THE NOSE AND THROAT IN RELATION TO ORBITAL AND OCULAR DISEASE.

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In this article only such conditions will be described as have their origin and points of attack in the nose and throat. The diseases under this heading are all inflammations in which the eye changes, though often the first to appear, are nevertheless only secondary to foci of gross infection in neighbouring structures. It is to emphasize and familiarize these important relationships that these notes are put together.

Anatomical Considerations.

The spread of infection from the nose and throat to the eye may take place along any of the usual channels; but as in one or two important instances such spread is direct, it is necessary to appreciate the anatomy of the parts and, in particular, the anatomy of the accessory nasal sinuses which are grouped round the orbital cavities.

The major part of the skeleton of the nose may be regarded as suspended from the base of the skull between the two orbits, and several bones on either side enter into the formation of both structures. These bones are the sphenoid, ethmoid, maxilla, palate, frontal, and lacrymal. The os planum of the ethmoid forms the largest part of the inner wall of the orbit, and attached to it on the nasal aspect is the lateral mass enclosing the anterior, middle, and posterior groups of the ethmoidal air cells. These air cells are incomplete in parts in the disarticulated bone, and in life are closed in by neighbouring structures. On the upper surface a few half-cells of the middle group are completed by similar half-cells on the under surface of the orbital plate of the frontal bone bordering the ethmoidal notch. The anterior or infundibular cells are completed by the lacrymal bone and maxilla, where they form the anterior part of the inner orbital wall. The posterior ethmoidal cells open into the sphenoidal recess where they are opposed to the conchae covering the sphenoidal air sinuses.

The anterior ethmoidal artery, though a vessel of no great size, is of considerable importance in the group of diseases under consideration, owing to its anatomical position. A branch of the ophthalmic artery, it runs inwards and leaves the orbit by passing with its accompanying vein and the nasal nerve through the anterior ethmoidal canal. This canal lies between the cells on the upper surface of the lateral mass of the ethmoid, and is commonly completed by the articulation of the orbital plate of the frontal. From this canal the artery emerges on to the cribriform plate lying under the dura of the anterior fossa, whence it runs forwards, and piercing the bone at the side of the crista galli enters the cavity of the nose, where it lies on the deep surface of the nasal bone. The antrum of Highmore lies immediately beneath the orbit, and its roof, formed by the orbital plates of the maxilla and palate, is also the floor of the orbit. In its roof is a canal containing the infra-orbital nerve and vessels, the latter joining the parent trunks in the sphenoidal-maxillary fossa. The antrum opens into the nose in the middle meatus. All the accessory nasal sinuses open into the nose and are at any time liable to become infected from the nasal passages.

Orbital Cellulitis.

The first condition to be dealt with is orbital cellulitis. It is unfortunately true that its relationship to ethmoid or other sinus disease is far from being generally appreciated, yet apart from cases caused by penetrating wounds of the orbit, orbital cellulitis is practically always secondary to inflammation in the ethmoidal cells. Its treatment therefore lies essentially in the hands of the nasal surgeon. Simple drainage operations on the orbit frequently fail to save the life of the patient, and still more frequently

leave a persistent discharging sinus. Orbital cellulitis is a complication of acute, but rarely of chronic, sinus inflammation, in spite of the fact that chronic ethmoiditis, characterized often by the formation of nasal polypi, is a very common disorder. The reason for this anomaly will be found in the discussion to follow on the mode of spread of the infection.

Following the rules governing the spread of infection elsewhere in the body there are three possible routes—namely, the blood stream, the lymphatics, and some direct path. There is no suggestion that infection is via the blood stream, except perhaps as a terminal event when a widespread dissemination may take place from one of the larger venous sinuses. Spread by lymphatics may also be excluded, as the parts are but poorly supplied with lymph vessels, and there is no connexion demonstrated between the orbital and ethmoidal symptoms.

A direct spread is the one that almost certainly takes place, and there are one or two alternative routes even here to be considered. A possible route is through the os planum, but although this is a very thin plate of bone, it is fairly tough; moreover, experience in operating on these cases nearly always reveals it intact. There is no evidence that, save in neglected cases, it allows the passage of infection.

The most probable path is that along the line of the ethmoidal vessels, and there are several points strongly in favour of this view. There is a ready-made communication in the ethmoidal canal between the ethmoidal and the orbital cavities. The pus found in the orbit in cases of orbital cellulitis is always in the upper and inner part of the cavity—that is, about the opening of the anterior ethmoidal canal. Furthermore, the passage of infection by this route accounts satisfactorily for two of the most common and important complications of orbital cellulitis—namely, cavernous sinus thrombosis and meningitis.

The mere presence of a collection of pus in the orbit is not in itself sufficient to cause thrombosis of the veins in the neighbourhood, and of the sinuses into which they drain, but such a condition would readily arise as the result of a spread of thrombosis along the radicles and trunk of the ethmoidal vein, which opens into the ophthalmic vein, and so into the cavernous sinus. It is worth noting here the parallel way in which cavernous sinus thrombosis may arise from sepsis on the face by spread along the infra-orbital vessels. It has already been noted, too, that part of the course of the ethmoidal vessels lies under the dura covering the cribriform plate. In this situation the dura is perforated by the olfactory roots, and affords a portal of entry for infection from a septio phlebitis such as obtains in the conditions under consideration. Meningitis occurs quite frequently in fatal cases of orbital cellulitis, and is evidenced by intense headaches, and, more typically, by hyperpyrexia.

Although the ethmoidal air cells have alone been considered as the starting point of orbital cellulitis, this condition may nevertheless complicate acute infections in the frontal sinus and the sphenoidal sinus, though less frequently. Quite often both frontal and ethmoid, or sphenoid and ethmoid, are affected together.

The above account is the argument for treating orbital cellulitis by radical operation on the accessory nasal sinus, by the external route. Apart from haemorrhage, the result of inflammatory engorgement, the steps of the operation can be followed deliberately and the source of the infection traced and eliminated. Briefly, the operation consists in perforating the nasal process of the maxilla and opening up the frontal sinus and the lateral mass of the ethmoid. Infected cells are opened and removed as far as possible, and the os planum is cut through to drain the orbital cavity. The anterior ethmoidal artery is almost constantly severed. Bleeding yields readily to moderate gauze pressure, but the site of the haemorrhage demonstrates very well, in the living, its close relation to the orbit. It is important to make as complete a clearance as possible, as infection often starts far back, but the patients are often so gravely ill that complete removal of the lateral mass is not always possible, and one has to be content with ample drainage.

Enlargement of the Blind Spot.

The second disorder to be discussed is a more purely ocular one. It has a fairly high incidence, but its relation to primary nasal infection is little appreciated. It is first manifested purely as a disturbance of vision, most often unilateral, and there is found a blurring and loss of visual acuity in that part of the retina immediately surrounding the optic disc. A most important sign and a fairly constant one, is enlargement of the blind spot for white and colours, as determined by perimetric examination. This, in all probability, signifies an inflammatory lesion of the retinal fibres in the affected area. The enlargement of the blind spot is known as Von der Hoeve's sign, and is described by him as an important symptom of posterior accessory sinus disease, and where no other cause for the eye changes can be found he considers it an indication for operation on the sinuses. Another observer found in 102 patients suffering from ethmoidal and sphenoidal sinus disease enlargement of the blind spot in no less than 31 per cent. of cases. In my experience, however, the antrum is as often at fault. A case that came under my care recently illustrates very well how completely unsuspected is this underlying nasal infection.

R. H. was referred to me by my colleague Mr. S. T. Parker, to whom I am also indebted for the notes on enlargement of the blind spot. The patient complained that for three weeks she had had blurring of vision in the right eye. Mr. Parker found enlargement of the blind spot, and sent her to me for examination of the nasal sinuses. There was nothing in her history suggestive of sinus disease, and examination of the nose only revealed a marked deflection of the septum to the left. There was no trace of pus in the nose or nasopharynx. A skiagram, however, revealed a marked opacity in the right antrum, and exploratory puncture under local anaesthesia found thick mucus. Under a general anaesthetic I drained the antrum into the inferior meatus by the intranasal method. A considerable amount of pus was evacuated at the time, and some discharge persisted for several days after the operation. No organisms could be grown from the pus on ordinary media.

In two weeks there was marked improvement in vision in the affected eye, and a month later it was almost completely restored, only a slight deficiency being recorded by the perimeter.

While the connexion between ocular disease and sinus disease is certain, the path along which the infection travels is not so clear. It is presumably a direct one, both parts being almost always affected on the same side. It is probable that the ocular element is not in fact an infection, but the result rather of compression by inflammatory exudate at the back of the orbit. The latter assumption is supported by the rapid improvement which follows adequate treatment of the primary nasal trouble. In a number of cases no direct evidence of sinus disease can be found, but frequently there is a history which indicates some such trouble perhaps months before. One girl had pain and swelling in one side of the face with profuse discharge of pus from one side of the nose, following a bathe in a well-patronized swimming bath. I have no doubt she had an acute antral infection, yet her visual defect only became apparent some six months later. I have found a similar coincidence in other cases, and it appears that sometimes, at any rate, the progress of the trouble from the nose to the optic nerve elements is so slow that the original focus may have cleared up before the advent of the eye symptoms.

Phlyctenular Conjunctivitis and Blepharitis.

The third and last group to which I am going to refer includes cases, chiefly in children, of phlyctenular conjunctivitis and blepharitis. Although they almost always come for treatment via the ophthalmic department, children frequently attend the throat clinic for recurrent sore throat, and complain that each attack is associated with inflammation and soreness of the eyelids. These cases are often intractable to all forms of local treatment, as they are secondary to a remote focus usually in the tonsils. The results of tonsillectomy in this disorder are so uniformly good that the operation should be undertaken even in the absence of any apparent tonsillar disease. The tonsils should be removed by formal dissection.

One or two points of interest come out in the examination of the tonsils in these children. They are quite frequently very small and look innocent, even on section

after enucleation. Further, there is most often a complete absence of palpable glands in the neck, and this is the more striking as the vast majority of children presenting themselves at the throat clinic have some cervical adenitis.

In the absence of any demonstrable anatomical connexion it must be assumed that the tonsils in these cases contain some toxin which circulates in the blood stream and lowers the vitality of the conjunctivae, which are already infected from purely local sources. Any effective resistance is thus hampered, and the condition becomes chronic.

I have not attempted in these notes to describe in any detail the symptoms and treatment of the diseases enumerated. My purpose has been solely to draw attention to relationships which must be fully appreciated in order to provide the scientific treatment so essential for cure.

Memoranda:**MEDICAL, SURGICAL, OBSTETRICAL.****THE TREATMENT OF TETANUS.**

WHILE the prophylactic dose of antitetanic serum has tended to make the incidence of tetanus an increasing rarity, it may still happen to anyone to have to treat a case, and the problem of the correct treatment suitable to various cases must be approached through the accumulated experience of the few instances available. The treatment of the wound by thorough disinfection is the first consideration, and, if suitable, complete excision is indicated. Where excision is impossible then continuous irrigation with oxygen-producing agents may prevent the production of any additional toxins.

For the control of the spasms the injection into the spinal canal of hypertonic salt solution, after removal of cerebro-spinal fluid, will give approximately twenty-four hours' remission of symptoms. Under chloroform anaesthesia about 10 c.cm. of cerebro-spinal fluid is removed slowly, and 2 c.cm. of 25 per cent. magnesium sulphate solution in distilled water is injected. To overcome the effect of those toxins already exerting their harmful influence, massive doses of antitoxin should be given. This may be administered by subcutaneous, intravenous, or intrathecal injection, preferably by all three methods. I have used with success in an adult case injections of 10,000 units into the spinal canal, after removing a similar amount of fluid, as an initial dose, and injections by intravenous and subcutaneous route of the same dose as well, making 30,000 units in all. These measures may be repeated more than once, at daily intervals, if there is an increase, or so long as there is no abatement of the severity of the symptoms of spasms and trismus, etc.

Experience gained with adults during the war does not afford any guidance in dealing with tetanus in children, and as there are so few cases in which the treatment and dosage are on record, I am venturing to record the result I obtained in a recent case, showing the dose used and the unusual reaction observed afterwards.

A medium-sized boy, aged 12, had a lacerated wound of the left leg, 5 inches long, transverse to the long axis, as a result of falling from a tree on April 5th. The wound was disinfected and treated with boric fomentations, but became septic. On April 15th he was seen by a colleague, who observed a well-marked condition of trismus, with stiffness of the back. I saw the patient with him later in the day, and removed the boy to hospital.

After admission, under general chloroform anaesthesia, the wound was thoroughly inspected and cleaned, and it was found to extend throughout its length 3 inches from the skin edges into the subcutaneous space. Carrel-Dakin irrigation was therefore arranged from the inside limits of the infected area, and the wound was dressed with gauze soaked in hydrogen peroxide solution. The healing of this presented no unusual feature. After dealing with the wound, lumbar puncture was performed and 10 c.cm. of fluid was drained, and an injection of 8,000 units of antitetanic serum given; 6,000 units were given by subcutaneous injection.

On April 16th the general condition of the boy was satisfactory; no spasm had occurred, but the trismus and the pain and stiffness of the back were unchanged. An intravenous injection of 7,000 units of antitetanic serum was given, and an injection of 1/6 grain of omnopon was sufficient to allay the pain in the back. On