both anteriorly and posteriorly, with the necessary appliances for so doing, are fully described in the author's work on *Post-Nasal Catarrh*, etc., Lewis, 1884. To this the reader is also referred for an account of those affections of the nasal organ, of catarrhal origin, which do not fall within the scope of the present essay.

CHAPTER I

NECROSING ETHMOIDITIS—NASAL POLYPUS

General Description—Mode of Examination—Clinical Appearances

NECROSING ETHMOIDITIS is the term which it is proposed to apply to a special inflammation of the nasal tributaries of the ethmoid bone, including its muco-periosteal investment. Its most objective symptom consists from the first in an enlargement of the lower turbinated process of this bone—the middle spongy bone of the nose; and its progress is, after a certain period, usually marked by the presence of squames or spicules of dead bone derived from the trabeculæ of the internal osseous structure, and which may or may not be detached, but remain concealed in the depths of the tumefaction. This necrosing process, which commences usually in the spongy projection, gradually and insidiously invades the anterior and posterior ethmoidal cells. The presence of the necrotic spicules can, in most cases, be readily detected at the period of their occurrence by a particular method to be subsequently described.

It is to be specially noted in connection with this necrosing tendency, and because of its causal relationship to it, that the lining membrane of the spongy bones, spoken

of above as *muco-periosteum*, dips into the spongy structure of the bone and lines the cells and their osseous dissepiments or trabeculæ. In this way there is introduced a new tissue element, absent from the cancelli of other bony structures, namely, the mucous membrane element; and it is to this that the special relationship of the ethmoidal disease to the development of polypus is to be attributed. For it is a natural sequence of this duplex character of the tissue primarily affected in inflammation of the ethmoidal spongy bones, that there should result pathological phenomena referable to each of its constituents. Thus, while on the one hand chronic inflammation of the mucous membrane element causes it to proliferate in the direction of myxomatous tissue, inflammation of the periosteal stratum, inseparable from the former, tends on the other hand to cause necrosis of the subjacent bone. The latter condition, when established, becomes an important factor in the persistence of the former, because irritation of the soft tissues is perpetuated by the presence of the necrosed spicules, the same as, under similar conditions, occurs in other localities. Thus the mucous membrane inflammation, which is catarrhal and idiopathic in its origin, would tend to resolution, or would readily yield to treatment, if uncomplicated by the conditions introduced through the periosteal element; whereas it becomes in consequence of this factor a persistent condition, granulating and proliferating after its kind, as is the wont with soft tissues about a necrosis generally. The disease then being a chronic inflammation of all the tissues of the ethmoid, associated to a greater or lesser extent with interstitial death of the osseous dissepiments which separate and encompass the cellular spaces of the bone, appears to justify the propriety of the above nomenclature.

It is seldom that patients are seen until the progress of

the disease is considerably advanced ; and the history given varies in different cases. Some state they have had trouble in the region between the throat and nose as long as they can remember ; the symptoms experienced becoming more prominent, and fresh ones also being added, after a severe cold in the head. In other cases the mischief may be traced back to its origin in an attack of one of the exanthemata—usually measles or scarlet fever. Frequent attacks of severe and prolonged nasal catarrh are spoken of by the larger number of patients, and this ought to emphasise the importance of giving more attention to such conditions than they ordinarily receive. In a smaller number of cases, blows on the nose have been referred to as a starting-point for the affection. Whilst the progress of the disease is aggravated, as well as distinctly altered, by the presence of inherited or acquired syphilis, it would appear that almost equally severe types may occur in patients in whom no evidence either of its present or past acquisition could be obtained.

With regard to sex, this seems to have but little to do with susceptibility to the affection. It exists most often bilaterally ; but when unilateral it seems to occur more frequently on the left than on the right side. No age is exempt, and some of the most advanced cases have been met with in quite young adults of either sex.

For the *examination of the region* in question the head of the patient should be inclined slightly backwards, and a non-fenestrated speculum introduced within the meatus so as to expand the nostril, slight upward traction being made in such a way as to bring its lumen into the horizontal plane. A good light being reflected into the cavity, the middle spongy bone will, if nothing intervene, be then visible, deeply situated behind and above the lower spongy

bone. Usually it is only the anterior margin of the process which is thus seen as a pale rounded thin surface about a third or half of an inch long, and descending apparently from the roof of the nasal cavity, though in reality only curving downwards from its junction with the outer wall. Under favourable circumstances, the flat perpendicular aspect of the bone may occasionally be seen foreshortened and retreating into the shadows of the recess. Should any marked deviation of the septum or thickening on its surface project into the cavity, a part of the view will be cut off; while an enlargement of the lower spongy bone may in a similar way so obscure the region as to entirely prevent its inspection.

The earliest appearance of disease, so far as the author has been enabled to determine, is indicated by the presence of one or more oval or rounded projections somewhere on the anterior margin of the middle turbinated bone, the overlying mucous membrane of which appears redder than the adjacent parts. At a later period these projections run together, so as to give to the presenting margin a uniformly thickened and more prominent appearance. This

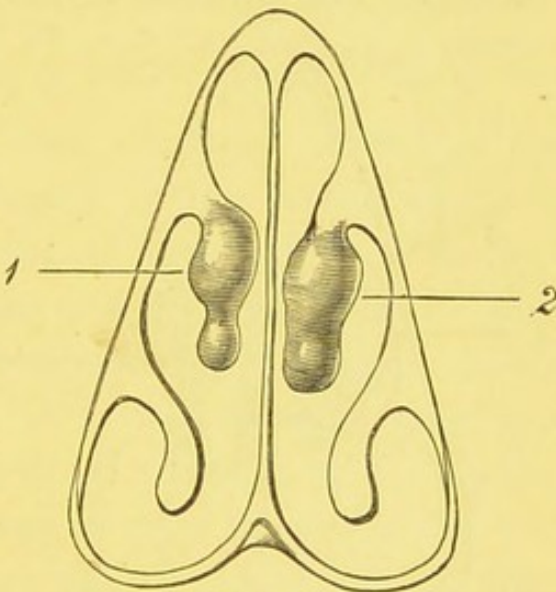


FIG. V.—1. Shows early stage of ethmoiditis; 2. Blending of projections.

gradually increases in size, causing the development of a large protuberance, which occupies an extensive share of the space allotted to the middle channel of the nose (*vide* Fig. VI.) Occasionally an exostosis-like spur is thrown out, which presses against and indents the septum at the point of con-

tact with it. When not obscured by crusts of dried secretion, the surface of the tumours throws back a bright reflex of light. Their size is, on an average, that of an ordinary date-stone, though some are much larger. The septum almost always yields before the pressure of the tumour when this is unilateral, and is pushed over to the other side. The nasal bone and the corresponding process of the superior maxilla likewise yield to some extent, so that on careful examination the external surface of the nose may be recognised as having become slightly expanded. If the disease be bilateral, this appearance will be more marked; as, however, its access is gradual and symmetrical, the broadening of the bridge of the nose often remains unnoticed.

Later in the course of the disease a *proliferating stage* is reached. The mucous surface of the tumour, instead of

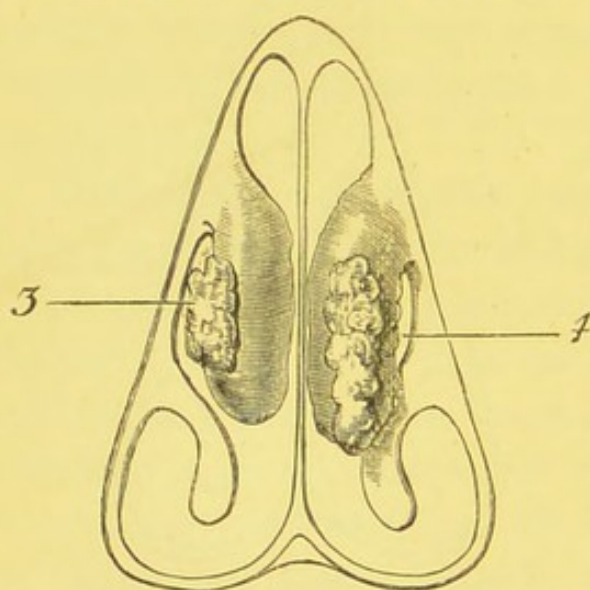


FIG. VI.—The disease fully developed. 3. Pushing forwards of granulations from outside surface of spongy bone, between it and outer wall of nose; 4. Similar granulations issuing from anterior cleft.

being red and glistening, is now more or less covered with soft reddish fleshy growths. At this early stage of their development they possess very little of the characteristic appearance of mucous polypi, which, however, they may be destined to become, but are firmer, redder, and flatter than fully-developed polypi: as will be apparent later on, they consist chiefly

of lymphoid or mucous-membrane granulation tissue. Some of these incipient myxomatous outgrowths spring from the surface of the spongy process, while others protrude

from behind its outer aspect. The origin of the latter will be presently pointed out, when they will be seen to possess unexpected relationships.

As soon as the disease has passed beyond the first stage, and at any subsequent period, the element of necrosis exists.

This may be detected by passing a fine probe (preferably a canaliculus probe) above the surface of the lower, and under the projecting shoulder of the middle spongy bone, in such a way as to pass between the latter and the outer wall of the nose. After passing a short distance in this direction, it will enter the ethmoid bone through the natural opening existing here, known as the hiatus semilunaris, which is

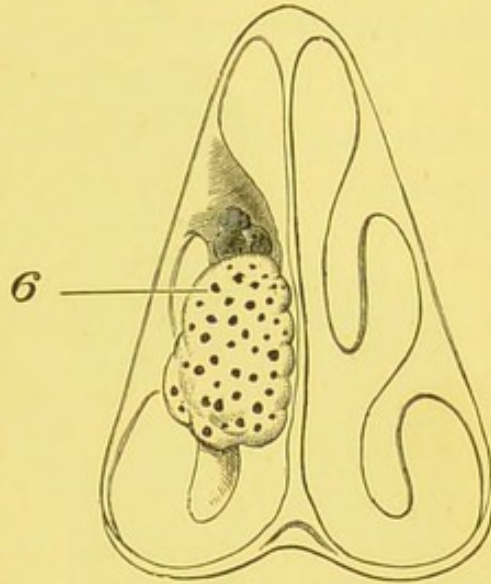


FIG. VIA.—Mucous polyp covering surface of enlarged spongy process.

usually abnormally large in this affection. Either at this point or in a pathological breach in the turbinated bone, which is usually formed sooner or later, and is probably a widening of this orifice, the probe will be felt to grate against exposed and roughened spicules of bone. If the probe be still passed on into the anterior ethmoidal cells (which communicate with the frontal sinus), further evidence of the necrotic process may be detected. The search for exposed bone should be extended by withdrawing the probe a little, and directing it towards the roof of the nose above the tumour; it will then enter the orifice of communication with the posterior ethmoidal cells, which communicate in turn with the sphenoidal sinus. This opening also is usually enlarged, and here rough and exposed bone, offering a very firm

resistance, may be encountered. The accompanying diagram represents the microscopical appearances of the condition described.

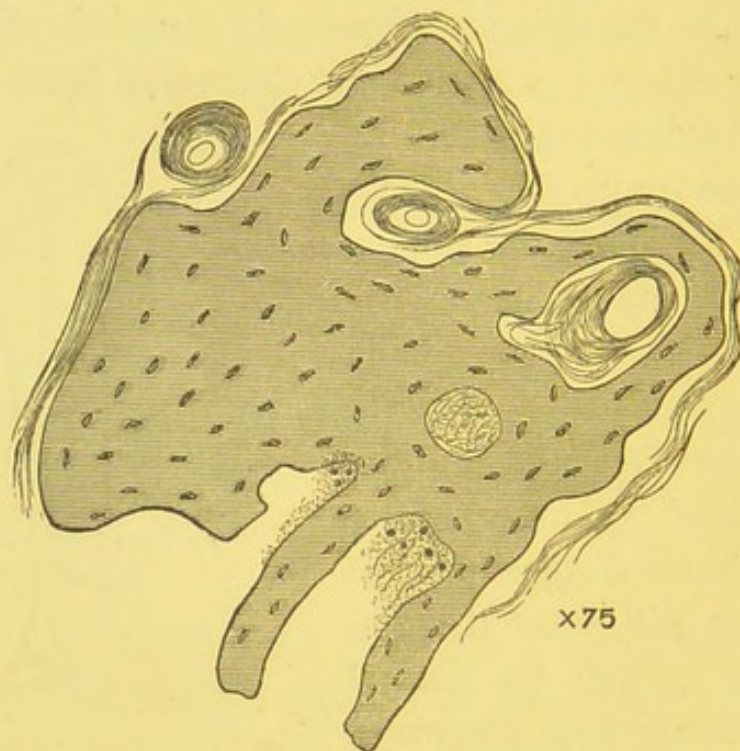


FIG. VII.—Bony trabeculum with two spicules, and a portion of neighbouring surface laid bare : necrosis.

Attention may here be called to what has been referred to as the *pathological breach* in the outer aspect of the turbinated process. This is very evident in nearly all the tumours removed by the author, though it is more obvious in some specimens than in others (Fig. VIII.) From its

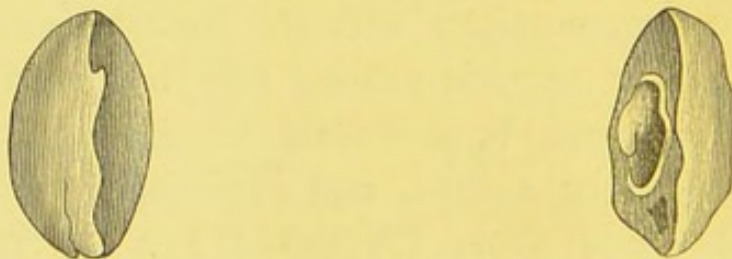


FIG. VIII.—The tumour from two aspects as seen by naked eye ; that to the right shows breach in outer surface described in text.

situation it cannot be seen when *in situ* ; it is the commencement of the cleaving process which shortly invades

the anterior aspect of the tumour, and is then seen to divide it into two nearly equal portions.

If a thin section of one of these, mounted on a microscope slide, be held up to the light, it will be seen that the centre of the osseous structure is occupied by a roundish mass of softer material. This material, if submitted to microscopical examination, exhibits the appearances of a true myxomatous growth (Fig. IX.)

Several centres of development of this myxomatous growth may exist in the specimen of tumour examined. The existence of the new tissue is to be attributed to abnormal proliferation of those portions of muco-periosteum which dip into and line the trabeculæ of the spongy bone; and it is to the result of this proliferation that the large size attained by some of these tumours is due. The enlargement cannot be referred to the formation of new bone, inasmuch as careful scrutiny has failed to discover any approach to such a regenerative activity as is seen elsewhere in situations where new bone develops side by side with necrosis.

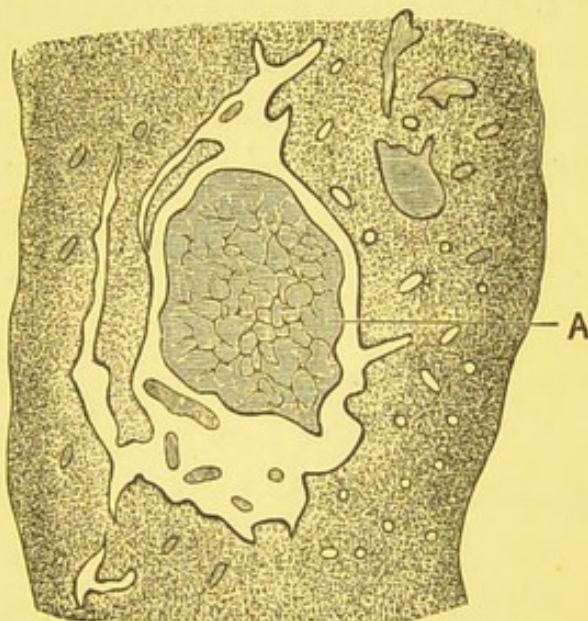


FIG. IX.—A. Myxomatous centre of tumour surrounded by bone.

The development of the new growth proceeds, causing distension of the surrounding osseous tissue, until a stage is reached at which the latter undergoes rupture at its weakest part. This is always that which has been indicated, viz. the outer aspect of the turbinated bone, just below the

infundibulum; and where, as already stated, there is an orifice communicating with the interior of the spongy process: from this point it extends forwards and becomes visible from the front.

If the case is one in which tissue-proliferation is going on rapidly—and there exists much variation in this respect in different individuals—it is not long before evidence of its progress is seen by the appearance of the myxoma, or more often of granulation tissue, from under the spongy bone, to which reference has been already made (*vide* Fig. VI. 3). From a comparison of advanced cases with others in an earlier stage of the disease, it would appear that the formation of the cleft proceeds in such a way as to divide the anterior half of the turbinated body into two segments,

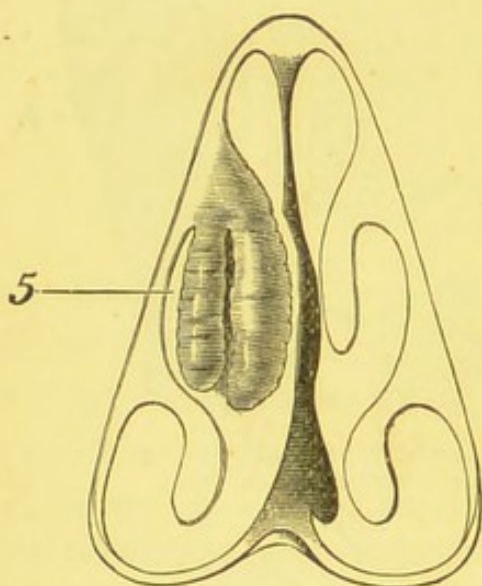


FIG. X.—Shows cleavage of anterior aspect of process, giving the appearance of two contiguous tumours. In this diagram there is no evidence of proliferation; it is the form most frequently met with.

the line of cleavage being now quite visible to anterior inspection, as it occupies nearly all the presenting aspect of the tumour; its depths may be explored with a probe, which will then usually come in contact with exposed bone. The cleft will be in some cases covered with purulent secretion, while in others it will afford exit to small granulations, which collect about and obscure the line of fission (Fig. VI. 4).

The process of cleavage is largely aided by simultaneous canaliculation of the bone (Fig. XI.) The osseous elements of the now bi-partite tumour become in some instances, especially if treatment be neglected, completely necrosed except at their attachments, and are hidden from view by

the overlying myxomatous outgrowths,—both those derived from the superficial tissue as well as those originating within

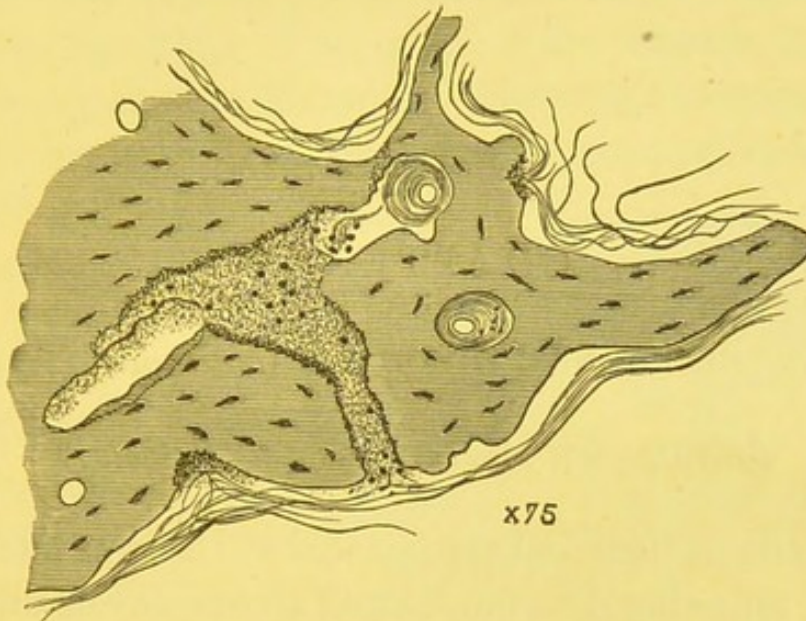


FIG. XI.— A bony trabeculum fissured by a canal with irregular outlines, containing granular débris and inflammation cells. The surface of the bone is eroded in several places.

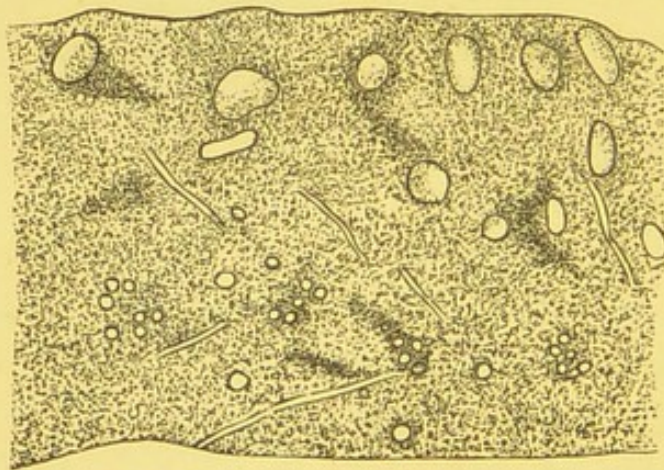
the tumour,—though the exposed bone is readily recognised by introducing a probe into the morbid structures.

CHAPTER II

NECROSING ETHMOIDITIS (*continued*)

Microscopical Appearances and Pathology

THE minute pathological appearances will become intelligible from the following descriptions and accompanying drawings. These were made from sections derived from two tumours, taken at random from a number of other specimens removed in a similar way by the wire *écraseur* during treatment. They may be accepted as a fair representation of the common morbid structural changes which occur in the disease.¹



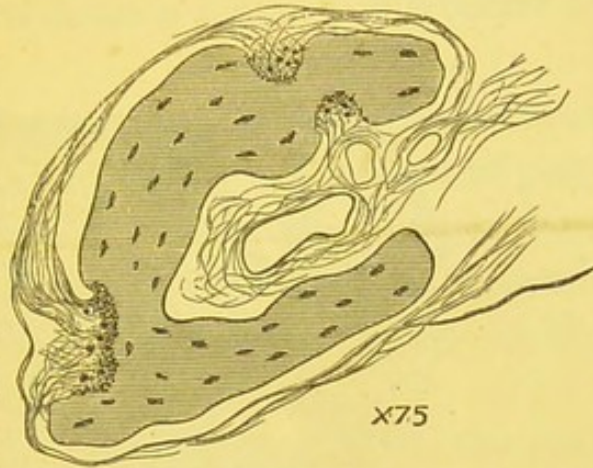
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FIG. XII.—Section through whole thickness of muco-periosteum, showing absence of epithelial layer, diffuse inflammatory mischief, dilated blood-vessels, and orifices of the large glands.

Tumour No. 1.—
The muco-periosteum is much thickened, as the result of a chronic inflammatory process, and the degenerated mucous glands are surrounded by dense masses of exudation cells (Fig. XII.) The surface is denuded of epithelium, except

¹ Prepared and drawn for the author by Mr. Edgar Thurston, late pathologist at King's College.

over a few spots at which the cells of the deep layer of the rete mucosum persist. The subjacent osseous tissue is denuded, and in many places necrosed osseous spiculæ are met with (Fig. VII.) The edges of the osseous trabeculæ show the appearance known as "Howship's lacunæ," being indented by excavations which contain giant cells and osteoclasts (Fig. XIII.) The appearance which is known as *canaliculisation* of bone is also well shown, the trabeculæ being fissured by a canal with serrated borders, and containing granular detritus and exudation cells (Fig. XI.)



The centre of the tumour is occupied by a sharply-defined area of *myxomatous* tissue, with delicate branching processes surrounded by a ring of osseous tissue (Fig. IX.)

FIG. XIII.—A bony trabeculum, of which the surface is eroded at three spots. The edge is thus broken into a series of excavations ("Howship's lacunæ"). The eroded areas contain granular débris and inflammation cells.

Tumour No. 2 shows very similar changes to those in the preceding, but possesses in addition several interesting features. The centre of the tumour is occupied by an irregular cavity filled with detritus, into which spiculæ of necrosed bone project. The muco-periosteum (superficial) is thickened, and the glandular tissue is surrounded by a dense fibrillar network. The surface is denuded of epithelium except at one extremity of the tumour, where there is an area sharply separated by its colour and soft gelatinous consistence from the subjacent tissue, and papillated on its surface. Microscopical examination of this area shows that it consists of a vascular myxomatous tissue, with

round and branched anastomosing cells, the spaces between which are filled with an amorphous gelatiniform material. The papillated surface is covered by the ordinary columnar nasal epithelium. The histological appearances of this myxomatous tissue are in every way similar to those of ordinary mucous polypus (Fig. XIV.)

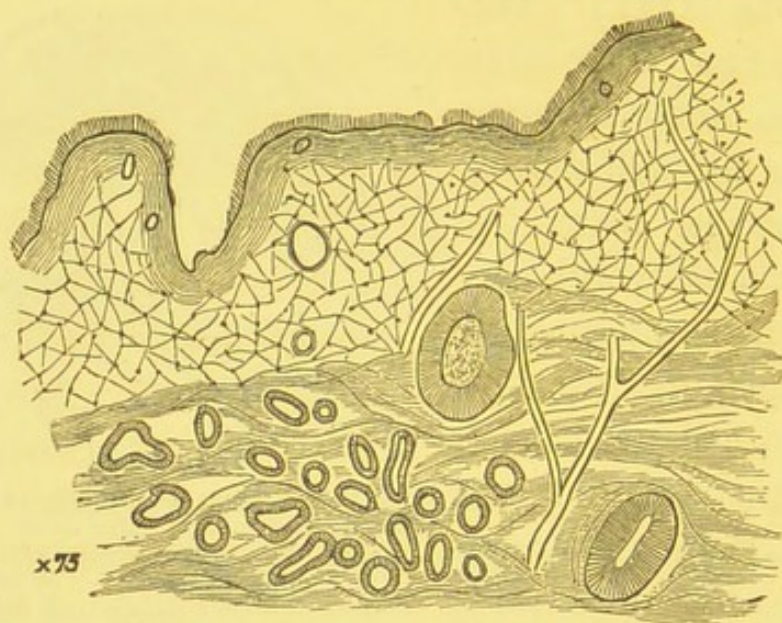


FIG. XIV.—Portion of mucous membrane from surface of tumour, showing gland and connective-tissue structures in the deeper layers, developing into myxomatous tissue towards the surface.

From a consideration of the different morbid appearances revealed by clinical observation, and elucidated by microscopical examination of the diseased structures, we become cognizant of the following pathological changes.

1. The gradual thickening of the superficial muco-periosteum in association with the development of neoplasms, which, at first resembling granulation tissue, become in many instances ultimately transformed into true myxoma, *i.e.* mucous polypus.

2. The presence of denuded spicules and squames of necrosed bone, with gradual cleavage of the anterior portion of the spongy process usually into two sections—a result in

part explained by the process of canaliculation, which microscopic examination shows to take place *pari passu* with the other morbid processes.

3. The emergence of lymphoid or polypoid growths from within the tumour—a phenomenon which from microscopical analysis appears to be dependent on the development of isolated foci of proliferation tissue in the centre of the diseased spongy bone.

The gross result of these processes is the manifestation of that phase of the disease in which the presence of polypoid growths is the most obvious symptom. Whether these are flat and sessile, or bulky and pedunculated, depends chiefly on their situation, and to some extent also on the stage at which they develop.

It is submitted that the foregoing facts supply the conditions which account for the persistency and progressive character of the disease. Because it has been shown that inflammation of the muco-periosteum is not confined to the surface of the affected area, but follows this tissue into the substance of the spongy process. That in consequence there are set up in the interior of the bone various centres of morbid action closely allied to *caries*, and of which the chief features are canaliculation of the trabeculæ and the formation of "Howship's lacunæ." Thus progressively destructive changes ensue, the limits of which are uncertain, and in numerous instances are only arrested when encountered by stern therapeutic measures. The denuded and necrosed particles left by these processes within the depths of the spongy bone, act as sources of irritation to the adjacent muco-periosteum, and excite in it a similar inflammation, ending in fresh proliferation on the one hand and more necrosis on the other.

In the processes of this vicious pathological circle are

evinced the conditions of *persistence* of the disease and of the *recurrence* of its proliferating products. In this, therefore, resides the answer to the second query—What are those persistent factors of the disease which elucidate its recurrence?—propounded at the commencement of these investigations.

To regard such a condition simply as one of mucous polypi, and to treat it under this superficial aspect, clearly argues a misapprehension of its true character. For if the observations which have been here recorded possess any significance, they manifestly imply that polypus of the nose is only one symptom of a much more important and far-reaching disease—namely, of necrosing ethmoiditis. This assertion does not ignore the fact that mucous polypus may arise from the lower spongy bone or from the osseous portion of the septum nasi. In both cases, however, the origin of the disease is essentially similar to that under discussion.

In further elucidation of these remarks, it is perhaps necessary to note that no *causal* relationship is postulated as existing between the presence of necrosis and that of polypus. The disease on which *both* conditions depend is ethmoiditis, *i.e.* inflammation of all the structures constituting the spongy bones. The process leads on the one hand to development of myxoma, and on the other to death of bone. It does not follow that, at an early stage at any rate, the polypoid tissue should be contiguous to the necrosed spicules; though at a later period, when all the soft tissues are proliferating, and nearly all the spongy bone is in a state of necrosis, such contiguity follows as a matter of course. The progress of the affection is such that in every case coming under the author's observation, whenever mucous polypus has been present, necrotic squames or spicules

could be detected also. The two pathological conditions run on side by side, experience affirming that when polypus exists, necrosis is also present; but the converse position cannot be maintained, necrosis being demonstrable earlier, and occurring much more frequently than does myxoma.

CHAPTER III

NECROSING ETHMOIDITIS (*continued*)

Clinical Course and Varieties of the Disease

TURNING our attention now more particularly to the clinical aspects of necrosing ethmoiditis, it will be found that the disease may during its progress follow several distinct courses. These varieties may for convenience be considered under four different classes.

In the *first group*, it is not uncommon to witness its arrest at any one of the præpolypoid stages described—an arrest which may continue over many years. In a *second group* of cases, after the appearance of polypi, the necrosing process advances from the ethmoidal cells to the orbital plate of the bone. This may become destroyed, and the contents of the orbit are then separated from the nasal cavity only by the thickened orbital periosteum.

Such a condition was recognizable in the first case in which Rouge's operation was performed by the author, the patient being a youth of fifteen. Instances are reported, though their occurrence is rare, in which abscess of the orbit, with or without consecutive necrosis of the frontal bone, followed by fatal meningitis, has accompanied the advance of the disease in this direction. The extension

again may be towards the frontal sinuses, or that of the sphenoid bone. Mr. Erichsen has mentioned a case—probably of this affection—in which the *sella Turcica*, together with the adjacent portions of the sphenoid, was expelled through the nose, the patient making a good recovery. There is no doubt that approximations are not so rare as may be imagined to the condition in which implication of the bones which enter into the base of the skull occurs—*i.e.* those enclosing large cells lined with muco-periosteum which communicate with the nose. Owing, however, to a conservative thickening of the overlying dura mater, the subjects of this affection are enabled to maintain a tolerable state of existence. The necrosing process occasionally extends to the superior maxilla, usually at the orifice of communication with the antrum. The aperture may become so large as to admit the tip of a finger, and in such cases abscess of the antrum or polypoid degeneration of its lining membrane may result.

Of the *third group*, about five or six examples only have been as yet observed by the author. In these a thin plate of atrophied bone is found quite bare in the midst of an exuberant cauliflower-like excrescence. The surface of this mass is covered with polyp-buds, some of which, growing in the direction in which space is afforded for their development, may attain the size and appearance of small mucous polypi. The bulk of the growth, however, though of the myxomatous type, is of much firmer consistence; it is very vascular, bleeding freely when touched, and if removed with a snare is reproduced in two or three weeks. It may soon fill the entire nasal cavity, and press upwards towards the cribriform plate of the ethmoid bone, the pressure exercised by the proliferating mass causing the neighbouring tissues to become absorbed or greatly expanded. In the first case

of this kind met with, vision was destroyed in both eyes successively, the patient ultimately sinking from exhaustion. Though not malignant in the histological sense, the clinical results may rival those of the most malignant growths occurring in this region. Judging from reports of such cases which appear from time to time in the medical journals, they are often assumed to be of a sarcomatous nature. So far as the observations of the author extend, the disease when fully established rarely or never undergoes spontaneous cure. On the contrary, its usual tendency is to progress, slowly and insidiously in some cases, very rapidly in others. Long periods of arrest prior to the stage of polypoid proliferation are, as already stated, frequent; but such latency is apt to cease and the disease become roused into activity by fresh catarrhs, or indeed by severe illness of any kind. On the other hand, there are many cases in which, though the proliferating phase is reached, the process does not advance beyond the development of a limited amount of myxomatous tissue, of the existence of which the patient may be ignorant, being conscious only of being "very liable to colds in the head."

The *fourth group* of cases differentiates itself from any of the preceding, inasmuch as those patients in whom this variety of the morbid process occurs, evince from its commencement the characteristics of true *ozæna*. In such the myxomatous or proliferating tendency is quite absent throughout. The spongy bodies do not enlarge, as in the other types of the disease, but rather diminish in bulk. The prominent symptom is the escape from the affected region of a foul-smelling discharge which collects upon and adheres to the adjoining projections and recesses of the nose.

The necrosing element is however constantly present. Doubts as to this point will usually be dispelled by using a canali-

culus probe for examination in the manner previously described, the ordinary conical-headed probe being quite unsuitable for the needful exploration, being too large to enter the orifices of communication with the ethmoidal cells.

Cleavage is not rare in this class, as shown in the figure, taken from a young lady aged sixteen, the subject of ozæna. The process described as canaliculation is probably the chief factor in its production in these cases, as no proliferation of any kind is present. The fissure has the appearance of a clear scoop along the anterior aspect of the spongy process.

The relation of this group of cases to the others is of much interest in reference to the differentiating factors in its pathogenesis. The necrosis is common to all the types, but while in the first three the organising tendency inherent in the tissues is exhibited in the development of a new growth—myxoma; this formative power appears in the cases under discussion in the fourth group to be entirely in abeyance, and to be degeneratively represented only by the production of a fœtid discharge. This difference must, as it seems to the author, depend upon the inherent variations in vital energy in different individuals, and there appears to be much evidence pointing to an inherited enthetic taint as the cause of this degenerated tissue activity in almost every instance of true ozæna.

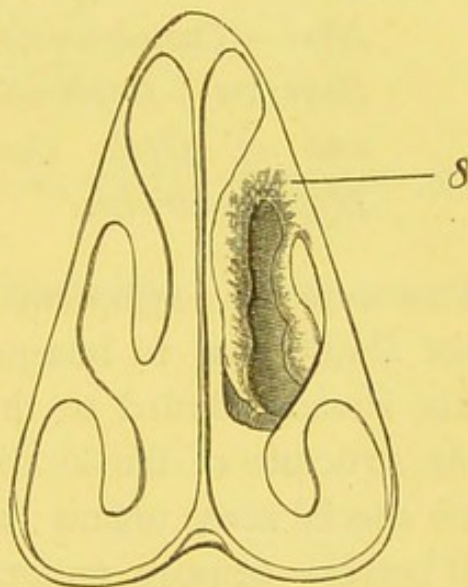


FIG. XV.—Appearance of cleft in ozæna.

CHAPTER IV

SYMPTOMS—I. DIRECT

Obstructed Nasal Respiration—Abnormal Sensations in the Nose—Derangements of Smell and Taste—Excessive Secretion—Implication of Intra-orbital Structures and of Optic Commissure—Ear Complications—Hypochondriasis.

THE numerous symptoms attending ethmoidal disease are not always easy to interpret. This is partly owing to the fact already alluded to, that the ethmoid bone enters into the structure of the localities in which are seated most of the special sense organs; and partly to the rich endowment of nerves—sensory, motor, or sympathetic—with which the region is supplied.

The symptoms in many instances are *reflex* in character; and this, roughly speaking, may be taken to mean that they present themselves at a greater or less distance from the situation of the disease which excites them. Others again may be considered as *direct* symptoms, the results chiefly of simple extension of the morbid processes to adjacent tissues or organs.

In accordance with these facts, the symptoms of ethmoiditis resolve themselves into three main groups, viz.—

1. Those arising directly from the presence of the morbid tissues as a mechanical interference with function; or such

as may be ascribed to excessive functional activity of hypertrophied tissue; with some few others of an anomalous nature.

2. Symptoms due to excitation of the sensory-motor nerve elements of the region implicated.

3. Those which involve vaso-motor nerves of the sympathetic system in relationship with the affected structures.

The second and third groups comprise the reflex aspect of the subject, and their consideration will be deferred until the direct symptoms included in the first group have been discussed. These may be enumerated as—

- a.* Some forms of obstructed nasal respiration.
- b.* Abnormal sensations in the nose.
- c.* Derangements of smell and taste.
- d.* Excessive secretion.
- e.* Results of implication of intra-orbital structures and of optic commissure.
- f.* Catarrhal implications of Eustachian tubes and of middle ear.
- g.* Granulations and polypi.
- h.* Hypochondriasis.

OBSTRUCTED NASAL RESPIRATION

As one of the earliest manifestations of the affection, the patient's attention is usually drawn to his nose by a sense of stuffiness, due to inability to breathe through it freely. This symptom may come and go very irregularly, and is generally exaggerated by lying down. It results, in this early stage, from swelling of the mucous membrane, and its frequent variations in intensity point to the erectile tissue, mainly on the lower spongy bones, as the structure chiefly involved. The changes in the muco-periosteum of the middle spongy bone, which are constantly present, act as

an excitant to the adjacent tissues of the lower turbinated bone, which will be found reddened and swollen, often to the extent of obscuring the view of the deeper parts of the nasal fossæ.

This swelling it is necessary to remove for purposes of diagnosis; in some cases this may be readily accomplished by painting the parts with a 10 per cent solution of cocain, and when successful this is a convenient and expeditious plan, which has at the same time the further advantage of anæsthetising the tissues and rendering any manipulation easy and painless. Cocain does not, however, always produce the desired result, especially if the congestion of the lower spongy bone is the effect of catarrhal inflammation, and is of some standing. It becomes then necessary to have recourse to other measures, of which the most effective is the extraction of blood by puncture with a sharp needle, as described by the author in a former work.¹ Or it may suffice to apply strong acetic, or dilute chromic acid, by rapidly passing a probe, previously dipped into the acid, over the surface of the swelling.

At a later period of the ethmoidal disease, nasal respiration becomes impeded from the presence of the enlarged turbinated bone, which then occupies the middle nasal fossa, producing a more or less complete obstruction to the passage of air through the nose. The foregoing condition has been dwelt upon prominently, because it attends the readily curable stage of the disease, and its occurrence should be the signal for active interference.

ABNORMAL SENSATIONS IN NOSE

Coincidentally with this, the patient complains of *a sense*

¹ *Post-Nasal Catarrh*, etc., p. 186.

of tightness, often amounting to *pain in the bridge of the nose*. The symptom is due to pressure and distension of the boundary walls of the space by the inflammatory swelling of the turbinated tissues, and it is as it were a cry for help from the affected region, which should not be allowed to pass unheeded. Other phenomena attending the incipient stage of ethmoiditis are, *frequent sneezing*, and the flow of a clear *watery discharge* from the nostril. The latter symptom indicates hypersecretion from the congested lining membrane of the ethmoidal surface and cells; the former will be more conveniently considered later on.

DERANGEMENTS OF TASTE AND SMELL

With the progress of the disease, the senses of smell and taste become impaired or lost. This occurred in about 34 per cent of the cases observed. When the sense of smell is defective only, *i.e.* not completely destroyed, taste remains good. This may be explained by the fact that the volatile elements derived from the food reach the olfactory region through the posterior nasal space, which is not obstructed by the disease; the capacity to appreciate odours, however, through the anterior nares, is rendered defective by the presence of the tumefaction, which impedes access to the olfactory region from the front.

This circumstance possesses a diagnostic value, inasmuch as it alters the significance of the symptom by eliminating its possible cause in a central lesion, and transfers it to its origin in some part of the nose.

In rare instances *false smells* are excited by the presence of odoriferous substances: thus one patient complained that the smell of roast meat was always appreciated as a putrid odour, entirely destroying his appetite for animal food.

This symptom should not be confounded with ozæna, or with those pseudo-smells which arise in the absence of any substance from which they might possibly be derived. The local condition of the patient in the case just referred to may throw some light upon the phenomenon. The disease was confined to one side, the right middle spongy bone being very greatly enlarged, and pressed firmly against the septum; thus, while the passage on the right side was occluded, that on the left was free to olfactory particles. The functional integrity of the perceptive apparatus as a whole, however, was doubtless rendered imperfect from the pressure of the diseased mass upon the olfactory nerves of the right side, which was probably sufficient to induce a misinterpretation of normal impressions.

It will be almost invariably found that when the sense of smell is lost, there is firm pressure of the tumour against the septum; even larger swellings which remain free in the nasal meatus are usually unaccompanied by loss of smell.

In reviewing these cases of impaired or perverted olfactory powers, and excluding the comparatively small number of cases in which definite brain lesions were demonstrable *post mortem*, there remains a considerable residuum for which no cause has been assigned, but in which it has been incidentally remarked that severe catarrh preceded the symptom. Such cases belong in all probability to the class of affections under discussion, as is suggested by the large proportion of the latter—34 per cent—in which the sense of smell was found to be more or less affected; and the recognition of this may perhaps serve to bring a large number of such cases within the range of successful treatment. It must not, however, be inferred that every case of deranged olfactory power due to the presence of necrosing ethmoiditis is capable of cure; because, as already observed,

there exist examples of the disease in which not only the cellular spaces of the ethmoid bone, but its cribriform plate also, are involved in the morbid process.

EXCESSIVE SECRETION

To the numerous sources of *post-nasal catarrh*, which have been discussed in a former work, must be added necrosing ethmoiditis; indeed a more extended experience has induced in the author the belief that to this affection of the middle turbinated bones must be relegated many of the more intractable forms of post-nasal catarrh. The inference is obvious that in presence of this condition, the upper nasal region should always be submitted to careful examination. It may be here convenient to mention certain *peculiarities* of this form of *chronic catarrh* of the nasopharynx, though in themselves they can scarcely be regarded as pathognomonic. Some of these patients complain of the sudden descent of a ball of fluid upon the soft palate or pharynx, and occasionally the collection of mucus falls directly upon the larynx, exciting a sense of suffocation or spasm. This would appear to arise when some of the large sinuses which open into the nasal cavity are suddenly emptied of their accumulated contents. Particular movements will favour this, and the clearance will be followed by a relief of the tension about the head which usually precedes it. The amount of liquid discharged is sometimes extraordinary, as in the case of a patient from Barton-on-Humber, in whom the quantity was stated to be a quart of mucus in twenty-four hours. It was difficult to estimate the exact amount, but as much as eight ounces has been collected and submitted to the author. If the patient could not "draw it out," as he expressed the hawking process by

which its removal was facilitated, he became very excited and irritable, and was compelled to walk rapidly to "shake down" the fluid. In this case the necrotic spicules were traced far into the ethmoidal cells towards the frontal sinuses. He presented a deplorable condition of hypochondriasis, and his affliction was aggravated by almost complete deafness. As the osseous structures entering into the base of the cranium were evidently involved to a great extent in the necrosing process, it was impossible to have recourse to any operative measures for his relief.

The microscopical preparations illustrative of the history of this disease indicate an implication of the simple mucous glands, which are abundantly distributed in the region of the middle spongy bone. Their increased activity contributes a large quantity of secretion, sufficient to account for the amount formed in the early stages of the affection, before the ethmoidal cells are involved.

We may thus be able to determine approximatively the source of the discharge in post-nasal catarrh. Assuming the surgeon has eliminated the post-nasal space as its origin—*i.e.* has observed by posterior rhinoscopy that the mucous membrane in this region is healthy, or has secured such healthy condition by appropriate treatment—he may infer that any discharge which still continues to escape by the posterior nares has its origin either in the cells of the ethmoid bone, or in the frontal or sphenoidal sinuses with which these cells communicate.

Excessive secretion from the mucous surfaces of the upper and middle turbinated bones, as also from the anterior ethmoidal cells, will collect upon these processes and be visible on inspection through the anterior nares; whereas that which hangs about the wall of an otherwise healthy pharynx will have been derived from the more

remote sinuses, the drainage of which is, from the situation of their outlets, more directly backward.

It may here be observed that pharyngitis sicca, especially in an advanced stage—even when the atrophy of the mucous stratum has advanced so far that the fibres of the underlying constrictor muscles are observable—is almost always attended with a thick secretion, which is seen to collect in curved ridges upon the pharyngeal wall, being thus shaped by the movements of the soft palate. It is clear that in this atrophic state the mucus must have owned some other source than the pharyngeal glands, these having, in fact, disappeared in the wasting process which the tissues have undergone. Its origin will be found, in most cases, in the region above indicated.

IMPLICATION OF INTRA-ORBITAL STRUCTURES, ETC.

Casual allusion has already been made to this subject, but its importance increases as acquaintance with the disease widens. In the first case in which Rouge's operation was performed by the author, it was found that the left orbital plate of the ethmoid had disappeared, the orbit communicating freely with the nasal cavity. In this instance, however, the corresponding eye did not appear to have suffered. In a more advanced case of disease, in which the frontal and sphenoidal sinuses were largely involved, the patient lost the sight of both eyes some months before his death. In another instance, well-marked proptosis of both eyes was present, giving an unsightly appearance to the features, but disappeared upon removal of the diseased portions of the middle turbinated bones. In these cases it is probable that inflammatory processes had extended from the nose to the orbit, producing changes in their extra-ocular

contents only, and subsided on removal of the exciting cause—the contiguous nasal disease. But it has occasionally happened that patients have complained of impairment of vision apart from any obvious mischief in the eyeball, and in several of these cases ophthalmological examination has revealed the presence of hyperæmia of the disc, or of optic neuritis, in concurrence with the ethmoiditis. As a point in favour of the view of a direct causal relationship between the affection of the nasal structures and that of the eye, it is to be noted that the transverse groove in front of the pituitary fossa, upon which the optic commissure rests, forms part of the roof of the sphenoidal sinus; and that the dura mater covering this and the adjacent parts of the base of the cranium is, by ophthalmological authorities, stated to be chronically inflamed in some instances of optic neuritis. The suggestion to which the author limits himself is, that a possible cause of this chronic meningitis may be found in the inflamed state of the cavity below, the lining membrane of which has become involved in the changes originating in the nose. It is quite conceivable that this morbid process may extend through the thin plate of bone which separates the sinus from the cranial cavity, and that in this way the meninges immediately contiguous to the optic commissure may become inflamed and involve the nerve substance also. Moreover, that such chronic meningitis does happen in association with disease of the ethmoid is unquestionable, and in its progress probably exercises a conservative function by the introduction of a thickened stratum between the progressive disease beneath and the brain above. In the chapter on Hay Fever the reflex origin of conjunctival congestion will be traced to lesions within the nose. To the reader who may accept the author's views as there advanced, it will not be difficult to extend the argument to

intra-ocular disturbances, and in this way the occurrence of glaucoma, when associated with ethmoiditis, may be accounted for. It would be travelling beyond the limits of this work to attempt here the establishment of this connection, though possibly the hint now conveyed may be worked out by those whose line of practice brings them into more intimate acquaintance with diseases of the eye than does that of the author.

EAR COMPLICATIONS

Deafness, sometimes accompanied by tinnitus, or vertigo, or both, existed in about 70 per cent of the cases observed by the author. The import of ear-disease complicating ethmoiditis varies with the stage at which the latter affection has arrived. At an early period, when the spongy bones are only superficially inflamed, the middle ear may be in a corresponding condition, the catarrhal state extending over the adjacent regions of the naso-pharynx, Eustachian tube and tympanum. Under such circumstances there is not necessarily any causal connection between these affections; in many cases, indeed, ear mischief has long preceded the nasal trouble. It is rather as a source of irritation in the neighbourhood of the Eustachian tubes, and as directly interfering with their function, that ethmoiditis in its necrosing and proliferating stages assumes importance in relation to ear-disease. It is then that paresis of the palate makes its appearance, and often, also, a marked and distressing form of tinnitus. Disease of the ear occurring under such circumstances can, it is obvious, be adequately dealt with only by simultaneous treatment of the nasal affection which perpetuates it.¹

¹ The author designedly limits his remarks on "Ear Complications" to the above brief notice, because he proposes to undertake this subject

HYPOCHONDRIASIS

The group of symptoms which constitute a case of hypochondriasis is somewhat indefinite in its limits, while its pathological basis is even more unsatisfactorily ascertained. As a contribution to the elucidation of these points the following evidence is adduced, drawn from a proportion of something over 5 per cent of cases of nasal disease recorded by the author. The majority of these were males in the full swing of their professional careers. In all of them the nasal affection had attained an advanced stage, as was shown by the presence of deep-seated necrotic spicules. In one only was there any tendency to proliferation, and this was limited to the development of granulation tissue only, no true polyp having appeared. The symptoms had a remarkable similarity in the several cases, at least in the men. Each felt completely disqualified for application to business; and this did not arise from any physical weakness, but rather from an unconquerable restlessness which the most strenuous efforts failed to overcome, and which completely destroyed the capacity for close application to any subject. Sleeplessness was present in most instances, the hours of wakefulness being tormented with all kinds of imaginings, often fantastical, but always depressing to the spirits, and ending at times in periods of extreme mental excitement. A sense of sinking and faintness referable to the cardiac region was present to a marked degree in several of these patients.

While there can be no doubt that the hypochondriasis in its reflex aspect on another occasion. He deems it undesirable, in a treatise on matters only cognately relevant to the ear, to diverge to the extent that would be necessary to do justice to the large and difficult subject of "paretic deafness."

them was associated with the presence of pronounced nasal affection, it must be conceded that no very wide generalisation can be drawn from such a comparatively small number of cases. It is, however, to be observed that this series of cases includes only those in which the hypochondriacal symptoms transcended in importance those pathognomonic to the ethmoidal disease, and ignores numerous instances in which a tendency to despondency was present to a greater or less extent; nor does it include one or two cases of melancholia in which a suicidal tendency was exhibited. It will appear to many not improbable that serious disturbance of the faculties should attend the insidious advance of a disintegrating disease within the framework of the protecting structures of the organ, upon the undisturbed working of which the integrity of these faculties depends.

CHAPTER V

SYMPTOMS—REFLEX

*Paresis of Palate—Paretic Dysphagia—Pareses of Larynx—
Neuralgia—Reflex Skin Rashes—Lachrymation, and
injected Conjunctivæ.*

IN the classification of the symptoms of ethmoiditis given at pp. 28, 29 of the preceding chapter, those of a reflex character are divided into the two following groups:—

- Reflex {
1. Symptoms due to excitation of the *sensory-motor* nerve elements of the region implicated.
 2. Those which involve vaso-motor nerves of the sympathetic system in relationship with the affected structures.

In pursuing this section of the subject it would obviously answer no practical purpose, if indeed it were possible, to consider the symptoms under the above respective groupings, as those of each group overlap and intermix with each other in all directions. This could not be otherwise, seeing that sympathetic nerves accompany all the cerebro-spinal nerves to the regions in question; special ganglia being provided for the intermingling of these elements prior to their distribution to the structures for which they are destined. Of these Meckel's ganglion is the most important, though the otic will

be seen to contribute in a lesser degree to the innervation of the areas under review.

Something will be gained in the direction of exact ideas respecting the symptoms to be investigated, if it is found possible in any instance to indicate which elements of the nervous system are concerned in its production; and still more if the actual channel through which it is elicited can be mapped out.

Difficult as this task would be to the most advanced physiologist, to the author it would be impossible, but for the recognition of the principle of the reflex relationship existing between the afferent and efferent members of the sympathetic system. The physiology of this relationship was worked out in a former treatise,¹ and the reader who may desire further acquaintance with the author's views on the subject is referred to the volume in question.

One of the earliest observers to note the occurrence of reflex phenomena in association with nasal disease was Voltolini, who in 1877 cured an asthmatic patient by removal of a polypus from the nose. This event marked an epoch in the progress of this province of medical study, and the new departure was seized upon with avidity by many continental and American specialists. Dr. Theodor Hering of Varsovia has quite recently reported the results of his own observations in this domain, and has also compared them with those of an earlier, though still recent date, by Hack, B. Fränkel, Herzog, Wille, Schadewald, etc., in the early numbers of the *Annales des Maladies de l'Oreille*, etc., for 1886. The more prominent reflex symptoms which these authorities have recorded in this connection are spasmodic cough, defects of vocalisation, sneezing, hay fever, asthma, and neuralgia. To these Dr. Hering adds two cases of epilepsy.

¹ See *Post-Nasal Catarrh*, Chap. I.

The author's most important contributions to this list are the conditions known as *paresis of the palate* and *paretic dysphagia*.

Speaking generally of the cases treated by the above-named authors, nasal polypi are noted as present in some only; in the majority the objective condition treated was that described by them as "hypertrophy of the middle turbinated bones." My contention, proved to demonstration in the pathological part of this work (*vide* Chap. II.), is that hypertrophy in this region is equivalent to ethmoiditis, and that polypoid proliferations and necrotic squames indicate only stages of the same disease.

It would seem that the advantage of a true pathological knowledge of a disease as a guide to treatment could nowhere be better illustrated than in the lesions in question. Because, so long as hypertrophy of this region is regarded as a mere superficial affection, and not as the outward sign of a progressive and deeply-reaching mischief, the treatment will stop short of the persistent efforts necessary for its arrest, with the result that after a delusive interval of relief the symptoms will sooner or later reappear. In the records above referred to such disappointments afford frequent occasions for expressions of the regret to which they gave rise in the minds of their skilled and candid reporters.

In the recognition of the pathology of ethmoiditis there lies, at least so it appears to the author, the clue to a more philosophical basis of treatment, and consequently the promise of a more successful one.

The following conditions will be discussed under the head of reflex symptoms due to ethmoiditis:—

Paresis of palate.

Paretic dysphagia.

Pareses of larynx, or, defective phonation.

Neuralgia.
Reflex skin rashes.
Lachrymation, and injected conjunctivæ.
Paroxysmal sneezing.
Paroxysmal cough.
Hay fever.
Nasal asthma.

PARESIS OF PALATE

The structure and function of the mechanism by means of which reflex paresis is established, have a paramount bearing on the explanation of many of the phenomena contained in the group of symptoms of a reflex kind which owe their origin to ethmoiditis. For this reason chiefly, the author has placed paresis of the palate first for examination,—the plan pursued in the following remarks being to start with that symptom which is most objectively evident, and respecting the anatomical relations of which there can be no doubt, with the view of arriving at an intelligible idea of others more subjective in character and more obscure in anatomical detail.

Since this symptom was described and figured by the author in a former work¹ it has attracted considerable interest and attention. The views to which expression was there given have undergone in the interval considerable expansion, mainly in consequence of the fact that the appearances then described as *paresis of the palate* have been since found to associate themselves almost constantly with the presence of necrosing ethmoiditis. So uniformly does this association of symptoms obtain that it has become

¹ See *Deafness, Giddiness, and Noises in the Head*. Second Edition, 1880.

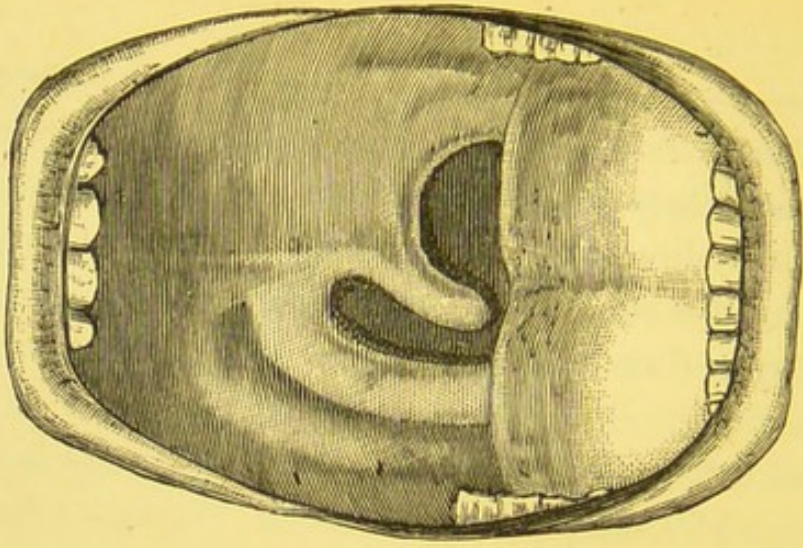


FIG. XVIII.

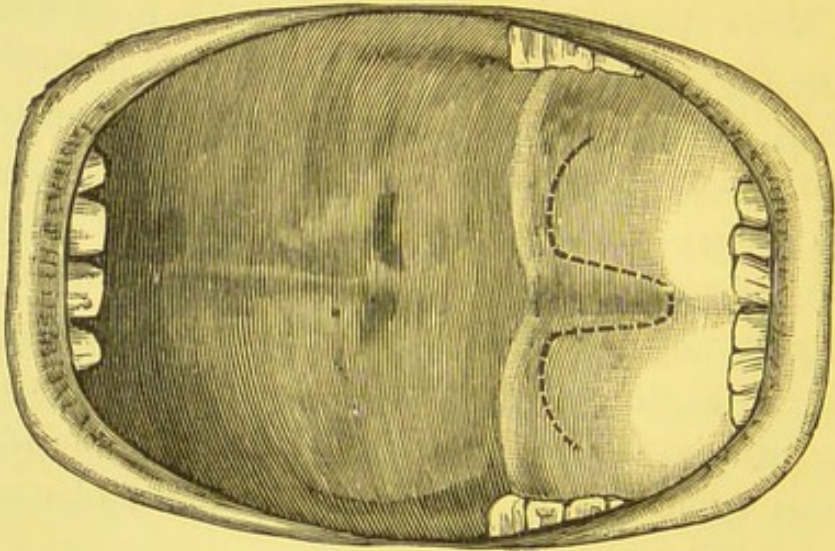


FIG. XVII.

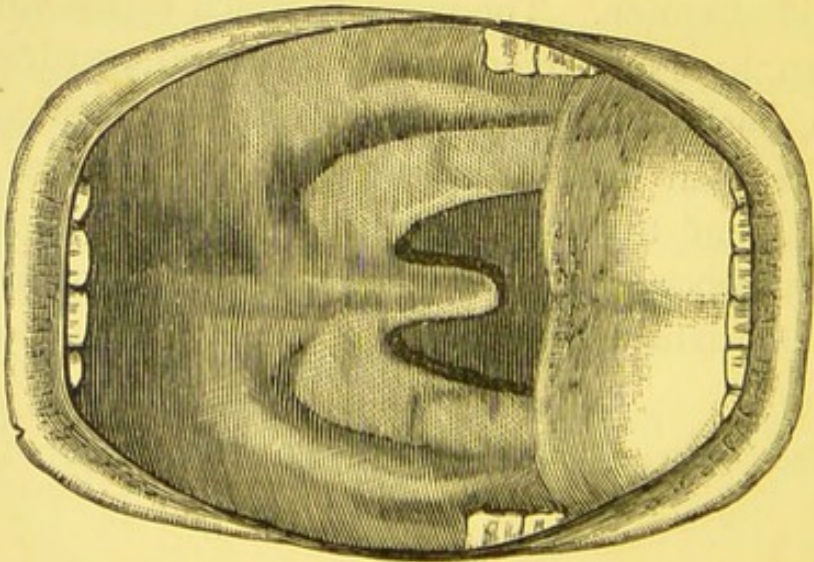


FIG. XVI.

FIG. XVI.—Typical representation of healthy fauces.

FIG. XVII.—Bilateral paresis of soft palate, showing obliteration of superior arches and drooping of the entire velum. The dotted line represents the position of the lower arch of the palate and the uvula, seen only when the tongue is firmly depressed.

FIG. XVIII.—Unilateral paresis of palate, showing obliteration of superior arch of palate and drooping of the velum on the affected side (left). The uvula is drawn to the healthy side.

a clinical habit with the author, whenever paresis of the palate is encountered, to investigate the state of the middle turbinated bones, and almost invariably with the result above mentioned.

The objective appearances of a paretic palate will be best gleaned by reference to the accompanying illustration, where, for the purpose of comparison, the morbid appearances are placed side by side with those of a typical or healthy state of the palate veil.

An inspection of these figures shows that two forms are met with: in one the affection is bilateral, *i.e.* implicates both sides of the soft palate; in the other it is unilateral only.

BILATERAL PARESIS OF THE PALATE

Fig. XVII. is the form most frequently met with. Here the palate veil, compared with the normal state as shown in Fig. XVI., presents a nearly uniform, flat, drooping appearance, its lower margin being lost behind the base of the tongue, so that the uvula cannot be seen unless the latter is forcibly depressed. There is an entire absence of the distinction between the anterior and posterior pillars of the fauces so far as the readily visible portion of the palate veil is concerned, while the superior arches have disappeared altogether. It has, moreover, a thin and flabby aspect, and is often distinctly anæmic. This state is frequently described as *relaxed*, and so it is; but it is more than this; it may be touched with the handle of a mirror, and even prodded roughly, without eliciting any sign of resentment in this usually irritable region. It has, in fact, become anæsthetic, the normal sensory-motor reflexes being in abeyance.

In *Unilateral Paresis* (Fig. XVIII.) of this region the dis-

tinative features are much more marked, in consequence of the contrast which the two sides of the soft palate present. One side of the palatal arch is seen to have dropped, and there is the same tendency to obliteration of the arches of the palate on the affected side as is observed in the bilateral class. The uvula usually points to the sound side—frequently it is turned towards it to a quite pronounced degree. Unilateral paresis shows a greater preference for the left rather than the right side, and it occurs with about equal frequency in both sexes.

The observations about to be offered on the causes of these phenomena are based on the application of the reflex function of the vaso-motor nerves of the part, and their implication, in common with the sensory-motor nerves which they accompany, in the disease of the ethmoidal spongy bones of the nose.

There are practically three muscles only to consider; these are divided into two groups by the peculiar source of their nerve supply. In the first group are two muscles, the *levator palati* and *azygos uvulæ*, which are innervated through Meckel's ganglion from the seventh nerve. The second group contains one muscle only, the *tensor palati* innervated through the otic, mainly from the third division of fifth, though this is probably reinforced by the small superficial petrosal nerve (from the facial and glosso-pharyngeal).

The most important palate muscle is the levator—the nerve to which (as well as to the azygos) is the small or posterior palatine nerve, which, after leaving Meckel's ganglion, passes to these muscles through the posterior or lesser palatine canal. Now the motor nerve of these muscles must be a prolongation of the only motor element which reaches the ganglion, *i.e.* of the Vidian—formed by a branch

of the seventh joined by a fasciculus from the sympathetic carotid plexus.

The lesser palatine canal is adjacent to, and probably in some cases partly formed by, the middle spongy bone. That is, it is so situated that any advanced disease of the ethmoidal spongy bones, especially when invading the contiguous bony structures, must perforce implicate and damage the nerve passing through it.

An explanation on these grounds, of confirmed paresis of the levator palati and azygos muscles in cases of advanced disease of the ethmoid, readily suggests itself. Still it must be admitted that these considerations, while they are tenable for a certain number of cases, are not applicable to the much larger number in which the nasal affection is in a comparatively early stage; but in which, while the paresis of the palate is a prominent symptom, and thus might seem to be independent of the disease of the nose, its real dependence is manifested by the fact that it disappears with efficient treatment of such disease.

This latter variety of the combination of the morbid phenomena admits of rational explanation by reference to the reflex vaso-motor function, in the same way as will shortly be seen to apply to the causation of reflex neuralgia. The following nerves, schematically represented in the diagram (Fig. XIX.), are involved in the process.

Sympathetic nerve fibres become mixed in Meckel's ganglion with branches of the fifth, and notably with the large palatine nerve which supplies sensory fibrils to the mucous membrane covering the turbinated bones. The sympathetic elements bound up with the sensory fibres in question, convey afferent impressions from the turbinated tissue to Meckel's ganglion, and thence to the superior cervical ganglion by way of the Vidian canal and the carotid

plexus. The impression received by the superior cervical ganglion is reflected by means of the efferent or vaso-motor nerves to those minute branches of the internal maxillary artery which constitute the nutrient vessels, or vasa-nervorum of the motor-nerve fibres by which the levator and azygos are innervated.

Thus afferent impressions, which originate in the ends of the nerves ramifying in the morbid structures of the spongy bones, become translated into efferent dilator waves in the

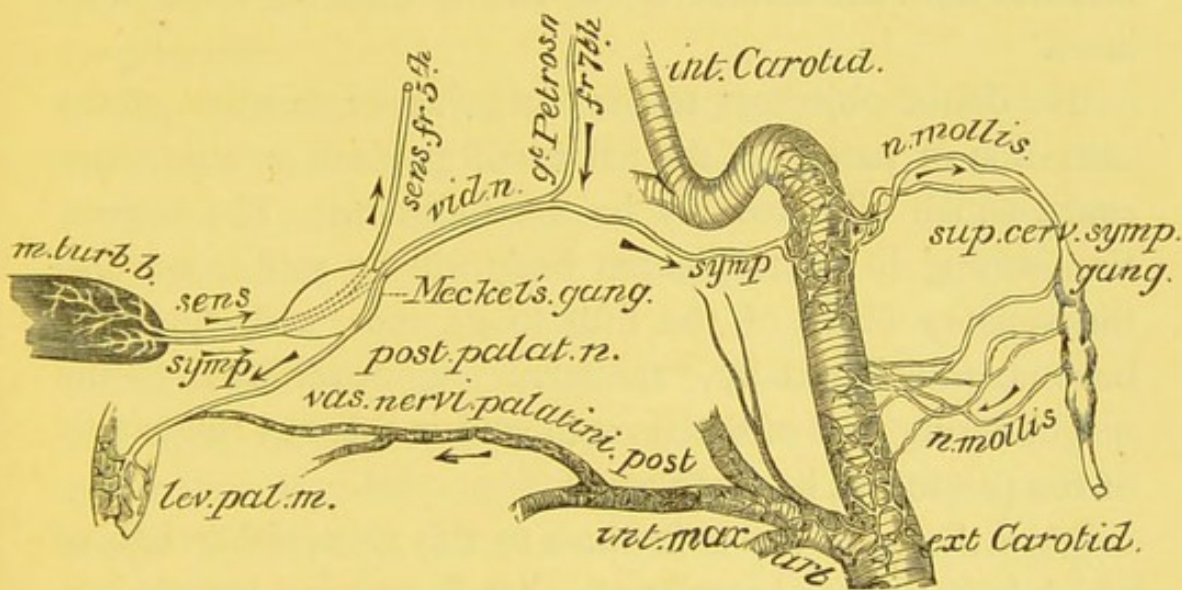


FIG. XIX.—Schematic representation of nerves, etc., involved in the production of reflex paresis of palate. In this diagram *afferent sympathetic fibrillae* (symp.) are seen, leaving the middle turbinated bone to join Meckel's ganglion, whence they accompany the *vid. n.* through a part of its course; on leaving it they shortly join the carotid plexus on the *intl. carot. art.*, from which they issue to enter the *supr. cerv. symp. gung.* *Efferent sympathetic fibrillae* having a vaso-motor function, pass with the *nervi molles* to the branches of the extl. carotid. One such is traced by means of the arrows to the small nutrient vessel of the posterior palatine nerve, *vas. nervi palatini post.*

The argument in the context is that impressions following the *afferent* route to the ganglion are reflected along this *efferent* route as vessel-dilator waves within the sheath of the motor nerve indicated.

N.B.—This diagram is intended as a scheme to indicate probable routes travelled by reflex nerve impressions amidst these complex elements of the sympathetic system, and makes no pretensions in other respects to exact anatomical proportions or relations.

vaso-motor nerves associated with the nutrient arterioles of the motor nerves of the palate muscles. The result is hyperæmia and distension of the sheath of the last-named nerve

filaments, and consequently, more or less interference with their conducting function.

With respect to the tensor palati, it seems probable that if it should be implicated in an analogous process the result, so far as paresis of the palate is concerned, would be of secondary importance. This may be inferred from the fact that, in dividing the muscles in the course of the operation for cleft palate, with the view of relieving tension upon the flaps, the effect is but trifling after division of the tensor, and it is not until the levator is cut across that the tension relaxes.

No doubt objectors to the foregoing explanation of the causation of paresis of the palate will propose an alternative route, which will probably be the following. The impression arising in the turbinated body will be said to traverse the sensory fibres of the fifth to its root, and will there become transferred by "radiation" or "overflow" to the neighbouring root of the seventh, and in this way the paresis of the palate will be established.

Now there are two objections to this view, either one of which is fatal to its acceptance. 1st, Supposing paresis anywhere could be established by calling into play sensory-motor action, which the author contends it could not, it is difficult to see why such paresis should, as in the present instance, be confined to the palate. Why should it not, on the above hypothesis, be diffused over the numerous muscles of the face to which the seventh nerve is distributed? Why, in short, should we not see Bell's paralysis complicating paresis of the palate in these cases? We do not see such a condition in ordinary cases of ethmoiditis, the paresis in these being limited to the palate muscles.

It is quite true that Bell's paralysis *may* accompany paresis of the palate in the presence of an ethmoiditis, though

such an occurrence is sufficiently rare. When it does occur, however, it is because there is severe lesion of the middle ear, which may or may not be the consequence of the ethmoiditis. The facial palsy is then due to affection of that part of the seventh nerve which is contained in the aqueductus Fallopii in the wall of the tympanum, and is the result of implication of this bony canal in the disorganising processes going on in the middle ear. Even then the facial paralysis has a distinct cause from the palate paralysis, as the nerve involved in the latter arises beyond the reach of any ordinary ear affection.

The second objection to this alternative route is implied in the fact that paresis of muscle is not a physiological consequence of reflex sensory-motor action, which, on the contrary, expresses itself in muscle contraction or spasm. It does not directly produce either pain or paralysis or trophic changes; and when such additional symptoms are superadded as reflexes where sensory-motor nerves are concerned, their explanation is to be sought in the implication at the original source of irritation of the sympathetic fibrillæ commingled with the cerebro-spinal nerves, and represents their share of the resultant phenomena. It will save much confusion of ideas clearly to recognise, at the starting-point of our study of the symptoms under review, this elementary proposition.

Now the careful observance of a patient with ethmoiditis, whose palate functions are becoming involved, illustrates all the foregoing points. For the first effect in this region is actually spasm, the uvula being drawn up and contracted, presenting a crumpled and insignificant projection only. The palate veil also is more tense than normal. Here then we have evidence of motor response to a sensory irritation. Soon the whole region is seen to be affected by tremor. This tremor indicates, as it seems to the author, the com-

mencement of hyperæmia within the nerve sheath, and points to the embarrassed transit of the motor impulses along the fibrils in the presence of the encroachment of the dilated vessels. Then the tremors cease, and the palate droops, becoming more and more dependent as the normal motor and sensory impulses are finally cut off by the jugulating process of vessel distension when this has reached its maximum. It is almost needless to remark that this explanation of *reflex* paresis has no bearing whatever on the well-understood paralysees of a central origin. Reflex paresis is often partial only, as the conditions by which it is brought about of necessity imply.

PARETIC DYSPHAGIA

It will not be difficult to understand this symptom, which is occasionally met with as a complication of ethmoiditis in its later stages. Allowing for a wider excursion of the same dilator-vessel waves due to persistence of the disease, so that one motor nerve after another comes under its influence in the way described in the last section, it is obvious that more or less disturbance of the normal function of the constrictor muscles should follow in succession to those of the palate. The dysphagia in these cases appears to be limited to that part of the act of swallowing which normally consists in the seizure of the bolus of food by the constrictors of the pharynx, after it has been pressed backwards by the tongue in order to be passed by them into the gullet. When the œsophagus is reached the difficulty ceases. The symptom points, therefore, to implication of the pharyngeal branches of the vagi, and perhaps of other members of the pharyngeal plexus, in the intra-neural hyperæmic wave, the origin of which is in the nasal lesion. It

indicates, however, a more limited excursion of the vessel-dilator impressions than will be seen to obtain in some similarly caused phenomena to be shortly examined. The following is a case in point:—

Mrs. G——, *æt.* sixty, was first seen in September 1886. She states that eight years ago she had a sore tongue and noticed upon it an appearance she describes as “little ulcers.” About a year afterwards she found difficulty in swallowing, which gradually increased until at the present time she is only able to swallow fluids. She describes the difficulty as located at the “beginning of the throat”; after passing this point there is no further obstacle to swallowing. The tongue is dry and devoid of epithelium, and on the centre of the dorsum, about $\frac{3}{4}$ inch from the apex, is a cleft, as if the tongue had been bitten, but the indentation is not at the present time ulcerated. There is marked bilateral paresis of the palate. On examining the nose each middle turbinated body presents the third stage of ethmoiditis—the mass occupying the whole of the middle meatus has undergone cleavage, and a thick creamy discharge is seen to issue from the line of division. A probe introduced into the cleft passes deeply into the tumour. The condition is alike on both sides, and is exactly represented in the adjoining cut.

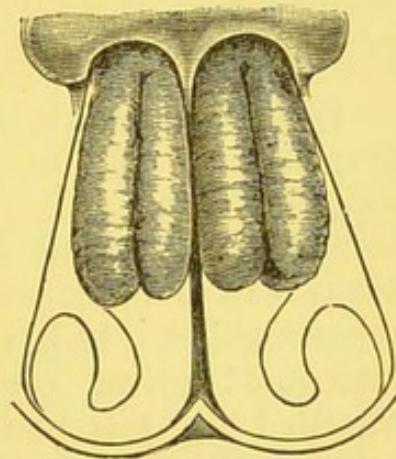


FIG. XX.—Both middle spongy bones in stage of cleavage, occurring in connection with paretic dysphagia.

The patient presented an extremely cachectic appearance, her sallow and distressed countenance being strongly suggestive of malignant disease. Nor was it easy to dismiss this first impression until a careful tactile and ocular observation with the mirror showed that there was absolutely no local lesion about the œsophagus, or base of the tongue, or larynx, to explain her condition. The peculiar appearance of the tongue and the history of “ulcers” at first seemed to favour the notion of a specific cachexia, but there was nothing beyond to confirm such a suspicion. The situation was explained by the condition of the nose. The advanced stage of the disease testified

to its long duration, while the reflex difficulty of swallowing with its insufficient feeding, coupled with the constant passage of muco-purulent discharge into the stomach—the pharynx was thickly lined with this secretion at her first visit—sufficiently explained her impoverished health. No paralysis of tongue proper existed.

The state of the tongue was significantly suggestive. The denuded epithelium and scarred dorsum all spoke of past and present trophic changes—changes of the starvation type, such as one sees in skin lesions resulting from injured nerves—the discussion of which will be found under its proper head (see concluding chapter).

This patient is still under treatment, which is directed to the removal of the diseased mass in the nose, and the restoration of her general constitution.

A similar case is that of a hospital patient, also a female, *æt.* thirty-seven. She presented the following conditions:—

Post-nasal catarrh, paresis of palate, chronic laryngitis, great dysphagia for solid food, though no obstruction existed in the œsophagus or fauces. On examining the nose there was found necrosing ethmoiditis in the third stage; both middle spongy bones had undergone cleavage, the segments being largely hypertrophied. In fact, the diagram representing the preceding case would answer equally for the present one. It is to be regretted that this patient discontinued attendance after a few weeks, and before the disease could be effectually dealt with.

Obviously these cases are not rare, and would doubtless be more frequently detected if the nasal condition referred to were sought for generally in connection with dysphagia of a paretic character.

NEURALGIA

Reflex pain in the course of a sensory nerve is a frequent symptom of ethmoiditis, especially in its proliferating stage. It occurred in about half the tabulated cases. The reader who has followed the argument adduced in support of

the explanation of paresis arising from vessel distension in the sheath of a *motor nerve*, will be prepared to appreciate the occurrence of pain when such dilated vessel-conditions are brought about within the sheath of a *sensory nerve*.

The distribution of the first and second branches of the trigeminus nerve to a portion of the face, to the forehead and temples, and the entirely sensory function of these nerves, need only to be named to recall the usual sites of the neuralgias in question, though they are not by any means limited to these. It is unnecessary, in order to understand this occurrence, to reiterate the principle of vaso-motor reflexes, or their special lines of travel when brought into operation by a proliferating ethmoiditis. Let the reader refer to the diagram illustrating paresis of the palate, and substitute for the posterior palatine nerve one or other of the divisions of the fifth above referred to, with a branch of the carotid entering it to form its nutrient vessel, and the text explanatory of reflex paresis will do equal duty to explain the case of reflex neuralgia. The exciting cause is the same, and the reflexes are the same; it is only the character of the nerve implicated which changes the nature of the resulting symptom. For whereas it was seen that pressure in a motor nerve weakened the transit of muscle impulses, so increased tension within the sheath of a sensory nerve gives rise to pain, by compressing the fibrillæ in the smaller branches of the nerve. It is a noteworthy fact that, setting aside the sensation of tightness across the nose, referred to as one of the early symptoms of the disease, there is a remarkable absence of local pain in the nose even when advanced ethmoidal disease is present. The fact that ethmoiditis is a true cause of neuralgia, and the possibility of the relief of the latter by treating the former, was first brought home to the author by the following case:—

Dr. C—— had amongst other symptoms of chronic catarrh severe pains over the forehead. For two years these had occurred every third and seventh day: he was in consequence extremely debilitated. The left middle spongy bone was greatly enlarged, and presented several small proliferations (lymphoid). The galvano-cautery was applied to destroy these; complete cessation of the pain followed this one application—a circumstance which was at the time so surprising that the author was disposed to regard it as a coincidence rather than as an effect of the treatment. The case was recalled to him on reading a similar experience recorded by Hack, and the relationship of neuralgia with disease of the middle turbinated bones is now well recognised by continental specialists.

The next case is equally relevant, and possesses in addition several important features, to which reference will again be made:—

Mr. H——, *æt.* sixty-four, a widely-esteemed practitioner in the Midlands, consulted me in July 1886. He stated that about three years since he was attacked with asthmatic bronchitis, with profuse secretion from the air passages, which has continued more or less ever since. About the same time he became the subject of neuralgia. This pain always affects the same tract; viz. a spot on the right side of the upper lip, passing thence alongside the nose, round the right eye, the conjunctiva of which becomes injected, accompanied with lachrymation: thence the pain passes upwards along the course of the right supra-orbital nerve. The asthmatic attacks commence with paroxysmal cough, and when the dyspnoea subsides, palpitation and cardiac distress follow. Such attacks associated with facial neuralgia occur on most days. About two years since he was treated by a surgeon, who removed a good deal of tissue, including portions of the spongy bones, from both nostrils.

On inspecting the nasal fossæ, a fringe of polypoid growths obscured the largely hypertrophied right middle spongy bone, while a much larger single polyp depended from the corresponding body of the left side; the left inferior spongy body was largely tumefied and congested.

The treatment was commenced with the view of relieving

the neuralgia, and consisted in the application of fused chromic acid to the neoplasms proceeding from the right spongy bone. The neuralgia, which was intense previous to the treatment, ceased almost immediately. A sharp rigor followed the application, but no rise of temperature.

A month later Mr. H—— writes, "I have quite lost the acute neuralgia from which I had been so long suffering. The effect of the remedy was marvellous and instantaneous."

This pain, in common with other reflex symptoms occasioned by disease within the nose, has a tendency to exhibit periodical variations of intensity. The explanation of this periodicity, happening altogether apart from malarial influences, is probably as follows. In these patients, who are usually cachectic subjects, the dilating wave occurs as a condition of used-up nerve force; the vessel equilibrium maintained up to the time of commencement of pain having exhausted the supply of nerve energy necessary to support it, is unable any longer to resist the dilating impressions issuing from the diseased area. Vessel relaxation follows, with the consequent compression of the sentient fibrillæ above indicated. The distension ceases when sufficient force, as from sleep and food, has again collected to enable the inhibitory centre to reassert its influence over the vessels in the reflexly disturbed area. With this re-establishment of the normal calibre of the arterioles the pain intermits.

Another case in point is that of Mr. ——, a gentleman of middle age, who suffered from seventh-day headache of a neuralgic or migraine type, affecting the left temple and side of head. This had occurred over several years, always on Mondays, and had resisted every kind of treatment. When first seen there was pronounced ethmoiditis of the left side, but cleavage had not yet taken place, though it appeared imminent. The treatment lasted over several months, the neuralgia gradually lessening, and finally disappearing with the subsidence of the disease.

Some few weeks after the foregoing concluding report, this patient returned with a recurrence of neuralgia, but this time it was in the *right* brow, the left still remaining free from pain. A careful ocular examination of the right ethmoidal region failed to reveal any abnormal appearance. When, however, it was explored after the application of cocaine, with a fine probe, a considerable surface of exposed bone was discovered; its situation was above the middle spongy bone, towards the outer wall of the nose, and as far as could be made out, appeared to involve the more superficial structures of the posterior ethmoidal cells.

A similar deeply-seated area of necrosis has recently come under the author's notice in a case of severe facial neuralgia of sixteen years' duration, and which was discoverable only after the removal of a fringe of neoplastic tissue from the cleft right turbinated process.

Obviously such an obscurely-situated necrosis renders the diagnosis as well as the treatment greatly more difficult than when soft neoplasms only are encountered. At the same time the discovery of such a persistent source of nerve irritation in a chronic case of neuralgia, coupled with the encouraging results of its elimination when attacked with fine points of fused chromic acid, should serve to bring within the prospect of cure a certain proportion of hitherto hopeless cases of neuralgia. This method of treatment is at least worth trying before having recourse to some heroic measures recently designed and carried out for the radical relief of those who hopelessly endure the almost lifelong anguish of facial neuralgia of this chronic type.

Another feature occasionally met with in association with neuralgia of nasal origin is *spasmodic contraction of adjacent muscles*—usually those which close the jaws.

A lady, *æt.* sixty, who had suffered with supra- and infra-orbital neuralgia for fourteen years previously to consulting the author, and during this period had all her teeth drawn, without

obtaining more than transitory relief, experienced during the paroxysms of pain violent "jerkings" of the lower jaw, during which she was unable voluntarily to open her mouth. There was ethmoiditis on both sides, most pronounced on the right, but no cleavage. After three weeks' treatment on the lines indicated above, this spasm ceased and the pain had become quite bearable. At the time of writing this patient remains under treatment.

The addition of muscular spasm to reflex pain points clearly to the fact that motor nerves are introduced into the circle of reflexes initiated at the seat of irritation in the nasal lesion. In the foregoing instance it was evidently through the pterygoid nerves—motor of third division of fifth—that the spasmodic locking of the jaws was occasioned; but lesser degrees of facial spasm are not rarely met with in neuralgias of the several branches of the trigeminus nerve.

BASAL HEADACHE

There is a form of headache of a more or less neuralgic type associated with ethmoiditis, which may be termed *basal headache* from the fact of the situation of the pain corresponding pretty accurately with the base of the skull. Thus it affects the back of the eyes, the temples, as well as the mastoid and occipital regions on both sides; occasionally one side of the head only is thus affected, but in either case it is accompanied with a sense of weight at the back of the head. A similar form of headache is met with in the subjects of impacted cerumen, presumably from irritation of branches of the fifth nerve distributed to the external auditory meatus. Besides that this possible cause of basal headache is readily eliminated by inspection of the ears, there are usually present, when it acknowledges a nasal

origin, symptoms directly referable to the nose, which point to and demand an examination of this organ. Such are a sense of stuffiness, profuse discharge, attacks of sneezing, etc.

The pain now referred to is usually met with in the second stage of ethmoiditis, when there is considerable enlargement of the turbinated tissues, with corresponding tension and stretching of the nerves; that is, before the development of neoplasms or the commencement of the process of cleavage. Basal headache is prone to be continuous; it is not so severe, neither does it develop the periodical intermissions which characterize the neuralgias of nasal origin. It is almost as readily relieved by cauterization of the ethmoidal hypertrophies as is the same kind of headache due to impacted cerumen by the removal of the offending plug.

REFLEX SKIN RASHES

Reflex skin rashes associated with ethmoiditis include—

Erythema of tip or alæ of nose.

Erythematous patches on face.

Redness of the skin of the nose, especially towards the tip, is a condition not rarely met with in this relationship. It is sometimes fleeting or intermittent, like other symptoms of its class, but oftener persistent. Not unnaturally, when it occurs in one of the gentler sex, it becomes a source of much annoyance to the subject, and many such have willingly swallowed any quantity of physic to correct the liver or stomach, or whatever remote abdominal viscus, the disorder of which has been supposed to occasion this disfigurement. It is, however, one of those sequences of neglected catarrh to which the entire group under consideration belongs, being almost invariably associated with

chronic intra-nasal mischief, usually of the nature of ethmoiditis.

Limited areas of injected integument occur under similar nasal conditions in other parts of the face than the above. They are oftenest met with at the side of the nose, or on the cheek below the orbit. At the time of writing the author has

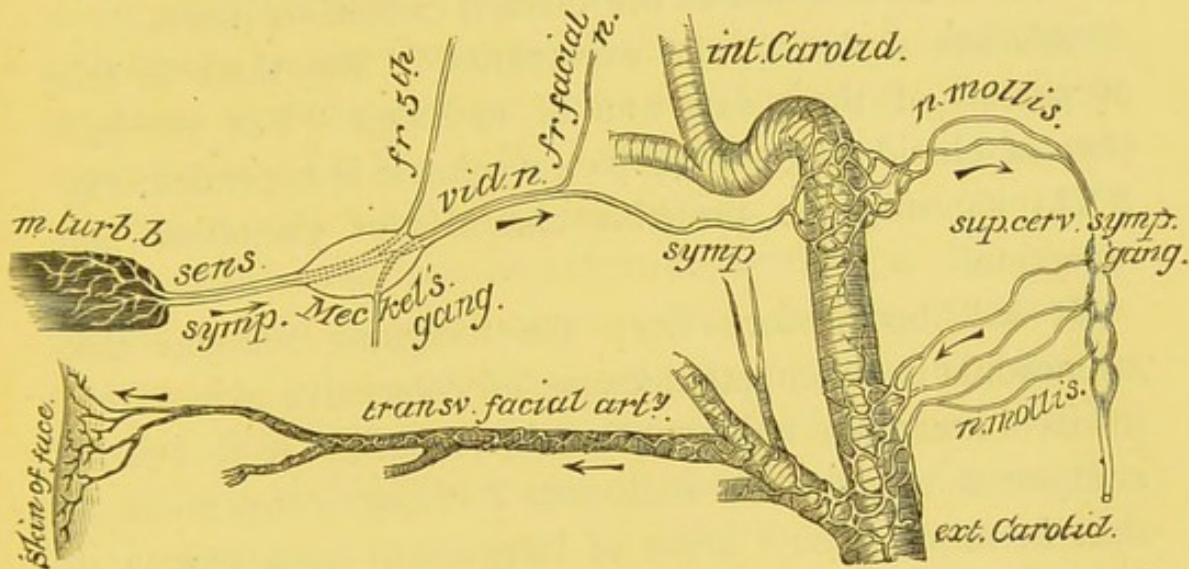


FIG. XXI.—Schematic representation of nerves, etc., involved in the production of reflex skin rashes of the face.

In this diagram *afferent sympathetic fibrillae* (symp.) are seen leaving the middle turbinate process to join Meckel's ganglion, whence they accompany the *vid. n.* through a part of its course. On leaving it they shortly join the carotid plexus on the *intl. carot. art.*, from which they issue to enter the *supr. cerv. symp. ganglion*.

Efferent sympathetic fibrillae, having a vaso-motor function, pass with the *nervi molles* to the branches of the extl. carotid. One such is traced by means of arrows to the congested area of skin on the face.

The argument in the context is that impressions following the *afferent* route to the ganglion are reflected along this *efferent* route as vessel-dilator waves to the area of integument exhibiting the condition of hyperæmia-erythema.

N.B.—This diagram is intended as a scheme to indicate probable routes travelled by reflex nerve impressions amidst these complex elements of the sympathetic system, and makes no pretensions in other respects to exact anatomical proportions or relations.

under treatment a female with right proliferating ethmoiditis in whom such a patch of erythema occupies the last-named position. When first seen the injected region was distinctly papulated, and gave slight indications of desquamation. This rash gradually faded away as the treatment of the nasal disease progressed.

The explanation given of the symptoms which have already occupied our attention will readily suggest to the reader the method of causation in the present instance. It is simply an extension to *skin* vessels of dilator waves, arising from persistent irritation within the nose of the afferent sympathetic fibres which are reflexly related to the efferent nervi-vasorum of the affected cutaneous patch.

Mutatis mutandis, the explanation is the same as that of paresis of the palate and of neuralgia. For the purpose of elucidating the subject, a scheme is appended, Fig. XXI., showing the probable channels of excitation and reflection.

It will be obvious from the foregoing remarks that ethmoiditis is a competent cause of congestive skin rashes in its immediate neighbourhood. Whether it is equally competent to establish analogous localised congestions of skin in more remote areas of integument must remain an open question. At present the author is able to adduce only one instance bearing on this point. It occurred in the case of a girl aged thirteen years, who, along with a laryngeal and pharyngeal catarrh of recent date, presented considerable hypertrophy of both middle spongy bones. For a fortnight previous to her first visit a rash had appeared on the backs of the hands and flexor surfaces of the forearms; it varied in distinctness, being more obvious on some occasions than on others, and had a tendency to form semicircular patches. From the faint traces remaining when first seen she appeared to have had an attack of circinate erythema.¹

¹ While going to press a case has occurred in which *acne punctata* appeared in a young lady, previously quite free from this rash, simultaneously with the development of a rapidly-progressing right ethmoiditis. Such an isolated case is clearly an insufficient basis on which to found any relationship of cause and effect between the nasal disease and the skin rash.

REFLEX DISTURBANCE OF THE CIRCULATION OF THE EYE,
CONJUNCTIVAL CONGESTION, AND LACHRYMATION

Reference has already been made to sundry affections of the orbit and its contents which attend the graver developments of ethmoiditis. Apart from these, there is a milder set of more or less fleeting vessel disturbances in this region exhibited at some time or other in the history of most of these cases. In not a few, conjunctivitis is of frequent recurrence, with swelling of the eyelids, etc., and generally accompanied with an overflow of tears; or the latter symptom may happen alone. The records of modern treatment of nasal affections contain constant allusion to the fact that copious lachrymation attends the application of irritants, such as the galvano-cautery, etc., to the interior of the nose; a circumstance in which nearly every part of the pituitary membrane seems to participate.

Occasionally one meets with defective vision in conjunction with disease of the ethmoid bone; and in these, when submitted to ophthalmoscopic examination, hyperæmia of the fundus has been noted.

Thus it would seem that the circulation of the eyeball, as well as of the lachrymal gland, is in correlation with the nasal mucous membrane, responding by way of vessel dilatation to irritation of the latter. Nor will this circumstance excite surprise when it is remembered that the various branches of the ophthalmic artery receive their vaso-motor nerves from prolongations of the upper cervical ganglion, through which ganglion the vessel reflexes already traced have been seen to operate.

There is about these eye phenomena the great additional interest, that not only can we produce them almost at will,

but that the resultant phenomena are evident to the observer. A similar observation applies, though to a lesser extent, in regard to the skin rashes discussed above. We learn therefore from these objective states, that vessel engorgement in a distinct area can be excited by morbid impressions starting in the nose: we know, further, that in one instance at least, that of the lachrymal gland, such access of blood-supply means increase of normal work; more fluid is secreted by the gland, and hence the down-pour of tears associated with the condition. Again, it is observable often, as regards both these phenomena, that their subsidence is as sudden as their access; after which, within certain limits, the area of recent disturbance is free from any trace of the storm which so recently swept over it. In like manner, when discussing paresis of the palate, we were able to *see* another kind of symptom, *paresis*, and to trace it to the operation of the same law—the reflex relationship of the afferent and efferent elements of the sympathetic system—to which the symptoms which have hitherto engaged our attention have alike been referred.

Such generalisations from particular instances will be found of special value when we come to attempt the elucidations of more complex combinations of symptoms, situated at remoter distances from the exciting cause, and the satisfactory solution of which necessitates that every step of the intermediate ground should be clearly traversed.

PARESIS OF LARYNX

Certain *pareses of the larynx* are seen in connection with ethmoiditis, and differ from those associated with other diseases of non-central origin only in respect of their less

pronounced character, and their greater likelihood of recovery under favourable treatment.

In endeavouring to discover the cause of the paresis in a given case, it is obviously needful to ascertain the absence of any other alternative condition competent to produce it, before concluding it to be due to nasal disease, even though this should be present.

So far as the author's experience extends, it has, with one or two doubtful exceptions, been the adductor or tensor actions of the vocal cords which have been found impaired as a sequence of pathological reflexes originating in the nose.

The opposing action, abduction, does not appear to have been implicated in these cases. In accordance with these facts, the symptoms noticed are nearly all referable to defects of vocalization.

Of the milder varieties of the affection numerous instances are met with. These patients complain of a sense of fatigue in talking, an unreliability about the voice generally, leading them to apprehend its sudden failure. This, at times, does happen; for, after a brief period of fairly good speech, the voice becomes reduced to a whisper.

In other cases the *timbre* of the voice is lost, speech is husky, or the pitch is suddenly altered for some words, and is only maintained at all by a considerable effort.

In other instances, again, the failure is still more marked, nothing but a whisper being producible.

The objective laryngoscopic appearances which the author has noted in these patients are the following:—

(a.) Gaping of the vocal cords during phonation; *i.e.* the cords do not approximate in a parallel and uniform manner, but leave an oval space between.

(b.) Tremor and uncertainty of action. Repeated efforts

have to be made before the cords attain the position needful for the production of a given sound.

(*c.*) A third appearance is imperfect apposition of the posterior segments of the vocal cords, so that while the anterior two-thirds approximate fairly well, the posterior thirds do not; thus leaving a somewhat triangular interval, of which the inter-arytænoid space forms the base.

(*d.*) Lastly, a more or less complete paresis of adduction of *one* vocal cord is occasionally met with, whereby it remains abducted during efforts at speech. Slight partial movements of approximation to the other cord are, however, usually observable, and serve to corroborate the parietic nature of the phenomenon by eliminating ankylosis of the crico-arytænoid articulation from the list of possible causes. The adductor paralysis is rarely so complete as when its origin is in syphilis, aneurysm, goître, etc. It is usually seen on the left side, thus corresponding with the more frequent seat of ethmoiditis when this is not bilateral.

The anatomical lines traversed by the morbid impressions which bring about the foregoing derangements in the innervation of the laryngeal muscles correspond very closely to those already traced. Passing from the nose to the superior cervical ganglion by way of the sympathetic portion of the Vidian nerve, they are thence reflected to the vasa-nervorum of the vagi as dilator impressions, with the result of impoverishing the stream of motor impulses traversing the fibrillæ. It is probable that a very small amount of vessel dilatation will suffice to bring about this effect in the delicate fibrillæ destined for the laryngeal muscles. At the same time its varying amount, dependent on the state of irritation in the nasal lesion, will explain the modifications in the degree of paresis visible at different observations, as well as its total disappearance with the successful treat-

ment of the nasal disease. Later on, in considering the phenomena of nasal asthma, we shall have occasion to observe the effect upon the heart of more pronounced degrees of this hyperæmia of the vagi; but it will be desirable to record the fact in passing that most patients with sufficiently pronounced ethmoiditis to develop these reflexes, complain of more or less cardiac derangement, with concomitant disturbances in the respiratory organs.

These cases are chiefly met with in comparatively young persons, and in the case of females are usually ascribed to hysteria. A recognition of the existence of the subject under discussion as a cause of aphonia and of other and slighter defects of phonation, may perhaps relegate some of these so-called hysterical cases to the category of reflex pareses acknowledging nasal disease as their origin. Such patients speedily improve when attention is directed to their nasal condition, and suitable treatment invoked. The methods at our disposal for this end will be described under the head of General Treatment.

CHAPTER VI

REFLEX SPASM

Paroxysmal Sneezing—Paroxysmal Cough

THERE remains for consideration a class of symptoms in which *spasm* is the characteristic element, and which symptoms are the antitheses of the paretic phenomena which engaged our attention in the preceding chapter: the ætiology of these is similarly referable to nasal disease. Like the former, these spasmodic symptoms are reflex in their nature, but the nerves concerned in their production belong chiefly to the sensory-motor system, and the resulting activities are for the most part those to which the term "reflex action" has ordinarily been exclusively applied.

PAROXYSMAL SNEEZING

Paroxysmal Sneezing is one of the earliest symptoms which mark the advent of chronic catarrh, or the period in which hypertrophic changes are taking place in the Schneiderian mucous membrane. The paroxysm frequently extends to sixty or seventy successive acts of sneezing, and is accompanied by profuse secretion from the nose. Such attacks are by no means trivial to the patient; the strain to

the muscles of the chest induces a sense of soreness in this region, while headache and prostration follow subsidence of the sneezing.

As the result of many observations of subjects whose nasal mucous membrane is thus chronically inflamed, it would appear that there exists a certain area, slight irritation of which induces sneezing more readily than elsewhere; this may be termed the *sneezing zone*. It corresponds to the middle third of the septum, the outer wall of the nose in front of the middle turbinated bone, and to a varying portion of the latter, as well as the anterior aspect of the inferior turbinated bone: very nearly, in fact, to the regions within the nose supplied by the nasal branches of the first division of the fifth nerve, but including also some adjacent tracts the innervation of which is derived from Meckel's ganglion. The analysis of a sneeze shows that it is initiated by a sense of titillation or irritation in one or other nostril. This induces or is followed by a deep inspiration, and is succeeded by a more pronounced expiratory effort. The latter, owing to a combination of coincident muscular actions in the fauces, which cause the arches of the palate to be approximated and brought forward against the tongue, so cutting off egress by the mouth, takes effect through the nose. The first step is a sensory one—irritation of one or other of the above-named nerves within the nose. The impression thus originated travels afferently to the respiratory centre in the medulla, in response to which the deep inspiration and strong expiration through the nose follow more rapidly than can be described. The muscular co-ordination brought into play by the foregoing sensory-motor reflex is designed primarily to get rid of foreign bodies which may have obtained entrance into the upper part of the respiratory tract.

In many children and some sensitive adults sneezing may be induced by the sudden incidence of bright sunlight upon the eye. This admits of very simple explanation on the ground that the nasal nerve before it leaves the orbit gives some offsets to the conjunctival mucous membrane; as also does the lachrymal branch of the same nerve from which the nasal is derived, viz. the ophthalmic division of fifth. In the subjects who exhibit this phenomenon of *eye-sneezing*, the foregoing sensory nerves are affected similarly by sudden exposure to the sun as are the corresponding nerves in the nose when irritated by contact with a foreign body, and the train of reflexes then induced is exactly as in the latter instance.

Reverting to the subject of paroxysmal sneezing, it is necessary to repeat that the tendency to exhibit it has, in the author's experience, always accompanied the presence of inflammatory thickening in the regions already indicated, whilst treatment directed to reduce such hypertrophies will usually cure it. In many instances, however, this symptom becomes less and less frequent, and even when not subjected to treatment may cease to be a prominent source of annoyance, its place being taken by other conditions, not, however, as a rule, less troublesome to the patient. Thus the history of many asthmatics contains the record of a period when frequent sneezing attacks were present, but which had long fallen out of the list of symptoms.

PAROXYSMAL COUGH

Paroxysmal Cough is another instance of spasm occasioned by intra-nasal disease; it is sometimes associated with *dyspnœa* on the one hand, or *defective phonation* on the other. Perhaps it would be more correct to say that when

these latter symptoms occur, they alternate with the cough paroxysms.

This cough is hard and hacking, and is unrelieved by expectoration, except towards the close of the paroxysm, when a minute mass of mucus is occasionally expelled. When *dyspnœa* is present it is more croupy than asthmatic, and both it and the cough are localized in the larynx.

The first exact attempt to establish the connection between morbid states of the nose and paroxysmal coughing was made, so far as the author is aware, by Dr. John Mackenzie of Baltimore (*American Journal of Medical Sciences*, 1883). This author demonstrated that a zone exists in the nose which when irritated artificially or pathologically is capable of exciting reflex cough, and he limits it to the posterior half of the inferior turbinated bones, and the corresponding surfaces of the septum. This area he describes as the "cough zone." It includes, therefore, the regions in which the *erectile tissue* is most abundantly distributed.

It must not be inferred from the foregoing remarks that simple turgescence of this tissue is the condition which gives rise to the symptom under review. This turgescence is apt to occur in various states of health, and repeated catarrhal attacks are its most frequent predisposing cause. It is only when the erection has become permanent, and a more or less solid tumour has been formed which projects into the post-nasal space, that it is capable of exciting paroxysmal cough. Its mechanism and *modus operandi* are much the same as in the analogous instance of sneezing, with the difference that the reflex effect takes place also through the upper branches of the vagus—or the associated spinal accessory nerve—distributed to the larynx. As in sneezing, so in coughing, the first step is a deep inspiration: in the

latter, this is followed by spasmodic closure of the larynx, through contraction of the adductors of the vocal cords, which being suddenly overcome by the expiratory efforts of the chest, the air is propelled forcibly and noisily through the now open glottis.

The important point to be borne in mind in presence of a patient exhibiting this kind of cough, is that it may be excited by persistent irritation of the cough zone in the nose, and should lead to the exploration of this region. The case of Mr. H——, given in the section on neuralgia, p. 56, is an instance in point; the left inferior turbinated bone presenting the conditions calculated to produce the symptom: it will be seen in the case of Dr. D—— given at p. 98, and in both the sufferings of these asthmatics were greatly aggravated by it.

Paroxysmal Laryngeal Dyspnœa, alternating with the foregoing symptom, resolves itself into a prolongation of the spasm of the adductors, and points rather to a less complete though more persistent narrowing of the glottis than momentarily obtains in the case of cough. Although several cases of laryngeal dyspnœa of nasal origin are recorded by the continental authors already quoted, it may be assumed that in this country, and especially in adults, such laryngeal dyspnœa is of very rare occurrence—that is to say, as the result of spasm.

CHAPTER VII

HAY FEVER

THE reader who has followed the foregoing studies of individual symptoms exhibited in connection with intranasal disease, and especially with the various phases of ethmoiditis, may be able to recognize the light thrown by them upon sundry groupings of these symptoms, as they are seen in particular cases which present themselves for treatment, and which, under these circumstances of combination, are ordinarily recognized as special diseases. *Hay fever*, so called, is one of these; and though the term is not a satisfactory one, and indeed is often misleading, yet from the fact of its being generally accepted in lay and professional circles, I shall adhere to it in the observations to be offered in this connection.

The *symptoms* of an attack of hay fever are in the main those of an intensified "cold in the head." Violent sneezing; sense of stuffiness in, and profuse discharge from, the nose; more or less conjunctivitis, associated with discharge from the eyes, and swelling of the eyelids; profuse lachrymation; intolerance of light; the eye symptoms frequently driving the sufferer to the seclusion of a darkened room. These conditions ebb and flow over a period varying from three or four days to as many weeks. They may alternate

with attacks of neuralgia or of asthma ; the latter occurrence was specially insisted upon by Hyde Salter, and it has been noted by most writers on the subject. The author has usually found in the history of chronic asthmatic subjects an antecedent period in which hay fever was present, though it usually disappears when the graver ailment is established. Not however always is this so, for, as in the case of Mr. H——, see p. 56, the attacks of asthma were associated with sneezing, flux of tears, and injected conjunctivæ.

Leaving for a moment all reference to the exciting causes of hay fever, it will be desirable to devote some preliminary remarks to what may be described as the persistent pathological state of the nasal organs in this disease. Dr. Daly of Pittsburg, U.S.A., was the first to publish any observed data on this subject, in 1881, when he clearly established the important fact that hay asthma was due in numerous instances to intra-nasal hypertrophies ; and further, that the cure of these was followed by the disappearance of the disease. This position he ably supported at the International Medical Congress of 1884. Corroborative testimony to the same effect was given on this occasion by Dr. Roe of Rochester ; and numerous writers have since confirmed this view. At the same congress Dr. Bosworth of New York recorded the important case, in which a foreign body had been impacted in the nose for many years, and had given rise to hay fever over a period of eight years. Dr. Bosworth adds, "The attacks disappeared on removal of the stone" (*Transactions of the International Congress*, eighth session, Copenhagen, vol. iv. p. 110).

A reference to the symptoms above described will show that the majority of them are vaso-dilator in character, while the *sneezing* is admittedly a sensory-motor reflex. With the recognition of the reflex relationship between the

afferent and efferent members of the sympathetic system, much of the vagueness usually associated with the term vaso-motor phenomena disappears. We are taught thereby to seek for a morbidly affected area capable of exciting the reflexes. The prominence of the nasal symptoms conducts us straight to the nose for the discovery of this tract. But in this instance we can experimentally test the correctness of this clue. For, just as we have seen that there is a cough zone and a sneezing zone in the healthy nose, so is there an area irritation of which produces a flow of tears, and in some mobile subjects congestion of the conjunctival vessels also—conditions which pass away on the withdrawal of the probe that excited them. This latter zone corresponds with the opposing surfaces of the middle turbinated bones and the septum, as well as some contiguous localities, the extent of which would seem to increase in proportion to the hypertrophied state of the tissues.

Now the conditions present in the nose of a patient prone to hay fever are, according to the author's observations, one of two kinds, both of which implicate this tear-flowing zone. Either there is ethmoiditis in an early stage, often with very little enlargement of the spongy process—though this may, however, be very marked—but showing a glazed or shiny surface from loss of its epithelial covering, this denuded surface being readily irritated by external causes, and resenting these by excitation of normal reflexes; or there exists a narrow conformation of the nose—which may be quite natural, and possibly congenital—in which the opposing surfaces of the septum and middle spongy bones lie in near approximation throughout, and in some places actually touch each other. Such a nose as this last described might present even to a careful observer nothing to suggest abnormality. And yet it is abundantly clear

that the close contact of sensitive surfaces designed normally for free exposure in the breathway, whether induced by disease or congenital formation, must compress, and therefore become a source of irritation to the delicate nerve-fibrillæ with which their investing membrane is endowed.

Perhaps this latter fact may explain the observation that the disease under discussion is most prevalent among the aristocratic classes, who are generally accredited with the possession of that refined contour and delicate "chiselling" of the nasal organ, which necessarily diminishes the space for the internal structures, and compels some of these to lie in contact with each other.

That such a contiguous compression of regions otherwise normal is capable of producing reflex symptoms, the following instance from the case-book of the author will show:—

Mr. —, aged about twenty, came under observation in the spring of 1886. He stated that for two years he had been subject to a sensation of impending suffocation, which became more pronounced as the day advanced. He had consulted several specialists during this period, and by the advice of one of these had taken a long sea-voyage. His health improved in consequence, but the feeling of being gripped by the throat came on just the same as previously. *Laryngoscopic examination* revealed the signs of slight chronic catarrh of the larynx, with somewhat relaxed and mud-coloured vocal cords. There was nothing otherwise in the larynx that was exceptional, either in regard to the intrinsic movements of the organ, or the patient's power to phonate perfectly—certainly nothing to explain the suffocative sensations described by him. Pharynx, normal. *Anterior rhinoscopy* showed the *inferior* turbinated bone on each side impinging upon the septum—not by soft hypertrophic tissue, which is common enough—but the normal spongy bone, owing to the extremely narrow configuration of the nose, was pressed into the septum on each side for a distance of about half an inch from before backwards; so that the nasal partition throughout its anterior portion was firmly nipped between the lower spongy bones in the manner just

described. The line of pressure extended sufficiently forwards to include the nerve of Cotunnus, as it courses downwards to join the Great palatine nerve in the mouth.

Arguing from previous experience of the effect of pressure upon this nerve higher up on the septum, the author concluded that in the conditions above described lay the cause of this patient's long-continued and anomalous symptoms, and advised reduction of the offending portions of the lower spongy bones in accordance with this view. So soon as this was accomplished, to the extent of causing a space to intervene between the regions which had hitherto been in close contact, the symptoms ceased altogether.

While, however, this case clearly indicates the adequacy of mere compression of the nasal septum to occasion reflex phenomena, it is a noteworthy fact, of more immediate concern to our present subject, that this patient's mother was the subject of hay fever. She presented the same delicate modelling of the nose as did her son, and there existed in her case compression of the septum at a higher level, by the middle spongy bones, consequent upon insufficiency of space for their accommodation.

It must not be concluded that the foregoing theory is advanced with the idea of embracing any large portion of the etiology of hay fever of nasal origin. It suggests, however, a true objective or starting-point of the disease in just those cases where no other abnormality is present in the nose. On the other hand, a much wider scope of causation must be allotted to those instances described in the first group, wherein distinct inflammatory changes involve the region indicated as that of the tear-flowing zone.

Respecting the lines traversed by the reflexes arising from the foregoing morbid states of the nose through which are produced the vessel-dilator symptoms seen in the eye in hay

fever, they will be seen to vary somewhat from those hitherto traced. The afferent impulses follow the same route as the others, being transmitted through Meckel's ganglion along the portion of the Vidian nerve derived from the carotid plexus, to the Superior cervical ganglion; while the efferent response returns by way of the second terminal branch furnished to the plexus of the Internal Carotid, and so to the ophthalmic artery and its branches to the orbit.

This tracing suggests a differentiation of function in the two cords which prolong the sympathetic system into the cranial cavity—viz. that one of these consists of afferent, and the other of efferent fibres. It seems probable, indeed, that these distinctive functions obtain throughout the nerves of the entire system, and that this individuality of function is maintained notwithstanding the apparently inextricable commingling of fibres in any given plexus.

That the prime factor in the etiology of hay fever will be found in a pre-existing pathological state of the nasal mucous membrane, is a presumption which experience increasingly favours; and as both fact and theory alike point in this direction, there is little doubt it will come to be the generally accepted view.

The *exciting cause* of these attacks has afforded a theme for wide controversy. Some uphold the "pollen" theory, and, actuated by it, many patients fly to the sea-coast to escape the pollen dust with which the air is said to be laden at the flowering time of grasses. On the other hand, many sufferers get no relief at the seaside. One patient says he is most comfortable *in the country*, but then he cannot go into a stable, ride a horse, play with a cat, or indeed stay in the neighbourhood of fur in any state, whether it be the coat of a living animal, or fur prepared for domestic purposes, without experiencing an attack of his enemy. The strong

sunlight of summer appears to be an exacerbating factor in some, they being unable to go abroad during the glare of day, but are quite able to do so after sunset. While some are liable to be attacked at uncertain seasons of the year, others are prone to the disease all the year round.

These discrepancies scarcely bear out the doctrine that one special state of the atmosphere is the sole exciting cause of the symptoms. Yet they do, with great clearness, point to such a hyperæsthesia of the sensory nerves of the nose as may well be occasioned by the morbid states of that organ so often testified to in connection with the disease.

Given this condition of preparedness, and it is clear that many emanations, too subtle for the healthy subject to detect, become transformed into very real sources of irritation to those who are so circumstanced as to possess it. The tendency to suffer such derangement is in no case, probably, the consequence of any peculiarly irritating endowment of the emanation itself. The phenomena following its access to the nose result from the fact that it falls, not upon healthy tissues, but upon a surface rendered susceptible by the loss of its epithelium, and already irritated by structural disease, or its equivalent—pressure. A trivial additional irritant then suffices to excite the reflexes proper to the nerve-supply of the affected area.

The radical *treatment of hay fever*, as the foregoing observations will suggest, is chiefly surgical. This subject need not be entered upon here, as the methods of dealing with nasal hypertrophies and their allied conditions in this region will be discussed under the head of General Treatment. One caution only is necessary: it is that the patient should not be submitted to surgical manipulations during an acute access of symptoms; an interval of repose should be chosen for this purpose either before or after an attack.

CHAPTER VIII

NASAL ASTHMA

By the term Nasal Asthma is meant a group of symptoms that includes many of those which have already occupied our attention as single occurrences ; but is more especially characterized by a symptom not yet discussed, viz. *dyspnœa*. The want of breath, and the efforts to acquire it which are seen in asthma, are quite distinct from that phase of paroxysmal dyspnœa of laryngeal origin already glanced at ; it is a deeper-seated more enduring dyspnœa, in which deranged functions of lungs, heart, and chest walls, obviously co-operate for its production.

In proposing to trace this wide range of disturbance to causes operating within the nose, it is not to be understood that the following remarks are intended as applicable to every case of asthma ; but rather they are confined to those forms of the disease which come within the lines about to be laid down. Thus limited, there will be found a large class of asthmatics to whom the term "nasal" may legitimately be applied.

Whether or not this group will be found to embrace any large proportion of cases hitherto referred to gout, suppressed skin eruptions, etc., the future perchance may reveal. This much may, however, be affirmed—that since the series of

observations, commencing with that of Voltolini, and supplemented by those of numerous other competent men, which clearly demonstrate that asthma may be caused by lesions within the nose, and is then capable of great relief, and occasionally of cure, by treating these lesions—it is clear that no case of asthma can be entirely referred to any other cause, until the nasal organs have been satisfactorily examined and excluded from any share in the evolution of the asthmatic storm by their proved freedom from abnormal conditions.

Reference has been made to the wide range of functional disturbance witnessed in this disease. Obviously there must exist some underlying state of system inherited or acquired by these subjects, if, as is maintained, this large excursion of their reflexes is to be traced to impressions originating in the nose. By all authors, asthmatics of whatever kind are accredited with the possession of a special constitutional tendency: they are said to be of the “nervous type,” or in other words, to be “neurotic.” There is nothing exceptional, therefore, in claiming for this particular group of cases a corresponding constitutional endowment. To avoid the ambiguity which surrounds even scientific terms, it is necessary to define the phrase “neurotic type” as used in connection with nasal asthma.

In the first place, the misconception must be avoided by which a “neurotic” is regarded as a weakly-framed, or if a female, a hysterically-constituted individual, unequal to the adequate discharge of the ordinary duties of life—and still less capable of rising to the higher walks of intellectual labour, or of successfully confronting the exigencies of physical enterprise. As matter of fact, a typical “neurotic” may be the reverse of all these. His idiosyncrasy amounts to this: the reflexes respond with promptitude to the

impression which elicits them, but the act is followed by a state of lowered inhibition in the organ or set of organs in correlation with the area of excitation. The frequent repetition of such excitation presupposes a starting-point in some morbidly-conditioned or hypersensitive area. The responding waves thereafter traverse a mechanism characterized by defective inhibition and feeble retentive power; hence they excite activities that extend beyond the limits which should confine the scope of the original impression.

The origin of a "neurosis" then, even in a constitutionally prepared subject, implies the existence of a pathologically conditioned region in which the exciting waves arise whose reflex response is the expression of the neurosis in question. This is important to bear in mind, because the recognition of the source of the mischief may possibly be equivalent to bringing it within the range of successful treatment, and is the only radical way of accomplishing this end. It is the more important to insist on this point because of the widespread tendency to prescribe something that is "good for asthma," or "cures neuralgia," etc., rather than to adopt the more tedious method of discovering their exciting cause.

The propriety of recognizing this underlying "neurotic disposition" is attested by the fact that not all the patients who present the lesions which bring them within the group of cases in question have asthma; actually, a very small proportion of them is so affected.

As regards the conditions that constitute a given case one of nasal asthma—it is to be remarked that all the writers referred to have limited their observations on this point to the presence of polypi within the nose. The removal of these was followed by great relief, but relapses were the rule. This experience induced some of them to effect the

partial removal of the hypertrophied middle spongy bone remaining after the clearance of the polypi. Probably from not recognizing the real import of this factor, this treatment was only partially carried out. Many of these patients, being much relieved, discontinued their attendance before the cure was accomplished: they appear to have been satisfied with a greater degree of ease than any former experience of treatment had afforded them.

It will be clear in the sequel that polypus is after all only an accidental cause in the production of the symptoms. There are, it is superfluous to remark, hundreds of polypous patients who are not and never have been asthmatic, while there are many others suffering from both polypus and asthma in whom removal of the former has produced no impression upon the dyspnoea, because other lesions adequate to produce the symptoms of the case were unmistakably present in the nose.

What then are those conditions, the presence of which in the nasal organs of neurotic subjects is competent to give rise to asthma? The author's observations have been tolerably uniform on this point, inasmuch as they show that the true area or zone in this region, irritation or pressure upon which excites spasmodic respiratory phenomena, is that occupied by the nerve of Cotunnus,—an important branch of Meckel's ganglion,—where it crosses the osseous portion of the septum, and where it is exposed to pressure or irritation from a diseased middle turbinated bone—ethmoiditis—or from proliferations due to this cause. This is particularly the case if the ethmoiditis be bilateral, when the septum, being squeezed between the two hypertrophies, is unable to yield to either, and the intervening nerves must suffer proportionally. In cases where no polypi are developed, such pressure is often exerted by the enlarged

spongy bones ; and it has already been indicated that the line of contact in many instances can only be made out by exploration with a suitable probe,—mere inspection, however perfect the illumination under which it is conducted, being insufficient of itself to determine this point.

While suggesting the foregoing as the most frequent source of nasal asthma, it is by no means intended to limit its possible seat of origin to the situation of that branch of Meckel's ganglion just named ; because the symptoms occasionally remain after the projecting portion of the ethmoid has been spontaneously disintegrated by the progress of the disease, and any pressure it may at one time have exerted upon the septum has been thereby removed. It is probable that in such cases the asthmatic habit, having been established in the earlier stage of hypertrophic expansion, is later on maintained by irritation of other branches of the ganglion distributed to the ethmoidal cells, etc., where the disease is still in progress.

We are now in a position to estimate the part played by polypus in the production of the asthmatic attack, just as the preceding remarks have indicated how this may be brought about in the absence of the former. Thus a comparatively small polyp suitably situated, moving freely in the breath-way, and large enough to reach the septum, will keep up incessant irritation of the latter, and be well calculated to excite distant reflexes which its removal would greatly relieve. On the other hand, a large polypus, or several such, may be squeezed between the opposing surfaces of the septum and middle spongy bone, and by the pressure so exerted will occasion similar symptoms. A recent patient illustrated some of these features. He had for five years been the subject of well-marked asthmatic attacks associated with urgent præcordial distress, and was in the habit of

injecting morphia subcutaneously for relief of these symptoms. A few weeks previously to consulting the author, he experienced a marked diminution of his troubles, but suddenly became aware that his nose was blocked by polypi, which he could quite well see and touch. Yet before this he was unaware of anything being wrong with his nose. The explanation of these facts appears to be that so long as the polypi were confined to a situation which permitted them to press against the septum, they gave rise to distant reflexes; when, by their continued and perhaps rapid growth, they escaped into the freer space of the anterior nares, pressure was taken off the septal nerves, while in place of the asthma he experienced obstruction in the nose. This case shows moreover, that simple blocking of the nasal air-passages by polypi does not produce asthma,—a circumstance the truth of which is confirmed by the frequent experience of polypous patients with no breath-way through the nose, and whose respiratory functions, apart from this, continue normal. Polypus, therefore, is only an occasional source of irritation of the asthmatic zone, which may be, and with equal frequency is, brought about by middle turbinated disease throughout the duration of which no polypus is or has been developed.

These remarks sufficiently emphasize the observation already made, that no diagnosis of the causes which conduce to this disease in a given case is complete until the nose has been subjected to exhaustive examination. It will also be apparent that it is not enough to exclude the existence of polypi, but it is necessary to ascertain that no part of the ethmoidal tributaries of the nose impinges on the septum. Only when this latter fact is made clear can it safely be affirmed that the asthma in question is of other than nasal origin.

It will be seen that the area just indicated as the asthmatic zone is nearly identical with that to which hay fever has been referred. In fact, these two disorders are constantly present in the same subject, either alternating or coexisting with each other. Even where the milder ailment has disappeared altogether, the early history of many asthmatics points to a time at which it was present. Dr. Hyde Salter insisted on this fact, and it has not escaped the observation of later writers. Similarly, *paroxysmal sneezing* and *coughing* are more or less seen complications. Dr. Dobell¹ has even formed a group of cases which he names "Sneezing Asthma," and has advanced the "perivascular hypothesis" to explain their occurrence. Dr. Ed. Liveing² notices sneezing as happening "vicariously" with asthma, and quotes another case where "*neuralgia* and paroxysmal sternutation" were associated with it. It is to be remarked that all these concomitant phenomena have already been examined in detail, and their origin traced to lesions within the nose. If the history of a patient, at the onset of an attack of nasal asthma, be carefully inquired into, it will be found usually following a severe cold in the head, or a succession of such colds, during which the hypertrophic processes are presumably commencing. Then frequently it would seem that all the correlated areas spring into activity at once: that is to say, there will be frontal or facial neuralgia, vertigo, prolonged sneezing,—the group of symptoms which together make up an attack of hay fever,—as well as slight asthma; so that the patient is involved, as it were, in a storm of reflex annoyances. When the reflexes are thus diffused over a

¹ *On Asthma: Its Nature and Treatment*, by H. Dobell, M.D., London, 1886, pp. 8, 9.

² *On Megrin, Sick-Headache, etc.*, by Ed. Liveing, M.D., London, 1873, p. 360.

number of areas, the intensity of the symptoms arising in any one of them is less than when the entire response is focussed in one particular tract. Such a curtailment of excursion, and consequent concentration of effect, is almost certain to follow in subsequent seizures, which will then be expressed by trigeminal neuralgia, or hay fever, or asthma, simply and singly. From time to time, however, the tendency to alternation of these, or to some fresh combination of them, will be observed in the same subject.

The explanation of the phenomena just described is, that when the primary irritation reaches a point at which it can excite reflex responses, all the outlets through which the latter can operate—both vaso-motor and sensory-motor—are called into immediate exercise. Some of these are more resistant than others, because—and this remark is especially applicable to vaso-motor centres—some of these latter are less mobile than others; consequently the dilator waves in these subside soonest, allowing the whole force of the impulse to take effect in that area where least resistance is experienced. Furthermore, this area of least resistance will be that preferred, so to speak, in subsequent recurrences of the attack.

“Inasmuch as this position rests upon the principle of the correlating function of the sympathetic ganglia, I must, for the purpose of demonstrating it, recall the illustration made use of to explain the behaviour of these ganglia under the influence of a chill, when the sympathetic system, as a whole, was compared to a pipe, perforated at intervals, to represent the efferent outlets of the initial or dilator wave. The latter, it will be remembered, was represented as issuing from each ganglion or orifice in succession, in its course up (or down) the series; the dilator influence being exerted on the vessel areas supplied

by each ganglion with vaso-motor nerves. This, for reasons then explained, is more marked in some and much less in others. The vessels so influenced will induce no objective results if the tissues to which they proceed are not calculated to elicit such symptoms. But it is obvious that all the arteries which enter nerve-trunks containing sensory fibres are so circumstanced as at once to give notice of their distension. These *vasa nervorum*, the nutrient vessels of the nerves, when distended, must compress the fasciculi contained within the unyielding nerve sheath. As effusion succeeds distension, this compression will be more severe and will disappear more slowly; but however transient, it will crowd upon and squeeze the sensitive fibrillæ, and will thus give rise to pain. This I submit is the true explanation of acute neuralgia occurring under the circumstances portrayed. It is in the first instance a mechanical jugulation of the contained fibrillæ, expressing itself, as has been stated primarily, by pain, but constantly interfering with all the reflex motor and sensory functions of the nerve also. Of such sort are localized anæsthesias, sensations of formication, pins and needles, tingling, etc., in some part of the limb supplied by the spinal nerve; as well as a quasi-paralysis of motion of the limb. All these conditions may be met with in sciatica, and may be erroneously, as I venture to think, referred to lesions of the spinal cord. Reflex pareses are of the nature now pointed out, and may be verified in numerous instances. Paresis (gaping) of the vocal cords in laryngeal catarrh affords a good example of the kind.”¹

The author's apology for reproducing this quotation from a former work is that in it are summarized the views he

¹ Vide *Post-Nasal Catarrh*, etc., by the author. Chap. III. p. 43 *et seq.*, “On the mechanism of taking cold.”

desires to keep before the reader while endeavouring to point out the mechanism by means of which nasal asthma appears to him to be brought about, and the complicated processes operating to this end.

Keeping within the lines of explanation advanced to elucidate the phenomena already discussed—in which has been traced the effect of reflexly-produced hyperæmia within the nerve sheaths—we have now to follow the same influence under circumstances, first, of *increased intensity* in nerves where hitherto it has been seen to a slight degree only; and secondly, of a *wider-reaching excursion* of the same, whereby fresh nerves are brought within its scope. Under the former of these, that of a more intense degree of hyperæmia, we shall be concerned chiefly with the vagi. In the latter, when new nerves are involved in the process, our attention will be directed to those which supply the muscles designed to expand the chest walls and assist the act of inspiration; those nerves, viz., whose origin is in the neck, and the nutrient blood-supply of which is regulated by efferent branches of the superior cervical ganglion.

Commencing with the vagi, it is assumed that no anatomical objection can be taken to the statement that their *vasa nervorum* are furnished by branches of the external carotid throughout their course along the neck, and that these vessels derive through the *nervi molles* their vasomotor supply from the superior cervical ganglion. The lighter degrees of reflex dilatation of these—resulting from impressions within the nose—have already introduced us to pareses of the pharynx and vocal cords. Now, any excess of the hyperæmic wave over and above that which sufficed to produce the foregoing pareses will manifest its effect in the more distant organs supplied by the vagi successively: the next prominent area of disturbance will accordingly be

the *heart*. The result of the increased blood-pressure upon the cardiac fibres of the vagi will be to diminish the function exercised upon the heart by these nerves. So far as the central organ of the circulation is concerned, this can hardly be called paresis, for the heart's action will be accelerated in like proportion to the extent to which the inhibitory influence of the pneumogastriacs is withheld. It is to be remarked that the intra-neural tension does not amount to jugulation,—rather it denotes interference with the transmission of impressions along the fibres of the nerves due to their compression. In just such proportion are the accelerator stimuli allowed to predominate. *In this way, starting from the nasal lesion, we arrive at the first factor of the asthmatic storm—viz. accelerated action of the heart.*

The meaning of this latter statement will be more clearly discerned after perusing the following quotations from an essay on Respiration by the late Dr. Patrick Black.¹ The author acknowledges his indebtedness to a quotation in Dr. Dobell's work²—extracted from an obituary notice on Dr. Black by Dr. Reginald Southey, which appeared in *St. Bartholomew's Hospital Reports*, 1879—for directing his attention to this suggestive contribution to the physiology of respiration; the support afforded by Dr. Black's views to the author's hypothesis of nasal asthma will be apparent in the sequel.

Dr. Southey has so admirably condensed the purport of Dr. Black's brochure on this subject that one cannot do better than quote his words:—

Dr. Black “shows that while the lungs are principally expanded by the dilatation of the thoracic chambers in which they hang, and the movements of whose walls they follow,

¹ *Respiration, or, Why do we breathe?* Dr. Patrick Black, Physician to St. Bartholomew's and Christ's Hospitals. London, 1876. Pamphlet.

² *Op. cit.* p. 7.

they are still opened and swelled in bulk in no inconsiderable degree by the blood propelled through them at every beat of the heart. 'Both these forces are always being actively exerted; one supplements the other; and when the function of respiration is being perfectly fulfilled, each is regulated by the other. They are mutually compensative.'

"We question if any physiologist perceived more clearly than he did the full value of old Hale's experiment, which proved conclusively the heart's power to distend the lungs,—an expanding force too often left out of calculation, both in health and disease."

In the original Dr. Black appends the following experiment of Hale's to illustrate the heart's power in distending the lungs: "But when, on straining, the dog, by the joint action of all the muscles of the abdomen, thereby compressed the venal blood forcibly up into the ascending vena cava, the right ventricle of the heart being thereby more plentifully supplied with blood, impelled it also more forcibly into the pulmonary artery, so as to make the collapsed right lobe of the lung instantly to dilate so vigorously as to push the lower part of the lobe one, two, and sometimes three inches' length out through the incision; and that after he had lost half a pint of blood."—*Hæmostatics*, 76.

Dr. Southey continues: "He shows that when the right heart, stimulated by muscular exercise, acts too quickly and too forcibly, the lungs so swell the chest cavity that little further expansion of this becomes possible by even the most violent effort at inspiration. The lungs are blood-gorged, the air vesicles remaining empty of air in proportion as they are over-full of blood. If the limit of chest expansion is reached thus by blood-pressure before the air-vesicles are unfolded, no oxygenation changes can take place, and no blood passes through the lungs to the left heart. Thus the

condition becomes at once one of distress and imminent danger. The individual stands with open mouth striving for air, which no effort of inspiratory muscles can draw in until the pump-force of the heart moderates; but then, as the lungs sink back the thorax too subsides, and the dilatation of the vesicles with fresh air is rendered once more feasible. 'You see, then,' says Black, 'what a difference it makes whether the chest is expanded by the muscular forces external to the lungs, or by the force of the circulation within them.' The aeration of the blood and its passage onwards are then shown to be collateral results of the expansion of the air-cells, and this expansion of them to remove the obstacle that previously barred the current of the blood through the lungs. And he continues: 'If the right heart were muscular pump enough to sweep the hindrance before it, instead of requiring that it should be lifted away by the act of inspiration, the necessity for this act would not have been felt. Medulla's function would not be invoked; the blood would pass through the lungs without his sanction unchanged. Nature has, therefore, so weakened the right heart that the barrier is effectual until another power is called in; as inspiration lifts off this barrier, the circulation through the lungs is continued, and the blood's changes duly accomplished.'"

Yet one other quotation from the original is needed to bring out a point of some importance in the sequel; it is that put in italics by the author. "A man runs a few hundred yards at the top of his speed, at the end of which he is out of breath. What is the physiological explanation of this condition? The lungs are filled with blood, not with air, *though indeed they contain probably more air than at any lower point of expansion.* To enable this blood to pass onwards to the left chambers of the heart, expansion of the

air-cells is now necessary, but the limit of expansion has already been reached, and death is inevitable, because this left chamber of the heart is starved of its supply; it has nothing to contract upon."¹

In the latter quotation Dr. Black explains how death is induced by unwonted muscular efforts, as in running to catch a train, etc. But this thesis serves the purpose of illustrating the share of the heart in expanding the lungs, and the effect of its accelerated action in impeding the processes of respiration.

In the case of the nasal asthmatic it is not contended that the quickened rate of the circulation is sufficient to fulfil all the conditions necessary to bring about such a crisis as that above portrayed; though no doubt these patients are sometimes in imminent danger of its complete realization. What is intended to be conveyed is that their condition amounts to this: owing to the prolonged acceleration of the heart's action consequent upon the diminution of the inhibitory influence normally exercised upon it by the vagi, the lungs become more and more charged with blood, in consequence of which they gradually attain an approximately maximum state of expansion: this being approached apart from the aid of inspiration, both this act and that of expiration become less and less effective. Notwithstanding this curtailment of the respiratory movements, the lungs contain "more air than at any lower point of expansion," because as the lungs unfold in response to the pressure of the blood, the column of air in the bronchial tubes is maintained and added to by its continuity with that of the atmosphere. It is only the pulmonary cells which are defective in this respect, "as they remain empty of air in proportion as they are full of blood." Hence the require-

¹ *Op. cit.* p. 21.

ments of the system which the interchange of gases in the air-cells is designed to meet, fails to be satisfied, and the stasis of the pulmonary circulation increases accordingly.

The establishment of the foregoing conditions suffices to explain a large part of the phenomena of an attack of nasal asthma—viz. the distended, immobile, but resonant chest, the pallid or leaden hue of the countenance, the distressing want of breath, and the futile efforts made to acquire fresh draughts of air. It sufficiently explains also the palpitation and cardiac distress which, though most pronounced during the asthmatic paroxysm, are seldom altogether absent in the experience of these patients, or if absent are peremptorily induced by slight muscular exertion.

If then such a miscarriage of intent in the performance of his vital dynamics on the part of the sufferer can be accomplished through the medium of this "first factor of the asthmatic storm," it may seem superfluous to seek additional forces, the co-operation of which tend still further to his discomfiture. The influence of the second factor working to this end remains for consideration. This, as already stated, consists in *the implication of the nerves of the inspiratory muscles in the dilator vessel wave*, which has already been seen so disastrously effective in the pneumogastrics. That is to say, an intra-neural hyperæmia is established as regards these respiratory-muscle nerves, with the like effect of compressing their fibrillæ and weakening or abrogating the transmission of motor impressions destined to rouse into activity the muscles in question. The consequent quasi-paresis of the ordinary muscles of inspiration ceases, however, to have any material bearing on the condition of the patient on account of their incapacity further to expand the chest, this expansion having already attained its maximum through the force of

the heart's action, as already explained. For the same reason, moreover, the strongest efforts of those muscles which can be called upon by the will to supplement the normal and involuntary acts of inspiration, prove equally abortive to add to the capacity of the cavity of the chest. Even the diaphragm, which has already been separated from the chest walls and depressed towards the abdomen with the progressive expansion of the lungs, however spasmodically it may contract, will have little effect upon the inert mass which these organs now oppose to its contraction.

As serving to illustrate the Tantalus-like state to which the derangement of the breathing apparatus of the patient has reduced him, this second factor in its causation may with propriety be cited here. But it may well be that another and a salutary purpose is accomplished by thus rendering the concentrated efforts of the will centre of no avail to rouse into activity the muscles of inspiration. For these volitional impulses, finding no outlet in this direction, may be diverted into another and contiguous channel, by means of which they will reach the vaso-motor centre,—from the intervention of which can help alone come in this crisis. Because the response of this centre to the appeals thus reaching it will have the effect of inhibiting the dilator waves proceeding from the cervical ganglionic subcentres, and by causing these latter to cease will remove the hyperæmic incubus from the vagi. These nerves will then reassert their controlling influence upon the heart. With the consequent slowing of the circulation the flow of blood to the lungs will be diminished, the air-cells will gradually become less gorged with blood, while more air will enter them. With the gradual restoration of the normal equilibrium between these two forces of respiration, the asthmatic storm will pass away.

No doubt the two factors enumerated above may come into independent but simultaneous operation, in which case there will ensue a gradual diminution of inspiratory effort, although the lungs remain expanded owing to the accelerated heart's action. Here also the patient will assume the asthmatic state.

It is to be remarked that a considerable number of ethmoiditis patients are disposed to shortness of breath, palpitation, faintness, or præcordial distress, especially on exertion, though the pulmonary disturbance may never, with them, assume sufficient prominence to warrant the appellation of asthma. Such symptoms, though only occasional occurrences, must be taken as evidence that the reflex dilator waves tend even in them towards the same range of excursion as become habitual and pronounced in similarly affected subjects when constituted after the neurotic type. Indeed, in these latter patients a certain amount of embarrassment of respiration is a chronic condition, which a very little additional excitement or exertion aggravates into a paroxysm of dyspnoea.

The potentiality of the two factors above described, when established in the economy, to induce asthma, and the sufficiency of the nasal lesion when occurring in suitable constitutions to call them into activity, constitute the author's contention in this relationship. Its consistency with the causative explanation of most of the morbid phenomena adduced in the earlier pages of this volume is strongly confirmative of its accuracy; whilst its appositeness to account for the attendant peculiarities of the disease it is put forward to elucidate will be further evidence in favour of its acceptance. A brief glance at some of these will bring our studies of the subject to a close.

Thus, it is a common experience with nasal asthmatics

that the attacks are apt to come on towards early morning—that is to say, after a few hours' sleep they are awakened by the increasing sense of dyspnoea. The reason of this resides in the fact that during the recumbent posture, more blood gravitates into the weakened and distensible vessels of the nose, the hypertrophies of which become in consequence increased in size; they occupy more space and exert more pressure upon the septal nerves. Thus the morbid impressions originating in the nasal lesion become more active, and the vessel-dilator reflexes responding to these assume the *rôle* ascribed to them in the preceding paragraphs.

Certain states of atmosphere act in a similar way: such are a lowered temperature, especially if the air be laden with moisture; the presence of fog, etc.,—all of which bear on the circumstance that some of these subjects are unable to sleep in certain apartments without suffering an attack; whilst in other chambers differently situated of the same house, they are quite free from it.

Reference has been made to the præcordial distress experienced as well during the paroxysms as in the intervals between these: its explanation was seen to reside in the disturbance of the innervation of the heart consequent upon the interference with one of its regulatory nerves. That in this condition of the patient exertion should aggravate the dyspnoea by increasing the amount of blood sent to the lungs is obvious. The fact that many of these patients have their pulmonary troubles increased by a chronic state of bronchitis, finds a ready explanation in the physical state of the lungs, the peripheral circulation in which does not entirely resume its normal condition on subsidence of the asthmatic paroxysm. Hence mucous *râles*, cough, and expectoration, are more frequently than not found in company with nasal asthma.

Underlying all these symptoms is the presence of the nasal lesion, which, although liable to variations as regards its irritating influence upon the adjacent nerves, is, so long as it remains unrecognised and therefore untreated, a constant source of excitation of those reflex intra-neural hyperæmias which have been indicated as the main factors of the disease.

Case.—The following case of nasal asthma has been selected from numerous others to illustrate the foregoing remarks; the subject being a medical man, the details are as far as possible given in his own words.

Mr. ———, surgeon, *æt.* thirty-two years, consulted the author in November 1885; he then complained of asthma, paroxysmal cough, nasal catarrh, and general weakness and lassitude. His family history was satisfactory except that both sides were gouty. There was no evidence of syphilis. His past history showed that he had been a delicate child, subject to bronchitis, and that he did not speak distinctly till the age of five years. The voice has always been nasal.

Present illness commenced in October 1883 while in active practice, with attacks of sneezing, abundant watery discharge from the nose, with loss of smell. These attacks lasted from three to four hours and occurred about once a week, but during the next nine months they became more frequent, and were followed by much prostration. About June 1884 he began to have attacks of asthma with cough, which came on during night-time.

In October 1884 he was compelled, owing to the state of his health, to relinquish practice, and travelled through Australia, New Zealand, and America for a year. During all this time the nasal catarrh was very troublesome, but the asthma, cough, and general health improved. On returning to this climate his former condition returned, and he came to the author as above stated in November 1885.

At this date he was pale, thin, and extremely feeble. Examination of the nose anteriorly showed two polypi in each nostril, which proceeded from above the superior turbinated bones, the latter being enlarged to the extent of touching the

septum on each side. Posterior rhinoscopy showed a large erectile-tissue tumour growing from each inferior turbinated bone, which nearly closed the posterior nares, and projected, the right especially, some distance backwards into the post-nasal space. When the presence of these growths was pointed out to the patient, he could quite easily feel them with his finger passed upwards behind the soft palate. The anterior polypi were removed with the snare, as was the right posterior vascular tumour, about half an inch of the posterior end of the inferior spongy bone—the greater portion of which projected into the post-nasal space—being removed along with it. Considerable hæmorrhage followed this operation, to avoid which it was resolved to attempt the reduction of the vascular mass on the left side with the galvano-cautery. It cannot be said that much success attended this latter method, though all his symptoms were temporarily relieved, and he left London in December for a month's rest in the country.

Shortly after his return to the north, violent paroxysmal cough came on, which proved so distressing that he besought operative relief from a surgeon in his neighbourhood, who removed a portion of the left erectile-tissue tumour by means of forceps introduced through the mouth. Receiving only partial relief by this measure, he returned to the author towards the end of January 1886. The left tumour was considerably reduced in size, and fresh polyps had made their appearance in the left nostril. All were removed, as previously, under cocaine.

With the extirpation of the left erectile-tissue tumour he entirely lost the paroxysmal cough which had been so distressing a symptom. The asthmatic attacks, however, became even more pronounced than formerly.

It was now practicable to inspect the middle turbinated bones from behind, which was not the case till the vascular tumours had been got rid of. These were now seen to have attained an unusual size, reaching down to the floor of the nose behind, and pressing the inferior processes against the outer wall, whilst they intruded upon the septum in the middle line.

It was then resolved to attack these bones, which was effected with chromic acid, superficial applications of a concentrated solution being made once a week, intermittently with

galvano-cautery punctures, till the beginning of March, when he again returned home.

March 9.—Patient writes: "Asthma and cough almost disappeared, and general health much improved." The author was sceptical respecting this optimist view of his case, for, owing to the hardness of the hypertrophied tissue, but little progress had been made in separating it from the septum. Accordingly in May, patient commenced another course of treatment similar to the preceding—after which he again reports: "Asthmatic symptoms much relieved, and air passes more freely through the nose than at any previous period."

There was, however, still considerable pressure on the septum, and in July he was again under treatment. On November 30, 1886, the patient writes: "Have been so much better lately that I have not been inclined to leave work to complete the treatment."¹

Remarks.—Referring to the earliest experiences of this patient, especially the troubles of his respiratory and vocal functions, we cannot escape the conclusion that he was in his childhood and youth the subject of post-nasal vegetations. These, as is occasionally their wont, cleared off in early manhood, but not until a state of chronic inflammation had been established in the posterior regions of the nose, which gradually assumed the form of hypertrophic catarrh of the lower and middle spongy bones. Yet it is to be remarked that he was nearly thirty years old before he became afflicted with those attacks of asthma, sneezing, and paroxysmal cough, which ultimately brought him under the observation of the author. That is to say, it was not until the slowly-growing hypertrophies and neoplasms had invaded the reflex zones to the extent of exercising pressure therein that the symptoms proper to the irritation of these areas were manifested.

¹ Whilst these pages were in the press, February 23, 1887, this patient writes: "I am glad to say I have been very much better the last four months, almost free from asthma, and only very occasionally any nasal catarrh. My general health is also much better, and am able to sleep eight or ten hours every night."

Furthermore this case serves to differentiate the reflex symptoms by referring each to its respective zone. It has therefore a great value in connection with this class of reflex nasal neuroses, the more so as it corresponds exactly with the author's experience in other cases in respect of these points—about which very indefinite ideas are held even amongst specialists. No doubt this confusion has been encouraged by the earliest published observations of continental writers, in which they attached undue importance to the *rôle* played by erectile-tissue tumours, and hypertrophies of the inferior spongy bones generally—referring almost every neurosis to these—whilst ignoring that of the middle turbinated regions, which have since been found to possess a paramount pathological interest in the causation of this class of reflexes. This error has been to some extent rectified in the latest communications on the subject, especially in those of Hering. The author believes that he has in the foregoing pages assigned to the several regions of the nose their true capacities as excitors of reflex phenomena.

It will be seen that the general tenor of his observations is to support the original thesis of Dr. John Mackenzie (of Baltimore), to the effect that the cough zone in the nose is that implicated by the erectile-tissue tumours of the posterior ends of the lower spongy bones, and that these act as excitors of spasm of the larynx. That these tumours have no relation to nasal asthma is proved by the fact that their complete ablation in the case just detailed failed altogether to relieve the patient's asthma, though the spasms of coughing which proved so distressing, ceased on their removal; and, as just stated, this corresponds with his experience generally.

Though the patient whose case has called forth these comments was not absolutely cured, the fact that he was

able to resume the arduous duties of general practice in a northern county, and to continue in these with comfort, will be deemed by most readers to vindicate the methods adopted to bring about the result. But it has a wider range of interest, inasmuch as, taken in conjunction with other cases similarly treated with corresponding improvement, evidence will be furnished to confirm the reputed relations of intranasal disease to the pathogeny of asthma, as well as to justify the expectations of an enlarged prospect of relief to be derived from treatment based upon the lines which this new departure originally opened up.

At the same time the author is not without hope that his insistence upon the regions within the nose to which more especially treatment should be directed, will serve to give to the therapeutics of nasal asthma a greater degree of exactitude than has hitherto obtained, even when conducted from this point of view.

CHAPTER IX

TREATMENT

It cannot be too strongly insisted upon that the condition somewhat lightly spoken of as "hypertrophy of the middle spongy bone" is *de facto* an ethmoiditis, with its possibilities of necrosis and proliferation, as set forth in the early chapters of this work.

The recognition of this fact will have reduced the previously inchoate notions respecting the morbid states of this region to an intelligible scheme, in accordance with which the series of pathological phenomena exhibited here will harmonize with those constituting the history of inflammatory processes in other more familiar localities.

From this it follows that the treatment proper to the various stages of ethmoiditis will consist logically in the suitable application to this category of cases of those principles of treatment proper to cognate affections occurring elsewhere.

The specialism of nasal surgery is thus *special* only in respect of the adaptation of those therapeutic means and appliances which the anatomical or functional peculiarities of the region necessitate.

The *Treatment of Necrosing Ethmoiditis* therefore will necessarily vary according to the stage at which the disease

first comes under notice ; and also to some extent with the severity of the symptoms traceable to its presence.

When the middle spongy bone presents the conditions previously described as characteristic of its first stage, or if this be passing into the second phase of the disease (see Fig. V. p. 11), it is important to attempt by vigorous treatment to destroy the hypertrophied muco-periosteum, with the view of arresting the morbid process before the underlying osseous textures have become involved in it ; or at any rate while the mischief to these is superficial only.

This may be done by means of the galvano-cautery ; a small electrode, under effective illumination, being made to penetrate the bosslike prominence to the bone, the number of such punctures being adapted to the size of the enlargement.

The previous application of a 20% solution of cocaine renders this a quite painless proceeding, but a weaker solution is of little avail for the purpose of securing anæsthesia.

A sufficiently strong acid may be substituted for the galvano-cautery: such as glacial acetic, chromic, nitric, or hydrochloric acids. Of these the chromic is to be preferred for the rapidity with which it seizes upon and amalgamates with the tissues. Nitrate of silver is useless. Ethylate of sodium, chloride of zinc, London paste, might possibly answer the purpose, but the author has little experience of them.

In the use of these agents care must be taken to limit the application of the corrosive to the diseased area, and no one incapable of sufficient delicacy of manipulation, or unacquainted with the locality, should be intrusted with its use. Such dexterity is, however, sufficiently easy to acquire. To facilitate the application of corrosives to the deep parts of the nose, the author makes use of the instrument figured below. It consists of an elongated loop of platinum wire

attached to a silver stem and fixed in a handle. The shape of the loop maintains a sufficient capillary attraction for the fluid to permit it to be carried to the destined spot without dropping off; while the quantity required is all held at the end of the instrument, and is not dispersed over its length, as is the case when an ordinary probe is used for the purpose. In the case of chromic acid, this can also be fused into the loop when a more concentrated application is required.



FIG. XXII.—Author's carrier : for applying corrosives to the nose.

After the application it is well to blow some precipitated iodoform over the part, and to direct a wash to be used two or three times daily, of warm solution of boric acid, $\bar{3}j$ — Oj . A good deal of lachrymation attends this procedure, and it is usually followed by copious watery discharge, which may last the greater part of a day. The patient should be directed not to blow his nose for three hours afterwards, but no inconvenience beyond the foregoing will usually occur, if the application have been carefully made.

If chromic acid be employed it is important to caution the patient against swallowing any of it which may chance to be carried backwards with the secretions, otherwise vomiting may follow, giving unnecessary annoyance to the patient. In one instance, when applying chromic acid, the patient—a young married lady—was seized with a slight epileptic fit; this did not last more than half a minute, and did not recur. Subsequently it was ascertained that this patient was subject to “seizures” accompanied with momentary loss of consciousness, but she had not attached any importance to their occurrence. The circumstance would seem to bring this case into alliance with those noted by Hering, in which

epileptiform conditions were associated with the nasal disease.

Chromic acid is on the whole a more painful application than the cautery, and the pain is apt to outlive the anæsthetic effect of the cocaine. This fact will be usefully borne in mind when the patient is of the hypersensitive class. The descent of the acid into the stomach may be successfully avoided by plugging the nares with absorbent cotton previously to its application, and removing it shortly afterwards.

It is matter of regret to the author that he did not receive the exceedingly valuable and exhaustive work of Dr. Beverley Robinson¹ till these pages were nearly complete for the printer. He has failed, however, to observe any mention of the use of chromic acid in this work for the purposes referred to, from which omission this valuable remedy in nasal therapeutics would seem not yet to have been adopted by the profession in America. It is, however, extensively used on the continent of Europe, and in the author's practice has gradually replaced every other caustic except the galvano-cautery. Reference has been above made to some of the drawbacks attendant upon its use, but these with due precautions may be avoided. There is one point about this acid which, if its inconveniences were even greater, would in the author's esteem rank it above every other destroying agent at present employed in this department of surgery. It is that after its use between contiguous structures, which it is most important to keep free from adhesion, such adhesion very rarely occurs, even though the opposing surfaces may simultaneously become cauterized by it. Such is its disintegrating and shrinking effect upon any tissue with which it

¹ *Nasal Catarrh and Allied Diseases*, by Beverley Robinson, M.A., M.D. Second Edition, New York, 1885.

comes in contact, that after the sloughs have separated and the surfaces cicatrized, a considerably larger interval will be found between the approximating surfaces than existed previous to the application. Hence this caustic is adapted with peculiar propriety to that region of the nose with which our subject is mainly concerned.

ANTERIOR NASAL POLPYI

In the next stage of the disease the osseous textures of the spongy process are more or less implicated; its cavities or surfaces, or both, are developing myxomatous tissue, and the trabeculæ begin to afford indications of limited areas of necrosis. The spongy bone is now considerably increased in size, reaching the septum in the middle line, and blocking up the middle passage of the nose. At the same time all this disease may be obscured by mucous polypi, more or less pedunculated, and which, though attached to the middle spongy bone, may descend so far forwards as to be visible to the unassisted observer at the external orifice of the nose.

It is usually about this time that the patient's anxieties become excited, and measures are adopted for the removal of the pendulous growth; both patient and surgeon being usually satisfied with the accomplishment of this end. Under these circumstances the reader will not be surprised that the patient is told that he may expect a return of the disease; nor, from this point of view, will it appear unreasonable that the belief in the incurability of nasal polypus should be a widely prevalent one. If the author's contention be valid, the ablation of a polypus is only the first step to the treatment, by clearing away a product of the disease, which obscures its *fons et origo*, but which latter is scarcely affected by it, and except for the temporary removal of obstruction,

is of real value only so far as it prepares the way to a right estimate of the conditions which underlie it, with a view to the further and complete treatment of these.

It is necessary, however, briefly to consider how this first step may be best accomplished. To this end it will be usefully borne in mind that over 90 per cent of nasal polypus cases are associated with the *middle* spongy bones, because this fact indicates the probable situation of the attachment of the growth when, as often happens, it is not easy to make out by any other means this essential factor of a successful operation. Obviously, reference is here made to operation by means of the snare or wire *écraseur*, which, in what may be called a virgin case—one, that is to say, which has not undergone previous treatment—is incomparably the best method; perhaps it is the only one that deserves to be classed as a surgical operation amongst the various methods still in vogue for effecting the object in view. True, it requires a knowledge of how to illuminate the nares, but this is not so difficult to accomplish as to constitute it an obstacle to the operation.

With regard to the choice of a snare, that known as Jarvis's, and which carries a loop of piano wire, is for ordinary purposes the best. The meatus being distended with a speculum, and a good light thrown into the nares, the snare is introduced so that the wire-loop is first parallel with the long axis of the meatus, after which it is turned so as to lie more or less parallel with the floor of the nose. This will bring the loop under the polyp, which should then be surrounded by the wire by raising the distal end of the instrument upwards and slightly outwards. When it is *seen* that the polyp is engaged in the wire-loop, the end of the snare should be pushed backwards and outwards, which will bring it against the spongy bone, and therefore as near as may be

to the peduncle. The wire may now be tightened, which will assure the operator that he has grasped the tumour. The operation is completed by working the screw until the obstructing mass is severed, when the snare is felt to be free. It is now withdrawn and the severed polyp seized with forceps and removed from the nose. This proceeding may be repeated, with such modifications of manipulation of the snare as the situation of the remaining growths may require. It will be necessary to wait for the cessation of bleeding which may follow the removal of one polyp before proceeding to the next. Syringing with cold water will check this hæmorrhage, which is seldom very troublesome. Cocaine applied previously will greatly facilitate these procedures.

POLYPI PROJECTING INTO THE POST-NASAL SPACE AND BEHIND THE SOFT PALATE

Whilst the usual seat of ethmoiditis is the anterior aspect of the middle turbinated bones, and its progress is from this point backwards and upwards, it is not altogether rare to meet with cases where the disease originates in the posterior surface of the spongy bone, the anterior portion remaining for a long period free from any indication of morbid action. Such posterior developments are more difficult of diagnosis than the others, and without recourse to posterior rhinoscopy would, in the early stage at any rate, fail to be made out at all. They are occasionally the seat of polypus, and when this happens the polyp, being free to grow into the post-nasal space, does so with great rapidity, and rapidly becomes pedunculated, owing to the fact that the tumour meets with no support to its weight, which therefore drags upon and stretches the loose tissue at its point of attachment. It is in these cases chiefly that polypus,

having its origin in the nose, is found to occupy a position behind the soft palate, where it may be readily seen on inspection through the mouth. The pedicle or stalk of these tumours occasionally attains an unexpected length; in one case removed by the author this measured close upon 2 inches, and could be seen on anterior inspection as a white band against the outer wall of the inferior channel of the nose. These polyps are usually single, and impart to the finger a firmer feeling than those met with in the nose itself,—a circumstance which is probably due to the compression they undergo between the wall of the pharynx behind and the stretched tissues of the soft palate in front. When effectually removed they show a less tendency to recur than do polypi arising from the more usual situations within the nostrils.

The readiest method of removing these growths is by means of the snare introduced through the nostril corresponding with the side to which the pedicle is attached. There is sometimes a difficulty in getting the wire-loop through the posterior opening of the nostril, owing to the close approximation of the tumour to it, and contact with which causes the wire to bend upwards, instead of passing downwards towards the mouth. This difficulty is overcome by the use of a flexible blunt fork or carrier, suitably curved, into which the loop is hooked, and which readily conducts it past the obstruction until it is fairly behind, and if necessary below, the soft palate. In this latter situation the loop is manipulated with a finger of the operator's left hand, so as to cause it to encompass the polypus. The snare is then somewhat withdrawn from the nostril, so as to cause the loop to enclose the pedicle, when the wire may be tightened till the latter is divided. The polypus will usually descend into the mouth, where it should be watched for by the surgeon.

The surgical measures required to deal radically with the disease to which the myxomatous growths are due after evulsion of the latter, will be the same as are required for the treatment of that stage of ethmoiditis where the proliferating process is seen in the form of granulations; or where, without any visible sign of proliferation, cleavage is commencing, or is already completed. They will accordingly be most conveniently discussed together. There can be little doubt that the conditions alluded to are very generally overlooked. Nor is this to be wondered at, seeing that except for some post-nasal catarrh, or tendency to frequent "colds in the head," to which in all probability the patient attaches no importance, he will be unconscious of any nasal trouble: and this notwithstanding that a state of things exists in his nose which, were it present in his tibia, would excite unbounded alarm. He may complain of asthma, or neuralgia, or vertigo, or deafness, as well as of being depressed in spirits to the verge of hypochondriasis—or he may have all these symptoms, and have suffered many things of many physicians for their relief—yet no one has even so much as suggested a possible source of his many ailments in his nose.

CLEAVAGE AND GRANULATIONS

Without a previous knowledge of the pathology of the disease, it is not too much to say that the appearances now presented will be quite unintelligible. There will be one of two conditions: either the cleft will be quite obvious, running through the presenting surface of the tumour and dividing it into two nearly equal portions, Fig. X. p. 16, the line of division being often clearly indicated by a streak of thick muco-pus; or the cleft is occupied by a mass of granulation-tissue, and a crop of the same growth

may be seen creeping round the external margin of the spongy process. The latter gives the observer the impression of being attached to the external wall of the nasal fossa, Fig. VI. p. 12. In Dr. Robinson's work¹ already alluded to he says: "We find on one, or more frequently on both sides, a large red mass, which is evidently attached to the outer wall of the fossæ, and which almost, if not quite, touches the septum narium by its inner aspect. Such tumours are not to be confounded with mucous nasal polypi, which are of lighter colour, and ordinarily pedunculated. If we make use of a probe, we cannot limit their base, which forms part of the soft tissues covering the turbinated bones, and upon pressure, while the probe will sink in slightly, it will soon be arrested by the solid bone beneath; and yet these two very different morbid changes are often confounded one with the other." The reader who has followed the author through the earlier chapters of this work will quite understand the origin and nature of this "large red mass," and also its relation to true mucous polypus. He will know that it represents the granulation tissue of mucous membrane when irritated by the presence of diseased bone, and corresponds to the prolific granulations, or "proud flesh," seen in connection with diseased bone elsewhere. He will know further that at certain points, not determinable beforehand, this same tissue may develop into true myxoma. Sometimes the whole of it passes into this condition; at others this transition occurs at one or two points only; while in yet other cases it may remain in this lymphoid stage for a very considerable period.

Obviously it will depend upon the period of development reached by the case when first observed as to whether these granulations, proceeding *apparently* from the outer wall of

¹ *Op. cit.* p. 93.

the fossa and those emerging from the cleft, shall have so massed themselves together as to appear to have a common origin in the outer wall, and to have grown to such proportions as to reach the septum. It requires one to have watched many cases throughout to determine these points. At any rate the conclusions arrived at by the author are those already stated,—the outer mass does not as a rule connect itself with the outer wall of the nose, but proceeds from the pathological breach in the outer aspect of the turbinated bone as already described, and is turned forwards by the opposition to its growth presented by the unyielding external wall of the nose, so that it appears upon the presenting surface of the spongy bone. The exception to this rule occurs when the necrosing process extends from the turbinated process to implicate in a similar way the orifice of communication with the antrum of Highmore. One occasionally finds this orifice very much enlarged and presenting bare spicules of dead bone, with granular masses springing from the superior maxilla in the vicinity of this orifice, and in fact extending into the cavity of the antrum, as well as obtruding into the nasal fossa. In this way polypoid disease of the antrum, or of its inner wall, is developed, but obviously this is only an instance of the spread of the initial ethmoiditis to the contiguous structures of the superior maxilla, just as in other cases we find the orbit implicated by similar contiguity, as described at p. 24. But it quite as frequently happens that a true polypus will be seen proceeding apparently from the outer wall of the nose, and gradually growing inwards towards the anterior nares. Allusion has already been made to this appearance, and its explanation given in the fact that in many instances myxoma develops in the cellular inter-spaces of the spongy bone, without passing through the intermediate stage—so far

as is known—of lymphoid granulation, and by its expansion largely assists the process of cleavage. When the cleft is sufficiently large to allow the myxomatous mass to escape, it grows rapidly forwards, presenting to the eye of the observer the delusive appearance of a polypus growing from some point on the outer surface of the spongy bone.

From the practical therapeutic point of view, which especially concerns us now, it being clear that the disease has reached its proliferating stage, it behoves the surgeon to recognize the meaning of these proliferations,—that they are the evidence of another deeper seated and vastly more important condition, viz. ethmoiditis,—and above all, that he does not fall into the common error of mistaking the proliferation, which is but one form of expression of the underlying disease, for the disease itself.

The surgeon who may be confronted with a state of disease in the nose such as that just depicted, will endeavour to define the line of treatment he should adopt in reference to it, and he will be largely guided in his decision by his knowledge of the pathology of the disease, and of its tendencies. It may safely be affirmed that at this proliferating stage of ethmoiditis, exposed bone may be detected with a suitable probe, in almost every instance. Even if it should fail to be detected, its presence may be inferred, because pathological study of the disease at a stage anterior to this, shows clearly that underneath the mucous covering the osseous tissue itself is undergoing those degenerative inflammatory changes seen in caries; canaliculization is in progress, by means of which the trabeculæ are perforated with numerous passages which cut off and isolate small portions of the bone, which remain denuded and necrosed. These changes are in progress throughout the whole of the enlarged portion of the spongy bone, and insidiously they

are extending into more and more of the contiguous structures. The proliferations are, as in other regions, the outward and visible signs of the internal vice. The author asks, How would any experienced surgeon act in reference to such a state of things occurring in any other equally accessible locality? and he does not hesitate to reply that he would attempt the elimination of the diseased area by one method or another, and would not cease his efforts until sound cicatrization showed him that these had been successful. Does he hesitate to excise the knee-joint to remove such a morbid mass from the end of the femur, though the doing so is more dangerous to the patient, if not more difficult of execution, than the elimination of the necrosing portion of a turbinated bone?

Clinical, apart from pathological, experience has long taught that some such effort should be made. Thirty years ago the students of surgery in London were instructed that the best way to prevent the recurrence of polypus was to tear off some of the subjacent bone along with the growth. Even to-day this method is not without its occasional followers, for in Dr. B. Robinson's work already quoted, at p. 115 we read in reference to the treatment of hypertrophy of the spongy bones as follows:—

“Evulsion of the mucous membrane is a second method of surgical cure. Gross speaks of tearing away the redundant mucous lining, and, if necessary, *the middle turbinated bone itself*. (The italics are the author's.) I (Dr. Robinson) formerly considered this as the readiest and most effectual method of accomplishing a radical cure. One case in which I made use of it, within a year, makes me urge caution in its adoption, since the after effects of pain and swelling of the face on the side operated upon, with great pain and soreness, followed by abundant discharges from the nasal

fossæ, were such as to be a source of considerable anxiety to me during many days."

Truly, if the resources of surgery were limited to the above procedure it would be better to leave the disease to itself.

But the object aimed at,—the ablation of the diseased tissue,—can be accomplished more certainly, as well as quite safely, in the following manner. In the first place it may be necessary to get rid of the neoplasms in order to expose the underlying tissue. These, if sufficiently large, may be removed with a snare: small granulations and polyp-buds are most rapidly destroyed with the galvano-cautery. Then, the hypertrophied process being fully exposed,—and it is to be noted that this preliminary clearance of super-imposed neoplasms is not always necessary,—as much as practicable is included in the loop of the snare, the wire, when necessary, being prevented from slipping by means of a small fork attached to a long flexible handle, and the loop thus firmly fixed against the tumour. As the loop is tightened by working the screw, the mass is slowly cut through, and may be withdrawn from the nostril with forceps.

Jarvis's snare may be used for the purpose; it has, however, certain drawbacks which the author has endeavoured to rectify in the instrument figured below.

The advantages claimed for this instrument are that the winder is far removed from the point where the instrument is held: the addition of a large handle by which it can be grasped firmly when *in situ* gives steadiness and certainty to the manipulation. This instrument is used with piano wire as in Jarvis's snare.

The object of the operation is to relieve the patient *at once* of as much diseased tissue as may be accessible; at the

same time it is necessary clearly to recognize the fact that the morbid processes may have invaded regions wholly beyond the reach of the instrument. Should this prove to be the case, the patient's position, as will be subsequently shown, is every way benefited by thus getting rid of a mass of disease which prevents access of remedial measures to parts immediately covered by it, and where the mischief is actively progressing. Judging from the author's experience,

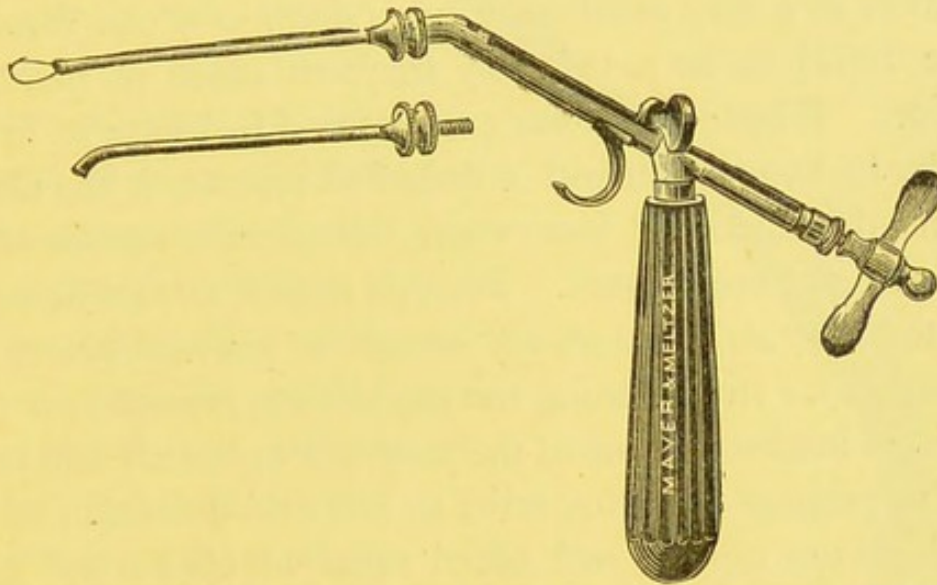


FIG. XXIII.—Author's nasal snare, specially adapted for extirpating hypertrophied spongy tissue.

this method of removing diseased portions of the middle spongy bone is a perfectly safe proceeding, whilst it shortens the period of treatment, and for the reasons just stated adds to the prospect of a successful result. At the same time it should be remarked that recourse to it should be reserved for cases of exceptional severity, or for those in which the various methods of cauterization are judged likely to prove ineffectual, or in which many months would be occupied in accomplishing a cure by their means.

Occasionally the middle spongy bone assumes such large proportions, and is so firmly wedged into the septum, that it is impossible to pass a snare round the mass. Yet it is

exactly in these cases that the necessity for operative interference becomes most imperative, not only on account of the obstruction to nasal respiration thereby occasioned, but because in these the most wide-reaching reflex symptoms, often of great urgency, occur most frequently.

Speaking of these exaggerated growths, Dr. B. Robinson says (*op. cit.* p. 191): "The enlargement of the middle turbinated bones particularly, has been shown by Dr. Bryson Delavan in a very excellent paper (*Archives of Laryngology*, June 1882) to be a tolerably frequent cause of nasal occlusion. Whenever he has encountered this form of hypertrophy in connection with a deflected septum, it has always occurred in the nasal fossa where the concave surface of the deviated portion existed. For this reason Dr. Delavan has insisted that *this bone should always be removed* before any operation for straightening the septum was resorted to. . . . In these instances none of the methods ordinarily employed for the purpose of giving relief to cases of deflection of the cartilaginous septum will afford relief to obstructed nasal respiration. In order to accomplish a cure, recourse should be had to the use of the dental engine, and drills and burrs of different forms . . . to bore one or more holes in the bony projection. Once the projection is considerably weakened after this manner in its attachment, it is cut away by means of a suitable burr until the nasal passage has become sufficiently pervious."

The author has never had recourse to the drill to remove obstructions caused by enlargement of the middle turbinated bone, because in these cases where the septum is deflected towards the opposite nostril, there is room to use the snare, which in his hands has accomplished the removal of the obstructing mass with ease and rapidity. The instances referred to by Dr. Delavan were probably those in which

the tumour existed in one nostril only. But there are cases in which the middle turbinated bones of each nostril are similarly expanded, in which the septum is tightly nipped between the two, and cannot deviate to either side. The occlusion of the nostrils in some of these is almost complete, and the voice quite nasal.

In contending with these cases the author has found the curved gouge—the cutting end of which forms an acute angle—to afford marked assistance, as it is possible with it to cut off the tumour at a single stroke. Occasionally, however, this can only be accomplished by instalments, when the process of elimination will be aided by the use of suitably shaped cutting forceps or scissors.

A distinct gain is accomplished by operative means even when a portion only of the disease is removed, because an

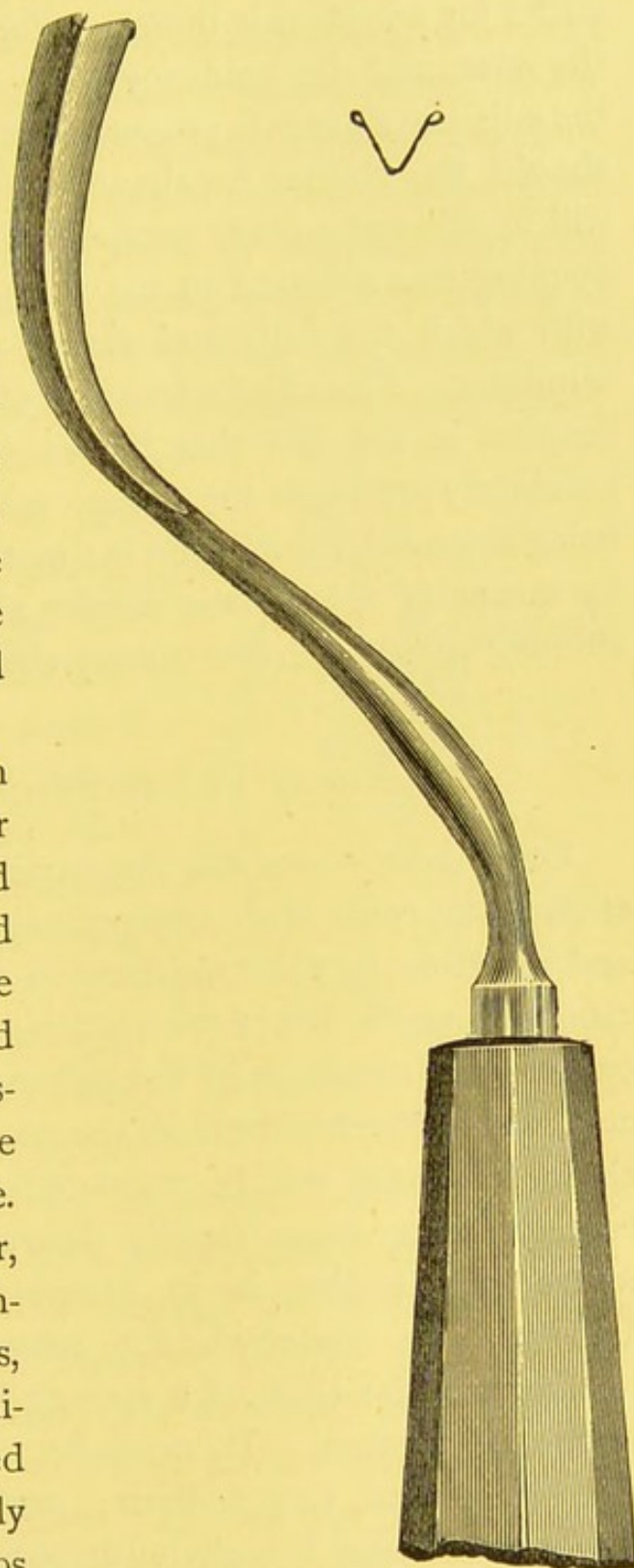


FIG. XXIV.—Author's curved gouge.

outlet for secretion is thereby afforded into the passages of the nose, and the tendency of these to find their way into the adjacent sinuses is proportionally diminished. Moreover, should the sinuses be already implicated, their secretions will be allowed a ready escape by means of the free surface-opening now afforded to the tortuous and narrow channels with which the cells and sinuses of the region intercommunicate. The chief advantage of even a partial operation consists in the fact that the external osseous shell which previously protected the disease against assault from without being removed, the surgeon is free to follow it into its depths by means of the caustic carrier above described, or with suitably shaped galvano-cautery electrodes.

TREATMENT IN THE STAGE OF CLEAVAGE

Leaving for a moment these cases of exceptionally severe ethmoiditis, with their exceptional methods of treatment, and reverting to the consideration of the treatment of the more ordinary forms of ethmoiditis—those in which cleavage occurs—the resources of the galvano-cautery, or of chromic acid, will suffice to supply all the needs of the surgeon. The choice of these will be regulated by circumstances; the cautery being more rapidly destructive, will be selected where proliferation is in progress: whilst the chromic acid will be preferred, for reasons already explained, to diminish the bulk of a spongy bone which is pressing upon the septum. It must be confessed that some of these cases are very tedious; especially is this the case where the disease has obviously obtained a deep hold upon the ethmoidal cells, and in which instances the surgeon naturally pursues his manipulations by tentative and cautious steps. In the majority of patients, however, after destruction

of the superficial tissue, as well as of that lining the cavity with which the cleft communicates, complete arrest of the disease takes place. The earlier the patient is seen, therefore, the better are his chances of speedy recovery under treatment. When this successful result is obtained the cleft turbinated process becomes covered with thin cicatricial tissue, and the secreting glands having disappeared, discharge is arrested or reduced to unnoticeable proportions. The patient is now cured. The crater-like appearance of the cicatrized remains of the spongy bone resulting under these circumstances is well illustrated in the subjoined cut, taken from a patient of the author's treated on the lines above indicated. But many varieties of this appearance are met with, two cases being seldom alike.

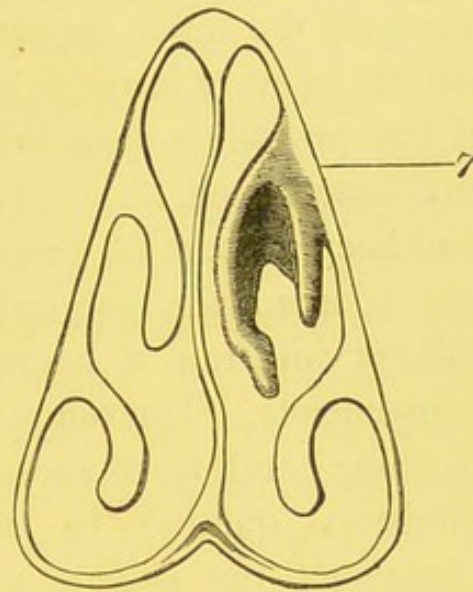


FIG. XXV.—Crater-like appearance of cleft middle spongy bone on recovery after treatment.

With the removal of the products of the pathological processes, to which the progressive hypertrophy and expansion of the turbinated bones have been traced,—any further departure in this direction is arrested. Recovery, however, is further assisted by the contraction of the cicatricial covering of the sound residual shell, in consequence of which the inner portion which had impinged upon the septum tends to shrink further from it, and at length leaves it perfectly free. In this way the breathway is restored through the middle channel of the nose,—a circumstance in itself of no little importance to the comfort of the patient. At the same time any reflex neuroses which may have been set up by pressure upon the septal nerves will

be greatly ameliorated by its removal. In many instances such neuroses will disappear permanently with the withdrawal of the cause which gave rise to their occurrence.

AFTER TREATMENT

Respecting the precautions to be observed after any of the operative interferences with the nose referred to in the context, the most important of these is that the patient should in every instance keep the house for a day or two; if the procedure have involved removal of portions of the turbinated bone, he should remain in bed till the fourth day, and keep indoors till a week has elapsed. If these measures are adopted the surgical fever which almost invariably follows will run a natural course, and occasion no inconvenience. The temperature should be taken night and morning, and if it exceeds 101° the author usually administers quinine in 2 gr. doses, which serves to counteract the *malaise* which generally attends the subsidence of the fever. This, with attention to the state of the bowels, is usually all that is required. Locally, he finds it best to leave the parts untouched for forty-eight hours; at the expiration of which time, the plug of iodoform wool which had been applied to the wound after the operation may be removed, an insufflation of iodoform, or iodol—if the patient object to the smell of the former—applied, and a fresh plug of wool introduced. About the third or fourth day, when the patient will be leaving his bed, the nose may be sprayed night and morning with a warm solution, consisting of

Sodæ bi-boratis	ʒijs
Acidi borici	ʒjs
Aquæ	ʒviii

a few minutes being then allowed to elapse before using the insufflator, to introduce a fresh covering of the powder.

GRAVER FORMS OF POLYPOUS DISEASE

There remains for consideration the small group of cases to which reference was made at p. 25, Chap. III., as constituting the third group of polypous disease. The patients belonging to this class are usually advancing in years, and though they have been subject to the disease for a varying length of time, have as a rule neglected its treatment. The nasal cavities are found completely blocked with myxomatous growths of varying degrees of consistency, whilst the middle spongy bone is represented by a necrosed squame, or the cellular structure of the entire ethmoid bone is degenerated, and infiltrated with proliferating material. It is in these cases that the surgeon is confronted with the most perplexing problems with regard to treatment. Simply to remove these polypi is to invite their speedy return—and in some instances to favour the establishment of a quasi-malignant form of polypoid proliferation.

In old subjects, or where the disease has existed over many years in comparatively young ones, the vitality of the entire region becomes lowered to such an extent that a very slight shock will determine an acute necrosis of the adjacent bones of the face. This is particularly liable to happen when the frontal sinus has become invaded by the progress of the disease from the nose upwards, the matter from which escapes by a tortuous channel opening usually in the upper eyelid near the inner canthus. The condition of such subjects is clearly a perilous one, but they will exist longer without surgical interference than with it. As intimated in the case already referred to, p. 25, the subjects

of this group of polypoid disease are prone to implication of vision through the orbit being involved in the disease, and ophthalmologists are not unacquainted with fatal cases of blindness coming on as a sequela of so-called nasal polypus, but which cases are really examples of progressive ethmoiditis of the type under review.

As an example of polypous disease, admitting only of the most tentative treatment, the following may be quoted, and for the notes of the case the author is indebted to his clinical assistant, Mr. Kelson, M.R.C.S.

This patient appeared in the author's clinic at the London Hospital. He is a weaver, aged sixty-five. He had been conscious of the presence of the disease for about three years, and a single polypus had then been removed by forceps. Some twelve months afterwards he noticed loss of power in his right arm and leg, with slight tremors of the limbs on voluntary movement. From this condition he partially recovered. When first seen in May 1886, the nose was entirely blocked with multiple polypi, the deeper-seated ones having a broad base, covering bulky and disintegrating bone in the ethmoid region, where an extensive surface of bare bone was readily detected. From the root of the nose, and extending downwards to the upper margin of the alæ, and outwards towards the cheek for about three-quarters of an inch from the middle line on each side, was a soft rounded swelling, caused by the protrusion of the polypoid mass through the partially absorbed nasal bones, which could only be distinguished as hard ridges in the central line.

Warned by the indications of progressive invasion by the disease of the sinuses at the base of the skull, and the probable existence of chronic meningitis in their neighbourhood, the treatment in this case was confined to the most careful removal with the snare of the more prominent polypi, with the view of securing a breathway through the nose; while the flatter neoplasms were attacked with chromic acid. In this way the mass was so far reduced, that the external contour of the nose resumed its natural appearance, though a distinct gap remained between the nasal processes of the superior

maxillæ and the nasal bones on either side, which fissure was covered only by integument. The quasi-paralytic state of the right limbs varied from time to time, but on the whole grew worse. The patient is still under observation, and with the aid of this tentative kind of treatment manages to prolong an unenviable existence.

The constant headache, general *malaise*, nervous prostration and sleeplessness of these patients render their state truly pitiable. Notwithstanding, the presence of such symptoms as concomitants of nasal neoplasms should caution the surgeon to restrain his efforts for their extirpation. Are we then to stand by helpless? There is one resource which avails to palliate the condition just described. It is the use of the *opium pipe*. The credit of introducing this solatium for the relief of incurable forms of polypous disease is due to Dr. Thudichum—an early pioneer in reforming the surgical treatment of nasal polypus. The advisability of this treatment is enforced when judged from the point of view of the present thesis, because the disease will now be recognized as including the potentialities herein shown to belong to the state of *progressive necrosing ethmoiditis*, rather than to the simpler one of nasal polypus.

The relief occasioned by opium smoked through the nose under the circumstances above alluded to is very great; and in those few cases where the author has had occasion to advise its use, under strict supervision, has afforded the only means of alleviation to the life of suffering uselessness to which otherwise these patients are condemned.

Opium thus used has, moreover, the great advantage of affording time for the occurrence of the conservative induration of the meninges already referred to, by means of which a barrier is interposed between the diseased bones at the base of the skull and the surface of the brain. This

result is more likely to come about when the subject is under rather than over fifty years of age. But even in the case of the aged sufferer in whom the end is obviously approaching, to secure at least immunity from pain will scarcely be considered an unworthy object of the healing art.

APPENDIX

OF SUPPLEMENTARY OBSERVATIONS

THE following remarks are added with the view of further illustrating the facts which have occupied the attention of the reader in the previous chapters, by presenting to him a series of similar phenomena of reflex vaso-motor origin, but happening in regions quite other than those already examined. The symptoms thus evolved in the new regions referred to, supply examples of skin rashes, neuralgia, etc., but are introduced here chiefly to illustrate the behaviour of a patch of integument when subjected to reflex vaso-motor irritation; and further, to bring under more direct notice some steps of the trophic changes which are induced by the continuance of these impressions, and the effect of these in the evolution of morbid phenomena generally.

Probably no more suggestive material exists on these points than that furnished by the records of cases of wounds and contusions of nerves, where the observer is presented with a direct vivisectional experiment, the results of which work themselves out with exceptional clearness. These, and some other nerve lesions of *idiopathic* origin, presenting similar symptoms, will supply the facts for the supplementary comparison referred to in the preceding paragraph.

Seven cases of traumatic nerve lesions, recorded by Dr.

Weir Mitchell and his colleagues of the United States army,¹ will be briefly noted. It was in some of these where the brachial plexus was injured that the phenomenon of *falling* on receipt of the injury occurred. This fact introduces the implication of an end-organ—the labyrinth—into the series of symptoms resulting upon the injury. It almost tempts one into a digression to investigate the mechanism by which this symptom is brought about as a sequence of an injury of the brachial nerves; but apart from the circumstance that it would lead too far from the present purpose, this symptom is part of the large subject of Vertigo, and has been considered with it in former treatises on this particular subject. The following cases are selected with a view to illustrate tissue metamorphoses following the nerve lesion.

David Schwely, *æt.* seventeen, shot in the neck at Gettysburg, *wounding the axillary nerves of right side.* Burning pain began on the tenth day in the palm and fingers of the right hand. (This burning pain is an almost constant accompaniment of injury to a nerve.) Sensation in the limb was but little impaired. The joints became swollen and contracted. About a year and a half after receiving the wound the entire arm was shrunken, many muscles being represented by the merest trace, and from their contracted state the wrist was partially dislocated. On the back of the hand, from the knuckles to the finger-tips—and it is the symptoms immediately detailed which point to the implication of the sympathetic system in the original lesion—the skin is tense, shining, hairless, mottled red and blue, and abraded in spots; nails curved as in consumptive patients; joints swollen, tender; the whole palmar surface of the hands and fingers is polished, deep scarlet, and eczematous. The eruption followed the burning pain in about six weeks: the palm of the left hand is

¹ *Gunshot Wounds and other Injuries of Nerves*, Philadelphia, 1864.

almost equally eczematous, and began to be so nearly a month before the wounded side.

Case 19 is less marked. It records a gunshot wound of the *left brachial plexus*; with paralysis of motion, atrophy and contraction of numerous muscles; finger-joints swollen and stiff.

Case 20 affords a striking parallel to one to be presently stated of idiopathic origin. There was a gunshot injury of both legs, with *injury of the sciatic nerves*. Paralysis of flexors of feet, intense burning pain, ulcers about nails, congestion and eczema, but no thinning of the skin.

Case 21. *Gunshot wound of sciatic nerve*.—Partial paralysis of motion and sensation, burning pain, successive crops of eczema about every two weeks, as high as knee, with relief to burning pain.

Case 22. *Gunshot wound of brachial nerve*.—Slight loss of motion and sensation, early occurrence of burning pain, diseased joints, no eczema, but remarkably acid sweats. These disappeared during electrization of arm.

Cases 24 and 25 are similar, but require no special detail. The next cases, abridged from Sir James Paget's lecture in the *Medical Times and Gazette* of 26th March 1853, are interesting as affording probably the first reference to the symptoms under review. An epileptic patient consulted him concerning the consequences resulting from a cord having been tightly applied round the wrists and arms during an epileptic seizure. The immediate effect was dropping of the hands, like those of a patient with lead palsy. They then became œdematous and very painful. On the subsidence of these symptoms the muscles of the forearms and hands were wasted, especially those of the balls of the thumbs and little fingers. The skin of the fingers afterwards became smooth and glossy, and the

palmar cuticle peeled. Recovery was gradual. Another instance from the same lecture records similar conditions :— A lady fell with her hands tied behind her, and in doing so forcibly withdrew one hand from the silk handkerchief which confined them. This was followed by weakness and stiffness of the hand, and numbness in the course of the distribution of the median nerve. After four or five weeks the back of the hand and fingers became hot, red, and glistening. The loss of power and defect of sensation in these cases left no doubt in Sir James Paget's mind of severe injury to the nerves of the forearm. It will be obvious, however, that some other elements than those furnished by sensory and motor nerves must have been implicated to produce the trophic changes witnessed in all these cases. Comment on this point is reserved till the completion of the series of cases of both traumatic and idiopathic nerve lesions.

The next example occurred in the author's practice :—

In the year 1864 a child, aged twelve, ran a thorn into the wrist on its anterior aspect some months before applying for relief. The site of the puncture was exactly over the *median nerve*. Since the accident, the inner side of the arm, from the elbow downwards, had been numb, and a *papular rash* had existed in this locality during the greater part of the time.

Another instance formerly recorded¹ from the author's experience, of injury to the ulnar nerve, will serve to recall attention to the readiness with which an "end organ" may be made to evolve symptoms peculiar to it, though seated far away from the site of the original lesion. A lad received a sharp blow from a tennis-ball, thrown with considerable violence, where the ulnar nerve is exposed at

¹ *Deafness, Giddiness, and Noises in the Head*. Second Edition, p. 105.

the spot popularly known as the "funny bone." Immediately he became giddy and confused in the head, and would have fallen but for the support of some railings: altogether the extreme distress which the subject of this slight accident manifested, and which included nausea and a tendency to vomit, appeared altogether out of proportion to the cause which induced the symptoms—but which symptoms may be definitely traced to the association of the sympathetic fibres of the ulnar nerve with the inferior cervical ganglion, and the reflex relationship of these to the vessels of the labyrinth.

Of a similar kind is another case of injury to the ulnar nerve recorded by Dr. Weir Mitchell.¹ G. A. was shot through the left ulnar nerve, and had at once great *agitation of the heart*, which was for some days his dominant symptom. When it is remembered that the inferior cardiac nerve of the inferior sympathetic ganglion is an important factor in regulating the heart's action, and that a shock reaching this ganglion from the afferent sympathetic fibres of the wounded ulnar nerve may be reflected in the ganglion to the inferior cardiac nerve, it is easy to understand how such "agitation of the heart," as happened in this case, may be thus brought about.

Before leaving these traumatic cases to consider the series of nerve lesion of an idiopathic origin, it should be stated that all the authors quoted agree that the phenomena arising under the former variety are most marked and of longest duration where the nerve is partially injured, but not completely divided or destroyed.

In the group of cases of *idiopathic nerve lesions* in which skin rashes are associated with neuralgia, *shingles*

¹ *Injuries of Nerves and their Consequences*, S. W. Mitchell, M.D., Philadelphia, 1872.

affords perhaps the best type. In the lecture already quoted, Sir James Paget speaks of two cases of *shingles affecting the arm*, in which neuralgia of the limb remained after subsidence of the rash, and with it the fingers exhibited in a well-marked degree the features so often seen after injury of a nerve. That is to say, they became thin and tapering, smooth, hairless, glossy, pink and blotched, as if with permanent chilblains. These symptoms subsided slowly, being unaffected by the ordinary treatment of neuralgia.

The same author reports in the *British Medical Journal*, 13th October 1866, a case in which an analogous series of events occurred : but inasmuch as the nerve affected found its ultimate ramification in a different texture, in bone as well as skin, a further varying of the experiment is afforded, and additional proof adduced of the uniform character of the morbid processes operating through all these cases. A gentleman after exposure to cold had *neuralgia in the right side of his face*. In three days an herpetic eruption set in, which coincided with the surface distribution of the infra-orbital, anterior dental, and anterior palatine branches of the right superior maxillary nerve. The eruption extended to the right half of the roof of the mouth and adjacent parts of the gums and cheek. Subsequently necrosis of the alveolar border of the jaw occurred, the teeth of which fell out, and ultimately the bone itself came away. Complete recovery followed, but well-marked pitted scars, unlike the Herpes of shingles, remained on the site of the eruption.

An instance of *Herpes of the brachial plexus* is reported by Dr. Broadbent in *British Medical Journal*, 27th October 1866 :—

A woman, *æt.* seventy-four, after suffering for a week with severe burning pain in right side of neck and right arm, with

herpetic rash extending from the lower cervical vertebræ (corresponding with the distribution of the small posterior branches of the plexus) across the right side of the back of the neck, over the shoulder, and down the outer side of the arm to the upper part of the forearm on its outer aspect, lost the use of the arm. The burning pain closely resembled that described in traumatic lesions, and the almost general but incomplete motor paralysis of the limb still more closely allied it to these. The patient appears not to have benefited by treatment.

This case supplies another link in the chain of phenomena which ally the two groups: viz. the association in an idiopathic case of paralysis of motor nerves, pain in sensory nerves, and cutaneous rash.

A further variation of symptoms is seen in a patient of Mr. Hooker, *Lancet*, 1859, where *neuralgia in the leg* was associated with superficial ulcers: it was successfully treated by division of the popliteal nerve. After the operation the pain disappeared and the ulcers healed.

Such cases might be multiplied indefinitely, but the foregoing will suffice to show that there is no single feature peculiar to any form of the disease, whether idiopathic or traumatic in its origin. Thus glossy skin, or, in other words, *atrophy* of the skin—a typical feature of such an extreme lesion of a nerve as results from a gunshot wound of it—is also found in company with idiopathic Herpes of the arm. The necrosis of the jaw in the case of facial Herpes with neuralgia, has a parallel in the ulcerated patches of integument (a cutaneous necrosis) occurring with severe neuralgia of the leg. And though an apparent divergence is presented in the character of the rashes described, these are all varieties of the same type, and own the same pathological cause. The special character of the rash is determined chiefly by the anatomical situation and arrange-

ment of the set of vessels reflexly affected by the dilator or contractor impressions conveyed to them, and by the permanency of one of these states, or their alternation one with the other.

A tabular presentation of these occurrences will place them more clearly before the reader, thus:—

Traumatic Nerve Lesions.

Of Median Nerve.	Numbness.			Papular rash.
„ Axillary	„ Neuralgia.	Palsy.	Eczema.	Glossy skin.
„ Sciatic	„	„	„	Ulcers about nails.
„ Brachial	„	Œdema.	„	Ulcers, glossy skin.
„ Ulnar	„	„	„	Agitation of heart.
„ „	„	„	„	Vertigo.

Idiopathic Nerve Lesions.

Herpes Brachialis.	Neuralgia.	Glossy skin.
„ „	„	Motor palsy.
„ Facialis.	„	Necrosis of jaw.
Ulcers of integument of leg.	„	Cured by division of popliteal nerve.
Eczema of leg.	„	Glossy skin, cured by division of popliteal nerve.

Now if we tabulate in like manner, for the sake of comparison, the symptoms discussed in the foregoing chapters, due to irritation of nerves arising in a defined centre of morbid action, viz. ethmoiditis, we shall find a remarkably close correspondence to the symptoms described in the two former groups.

Consequences of Nerve Lesions originating in Ethmoiditis.

Skin rashes.	Injection of integument of nose. Erythema of cheek.
Pharyngitis sicca.	Glazed and atrophied mucous membrane of pharynx (the analogue of glossy skin).
Neuralgia.	Of each division of trigeminus, extending also to adjacent nerves.
Motor paralysis.	Paresis of palate, pharynx, larynx, etc.

This analysis might be carried further to show a corresponding implication of end-organs. Thus the *falling* in gunshot wounds of the brachial plexus is paralleled in ethmoiditis by constant vertigo. Further, the agitation of the heart seen in wound of the ulnar nerve is witnessed in a majority of ethmoiditis patients more or less, and in some special cases is competent to give rise to asthma. It does not seem necessary to repeat the evidence in all the groups of cases of the occurrence of motor spasm—this symptom having reference to motor nerves implicated in the lesion, and which, while allowing to it its due weight, is so well recognised an occurrence as to need no special comment in remarks designed to bring into prominence the sympathetic factors to which the totality of symptoms are mainly due.

The author submits the following *conclusions* as some amongst those which may be legitimately formulated from the foregoing considerations.

That when persistent but anomalous symptoms exist of the type of neuroses, it will usually be safe to predicate the existence of some localized source of irritation which implicates a portion of the nervous system: and that, in the majority of such instances, such source of irritation is *not* of the nature implied by the term a *central nervous* lesion.

That in a given number of such cases very grave phenomena may arise from the accidental implication of "end-organs"—seated oftentimes at considerable distances from the original lesion—in the reflex phenomena to which this implication gives rise.

Any attempt to distribute the resultant phenomena to their respective mechanisms, which does not take into consideration the elements of the sympathetic system of nerves and ganglia, must be entirely futile.

The right estimate of the potentialities of the sympathetic factors in this chain of causation demands the recognition of two chief points. One is anatomical, and relates to the fact that fibres of this sympathetic system are associated with nearly all cerebro-spinal, and, as far as is known, with all spinal nerves. The second point is physiological, and relates to the function of these sympathetic nerves. Those just referred to as associated with the cerebro-spinal and spinal nerves are afferent in their function to a particular ganglion of the sympathetic chain with which they are in immediate connection. The efferent branches are those which proceed from a ganglion to an artery and regulate its calibre. *These two sets of branches are in reflex relationship.*

Furthermore, it is necessary to recognize that plus and minus variations of vessel-tension are brought about through the medium of the last-mentioned arrangement, and that such alterations of tension, which are scarcely noticeable when happening in indifferent tissues, assume very noticeable proportions when they occur in an organ of special sense, or, speaking more broadly, in any end-organ. Persistent reflex, and therefore passive, states of vessel dilatation or contraction, *i.e.* minus or plus degrees of tension, induce tissue changes; they regulate the nutrition of the tissue-area in which they occur. The *former* produce hypertrophy;

less tension being equivalent to more blood; hence, in the integument we get congestion and œdema, passing into more or less permanent rashes; in solid organs, *e.g.* the thyroid gland, dilated thyroid arteries, often perceptible to the eye and touch, induce goître: this hypernutrition resulting in the formation of new tissue which approximates more or less closely to the histological character of the area in which it occurs. The *latter* produce atrophy. More tension being equivalent to less blood, or to none at all, owing to complete contraction of peripheral vessels: hence in the integument come ulcers, *i.e.* starvation ulcers, real necroses of skin, seen in the cases already mentioned: and also in duodenal ulcers after severe scalds or burns of the surface.

But, besides the above, plus or minus states of reflex tension occurring in the nutrient vessels of a nerve produce marked effects according to the character of the nerve in which they happen. Thus dilatation of blood-vessels within the sheath of a motor nerve will cause more or less abiding paresis of the muscles innervated by it. The same state established in a sensory nerve gives rise to pain—in other words, to neuralgia. Besides the instances of reflex neuralgia quoted in the previous chapters, more familiar instances may be cited, such as pains in some part of the foot in hæmorrhoids, and of the knee in hip-joint disease.

How variable are the phenomena capable of being induced by this single instance of altered blood-tension within the sheath of a nerve, is shown when the *vagi* are brought within the range of its influence. Motor changes in the larynx and heart have been traced thereto; exhibiting, in the one case, numerous defects of vocalization, and in the other, suspension of the normal mechanism of respiration, and the supervention of asthmatic conditions.

Thus it would appear difficult to limit the extent or variety of morbid phenomena which may originate in a comparatively small area which is the seat of a supposed trivial ailment, especially if this area should possess a liberal endowment of sympathetic nerves.

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