Remarks

ON

HEADACHE AND PAIN IN INFLAMMATION OF NASAL SINUSES*

BY

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It is common knowledge that pain is a frequent and sometimes the chief subjective symptom of chronic inflammation of the antrum, ethmoid, and frontal and sphenoidal sinuses or air cells. We are equally aware that the pain may assume the type of a generalized headache, or be confined to a more or less restricted area. In the latter case the localization of the symptom may be so definite as to suggest the particular sinus which is at fault. On the other hand, it must be emphasized how true but strange it is that one, more, or all the air cells on both sides may be in a state of chronic inflammation, even of the suppurative type, and yet there may be no history of diffuse or of restricted pain in the head. For example, an ophthalmic colleague referred an elderly man to me for examination of his nasal cavities as a possible cause of diplopia with slight downward and outward proptosis of the right eye. The corresponding nasal fossa contained many polypi, and all its sinuses were suppurating. On opening the frontal sinus externally a pulsating discharge of pus under tension escaped. After free exposure and cleansing of the sinus it was seen that its posterior bony wall had been destroyed and its place taken by granulation tissue protecting the dura mater. The inferior wall, or floor of the sinus was also absent, and occupied by intra-orbital tissues covering the upper dome of the eyeball. In spite of these destructive lesions and the presence of pus under tension, the patient was most explicit in his statement, "I have never had a headache in my life."

RELEVANT FACTS

For those who have little practical experience of diseases of the nasal cavities it may be well to state at this juncture a few facts which have an anatomical, physiological, and pathological bearing on that particular aspect of the subject which has been chosen for our discussion.

The accessory nasal sinuses or air cells lie in close relation to one another, especially the ethmoid, frontal, and sphenoidal cavities; consequently it is unusual to find chronic inflammation confined to any one of these. On the other hand, the maxillary antra having a more or less detached and lower position, it is not uncommon to find one of them to be affected, and particularly so when the primary source of inflammation is of dental origin.

With the exception of the specialized epithelium of the olfactory nerve expansions in the higher regions of the septum and ethmoid bone, the nasal cavities and the sinuses which communicate with them are lined by a continuous, columnar-celled, ciliated epithelium. In the living condition and by means of the cinematograph it has been demonstrated that the action of the cilia in each sinus is such as to produce a propulsive and wave-like movement over the surface of the mucous membrane, which is directed towards the nasal cavity by way of the "ostium" of the respective air cell. If one watches a slow-motion picture of a highly magnified ciliated cell, it will be seen that the lash of the cilium is not an indiscriminate waggle, but that it has a slow back and quicker forward movement, which closely resembles the "cast" of the angler or the "drive" stroke of the

correct golfer. It is this concerted and characteristic action of the cilia which causes the general and purposive wave-like movement which tends to expel both normal and pathological secretions into the nasal fossa, and from these towards the anterior or posterior nares. This intimate continuity of ciliated mucous membrane extending from just behind the vestibule of the nostrils to the furthest ramification of the nasal sinuses explains (a) the ease with which inflammation may extend from the nasal cavities to their accessory air cells, or from any one of these to its immediate neighbour; and (b) that if ciliary action is temporarily or permanently inhibited there will be retention of inflammatory products with pain and other clinical manifestations as probable consequences.

Incidentally, such considerations have this important bearing on treatment in that, while every effort must be made to establish free and spontaneous drainage for pathological secretions, equal care must be taken to preserve any inflamed mucous membrane which would appear to be capable of ultimate recovery. Neglect of this precaution may lead to such ultimate complications as pain resulting from obstructive scar tissue, or troublesome crust formation, which may prove an intolerable nuisance to a sensitive patient.

PAIN IN THE HEAD: ANATOMICAL AND PHYSIOLOGICAL ASPECTS

In the consideration of this symptom in relation to chronic inflammation of the nasal sinuses, we naturally envisage the origin and distribution of the fifth or trigeminal nerve, from which the air cells, as well as the whole face area and most of the deeper structures of the head, derive their sensory innervation. As this aspect of the subject will be dealt with authoritatively by my collaborator Dr. Wilfred Harris, there is no need for me to do more than refer to one or two general observations upon it. In a very clear and illustrated account of the anatomy of the fifth nerve Leslie Paton (*British Journal of Ophthalmology*, June, 1926) says:

"The sensory afferent nerves from the whole face area and from a portion of the scalp are gathered together into three main branches of this nerve and pass into the Gasserian ganglion and thence into the pons to be distributed up and down over a very extensive area of the brain stem from the mid-brain on a level with the corpora quadrigemina to the upper cervical region of the cord. . . . This extensive distribution of the fifth nerve from the mid-brain down to the second cervical level and the numerous interrelationships which it forms with the nuclei of origin of all the other cranial nerves form one of the reasons why headache so frequently results from many different causes and is so vague in its distribution."

When pain happens to be a symptom of chronic nasal sinus inflammation its cause is often obvious—namely, pathological secretions retained under tension. This is proved by the fact that release of the discharge is frequently followed by immediate relief of the symptom. But sometimes pain or headache is complained of even though drainage appears to be quite free by way of the natural opening of the sinus into the nasal cavity. This may be due to at least two causes. (1) The presence of a secondary chamber or "loculus" within the parent air cell and not freely discharging into it. (2) A hyper-sensitive condition of the inflamed mucous membrane of the sinus in a patient whose deep trigeminal nuclei have a low threshold of resistance to afferent impulses—that is, both a distal and a central weakness, which is often met with in the type of patient who says he (or she) "never feels really fit." The explanation of this want of tone may, of course, result from a mild toxæmia arising from the infected sinus, or from some independent constitutional factor.

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In other instances headache or pain is produced by mere pressure on sensory nerves in the neighbourhood of the lesion. Here is a specimen of a cystic middle turbinal, as large as a pigeon's egg, which completely blocked the right nasal cavity. Its upper extent was tightly wedged between the nasal septum and the "lateral mass" of the ethmoidal labyrinth. Its removal at once relieved severe pain in the upper nasal region, the inner side of the right orbit, and the corresponding lower mid-frontal region. On this aspect of the subject it is unnecessary for me to say more than that, however uncertain we may be as to ultimate factors of pain in relation to chronic inflammation of the nasal sinuses, we can safely assume that its primary source is due to impulses which arise in the inflamed mucosa of the air cells and pass along their respective sensory nerves to join those others which go to form the ophthalmic, maxillary, and mandibular roots of the Gasserian ganglion. From here they issue in the main trunk of the fifth or trigeminal nerve to enter its central nuclei, with their numerous ipso- and contra-lateral communications.

The nerves from which the nasal sinuses receive their sensory supply are as follows:

Frontal Sinuses.—Terminal twigs of the supraorbital branch of the "frontal nerve," derived from the ophthalmic division of the fifth.

Ethmoidal Sinuses.—The naso-ciliary branch of the ophthalmic nerve, and from the maxillary nerve by way of the orbital and posterior superior nasal branches of the sphenopalatine ganglion.

Sphenoidal Sinuses.—The orbital branches of the latter ganglion.

Maxillary Antra.—From the maxillary nerve through its posterior superior alveolar branches.

(The mandibular nerve has only an indirect connexion with the sinuses by way of the otic ganglion, and its communicating branch with the deep petrosal nerve which enters the sphenopalatine ganglion.)

CLINICAL ASPECT OF PAIN

I have already stated that chronic inflammation of a nasal sinus may be associated with a localized or more diffuse pain in the head. In the first type the symptom may be felt in the immediate region of the inflamed air cell, or at a distance from it and where there is no apparent reason for the discomfort. In such cases it is spoken of as "referred pain," and examples of it will be familiar to you in other regions of the body—for example, angina pectoris with pain in the left arm, or tuberculous disease of the hip-joint, with pain on the inside of the corresponding knee-joint, or lancinating pain in the ear caused by certain lesions in the throat or in the larynx. It is my experience that pain is more likely to be of the localized or of the referred variety when only one sinus is affected, whereas a general headache is more common when more than one air cell is inflamed. In the latter condition the explanation may be that with an increase of afferent impulses reaching the ganglion cells of the ipsilateral nuclei, the stimuli may overflow or irradiate those of the contralateral group and thus cause a diffusion of pain, which is felt in the whole head area. If a rough simile be permitted, one might compare the large central nuclei of the fifth nerve and its connexions with B.B.C. House, where in-coming messages are received, considered, and transmitted to their appropriate destinations. A message from a distant station and of only local importance would receive a direct reply, but if the information was of far-reaching importance B.B.C. House would relay it, or refer it to other or even to all its outlying stations.

But this is dangerous ground for me to tread on, and I shall await, with due composure, any "corrective"

which my friend Dr. Wilfred Harris thinks fit to administer.

We may now pass to the consideration of the situations and types of pain to which chronic inflammation of each particular sinus may give rise. In the first place, it may be said that such a condition is generally the result of an acute or subacute primary infection which has not undergone resolution, either with or without treatment. Furthermore, in a large majority of cases the sinus infection is a complication of one of the acute specific fevers, and particularly of influenza.

Maxillary Antrum

This large air cell differs from the other sinuses in that an additional source of infection arises from septic conditions in and around the roots of the second bicuspid and the first and second molar teeth, which are in close relation with the floor of the sinus. In such circumstances pain will often be experienced in the cheek area, and may be explained by the presence of some degree of alveolar periostitis. It is a common experience to find the pain of chronic antral inflammation, whether of dental or of intranasal origin, referred to a region corresponding to the supraorbital foramen and the distribution of the supra-orbital nerve. In the former area it may be so intense and localized as to suggest the frontal sinus as its source. In other instances, and particularly in patients of low resistance, the pain may affect the whole corresponding side of the head. There is a further peculiarity about headache and pain in chronic inflammation of all the sinuses—namely, its tendency to come on soon after the patient rises in the morning and to pass off about, or shortly after, noon. Such periodicity should always call for a careful examination of the paranasal air cells.

Ethmoid

In chronic inflammation of this labyrinth of air cells, whether suppurative or not, pain is most often felt in regions bordering the inner side of the orbit and at the root of the nose. Sluder gave its location as a small area bounded by the supraciliary ridge above, the supra-orbital foramen laterally, and the nasal bones below. From the diagnostic point of view such pain can often be relieved immediately by the application of cocaine to the internal and external branches of the naso-ciliary nerves in the upper anterior regions of the nasal fossae. In yet other instances pain may be felt over the vertex, or there may be a feeling of "pressure" in that locality.

Frontal Sinus

As a general rule when pain is complained of this symptom is localized in and immediately around the region of the sinus, and is definitely aggravated if pressure be applied upwards and inwards on the inner region of the floor of the air cell. The periodicity of the pain, to which I have referred, is particularly noticeable in a chronic suppurative inflammation of this sinus.

At this juncture one may perhaps draw attention to what is termed "vacuum headache." It is due to the narrowing of the fronto-nasal duct leading from the sinus into the nasal cavity, and is generally brought about by encroachment of the adjacent ethmoidal cells through which the duct passes. Absorption of the air in the frontal sinus brings about the vacuum, and this induces a dull frontal headache, which is much increased by any sustained use of the eyes. There may be no intranasal signs of disease, and the diagnosis has to be inferred from the above symptom coupled with pain on pressure on the inner region of the floor of the sinus. In cases of doubt, a skiagram may be of great value.

Sphenoidal Sinus

Perhaps the most frequent situation of pain is over the occiput, and next in order the vertex and, occasionally, the region supplied by the supraorbital nerve. If the Vidian nerve becomes involved by hyperplastic inflammation of the outer wall of the sinus and neuritic changes reach Meckel's ganglion, the sphenopalatine ganglion syndrome may result—that is, neuralgic pains in the supraorbital, ocular, superior maxillary, mastoid, and occipital regions. In some cases they may extend to the shoulder-blade, the arm, and even to the finger-tips. Such symptoms may be accompanied by lachrymation and sneezing attacks. My own experience has confirmed this widespread nature of the symptoms. The diagnosis is usually easy, because an application of cocaine to the nasal mucous membrane behind and above the posterior end of the middle turbinal will temporarily cut short the pains, and sometimes they can be cured by injecting the ganglion with 5 per cent. phenol in 95 per cent. alcohol. It may be well to emphasize one very definite and not infrequent symptom of chronic inflammation in the sphenoidal sinus—namely, pain over the corresponding mastoid region—to which I drew attention so long ago as 1905 at the meeting of the British Medical Association in Leicester. It is, of course, a referred pain, the sensory impulses passing from the sphenopalatine ganglion by way of the Vidian and large superficial petrosal nerves to the geniculate ganglion of facial, and from thence to the facialis cutaneus branch of the posterior auricular nerve, which terminates about 5 cm. behind the mastoid.

SUMMARY AND CONCLUSION

In this brief introduction of the subject for discussion it has been my object to show: (1) that pain is a frequent symptom of chronic inflammation of the nasal accessory sinuses, and that it may take the form of a more or less generalized headache or be felt in so restricted a region that suspicion will fall on a particular sinus; and (2) that there may be a complete absence of pain when one, more, or all the usual air cells are in a state of chronic inflammation, even of the suppurative variety. These facts should prompt a question of even wider clinical significance—namely, if and when pain is associated with the chronic nasal sinus lesion, may it not sometimes be due to a cause entirely independent of local inflammation? The answer may be of far-reaching importance, because in the majority of such inflammations some form of surgical intervention will probably be required; and, if this is carried out in ignorance of a coexisting extraneous factor, the most skilful operation may be followed by prolonged convalescence or by complications productive of anxiety to all concerned. In other words, a preliminary overhaul of the patient should never be omitted, and at any rate, the heart, lungs, blood pressure, and the proper functioning of the kidneys and bowels should receive attention. A single example in illustration of my meaning will suffice. A healthy-looking patient was sent to me for chronic antral suppuration, associated with headache and occasional "neuritic pains in the limbs," all supposed to be due to absorption of toxins from the septic focus. Two days later she entered a nursing home for operation. In the meantime examination of the urine showed a high sugar content, and operation was deferred. The following day diabetic coma developed, and she died. (This was in pre-insulin days.) It is unnecessary to comment on what my feelings, and those of the relations, would have been had the fatal issue taken place immediately after the proposed operation.

Any surgeon who has had considerable experience of intranasal operations for the relief of septic conditions will

agree that secondary haemorrhage is by no means an infrequent complication, and that sometimes it is difficult to control because of the relative inaccessibility and the unhealthy nature of the tissue surrounding the source of bleeding. Many such accidents could be prevented, or their frequency minimized, by a little general care and preparation of the patient before operation. To my senior colleagues these observations may seem trite and almost discourteous, but that is because they graduated in days when the "nature of the soil" received greater consideration in the scheme of treatment than it seems to retain in these later years. It is for this reason that a word of warning may not be out of place to the younger members of our profession, and particularly to those who are beginning to concentrate their attention on diseases of the throat and upper air passages.

In these regions foci of infection are very common, their local manifestations are well known, and it is now common knowledge that the toxins derived from such sources may bring about pathological conditions in practically every region of the body. For the establishment of this truth Medicine is indebted to the pioneer work of William Hunter, which he commenced some forty years ago. Since then it has been so fruitful in its application to the practice of medicine and surgery that, in 1927, the then President of the Royal College of Surgeons—now Lord Moynihan—said (*British Medical Journal*, November 5th, 1927): "William Hunter's contribution to direct research is, in my judgement, the most significant of any conducted in the last generation." There can be no dissent that such a eulogium, and coming from such an authority, was timely and well-merited. On the other hand, those who are in touch with current medical practice will surely have had frequent occasion for questioning whether there is not a tendency to assume too readily that nearly all pathological lesions of obscure origin are the result of a focal infection. The net of "hidden sepsis" is very wide in its spread, and in proportion to the myopia of the fowler will be the number of birds which escape it. May it not be that the unlettered patient who said he had been told that his ailments were caused by a "sceptic" antrum (or tonsil) was possibly as near the truth as he by whom the diagnosis had been made?

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BY

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In approaching this subject from the physician-neurologist point of view, one is at first impressed by the brilliance and rapidity of the cures of headaches and neuralgias that are so frequently wrought by skilful surgeons in sufferers of perhaps many years' standing. On second thoughts our more lasting impression is the difficulty in diagnosis and in the sorting out of those headaches and neuralgias which are amenable to surgery of the nasal accessory sinuses from those which are not, for truly the path of diagnosis is beset with many pitfalls. The periodicity of the pain, in frontal sinusitis especially, commencing at 9 or 10 a.m., and lasting to the late afternoon, may simulate a migraine or may even be mistaken for paroxysmal neuralgic tic by those unfamiliar with the latter disease. We are probably all well acquainted with cases of antral abscess, often bilateral, which have given rise to chronic headaches and ill health, perhaps for

* A paper read in a discussion at the Medical Society of London, March 27th.