DISEASES OF THE ORBIT AND ITS CONTENTS, SECONDARY TO PATHOLOGICAL CONDITIONS OF THE NOSE AND PARA-NASAL SINUSES

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by
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WHEN YOU DID me the honour of inviting me to give this lecture, I felt some doubt about accepting the invitation because my knowledge of the subject was so meagre. Although I succeeded the late Stephen Mayou a considerable number of years ago as ophthalmologist to Golden Square and later to the Royal National Throat, Nose and Ear Hospital, it is only rarely that I have been called in. I have therefore had little personal experience of the conditions I am to describe.

Before discussing the diseases of the orbit secondary to pathological conditions of the nose and sinuses, it is advisable to say something about their anatomical relationships.

These are more easily understood if, in the first instance, the orbit and sinuses are examined from above in horizontal sections. I am therefore showing you these three diagrams modified from Wolff's *Anatomy of the Eye and Orbit.*

Fig. 1. This shows the appearances after removal of the roof of the orbit, but leaving the periorbita *in situ.* It demonstrates in striking fashion, the close association which exists between the medial wall of the orbit and the frontal and ethmoidal sinuses.

Fig. 2. This section shows the appearances when the periorbita has been removed. Again we see how narrow is the lateral wall of the frontal and ethmoidal sinuses and how close is the apposition of the belly of the superior oblique muscle. The muscle passing obliquely outwards and forwards is the levator palpebrae, which is well separated from the medial wall.

Fig. 3. When the levator and superior rectus muscles are reflected we get the appearances shown in this figure which is useful in demonstrating the proximity of the internal rectus to the sinuses.

There are two other points to notice, first the presence of relatively large blood vessels passing between the ethmoidal cells, and secondly, how, at the apex of the orbit, the optic nerve comes into close relationship with the posterior ethmoidal cells.

Though these anatomical facts have an important bearing on the symptoms of disease, they are also of consequence in operations on the sinuses. Thus Godtfredsen in a paper on the orbital complications following operation on the para-nasal sinuses finds that these are rare in connection with frontal and maxillary sinus operations, but that after ethmoidal cell resections they are more frequent and more severe, the commonest being lesions of the optic nerve and production of an orbital

haematoma. The optic nerve lesions are secondary to the presence of a subperiorbital haematoma, and apt to be permanent unless the pressure is relieved within the first 12 to 20 hours.

The presence of dehiscences in the orbital walls is well known to you but it may be worthwhile to mention the common sites of these. There are three in the floor of the frontal sinus, the first behind the trochlear fossa, the second behind the supraorbital notch, and the third at the junction of the middle and outer thirds of the floor. In the os planum dehiscences are apt to occur at the junction of the anterior and middle thirds and the same is true of the walls of the posterior ethmoidal and sphenoidal cells, leading to direct contact between their mucous membrane

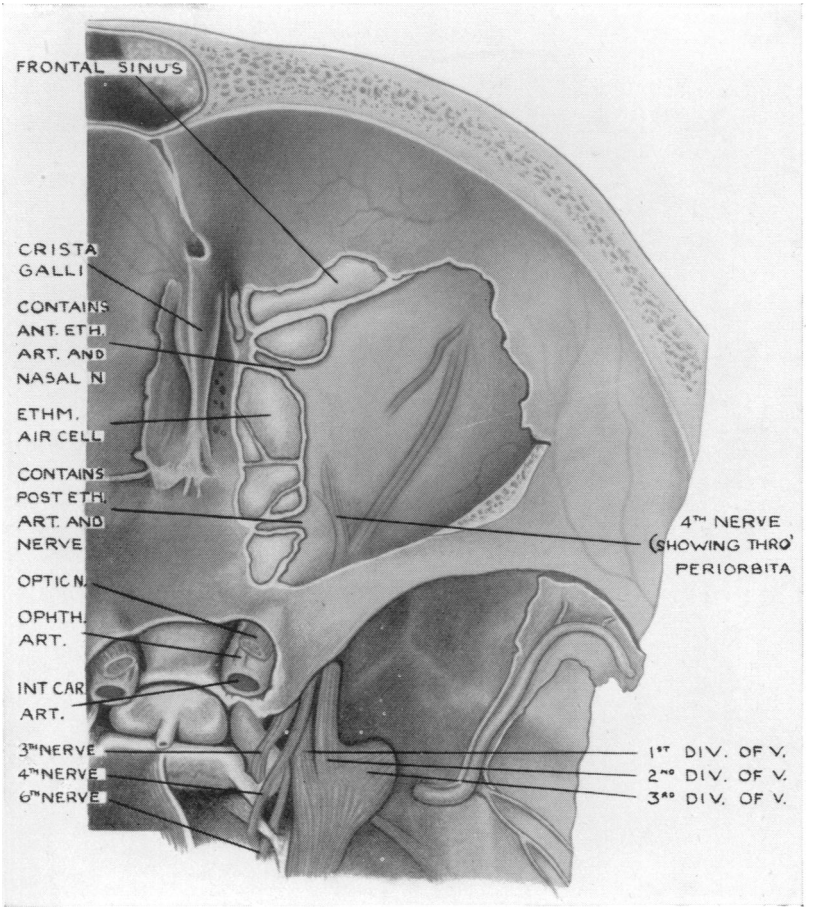

Fig. 1. Horizontal section to show orbital relations of sinuses.
(*From Wolff's Anatomy of the Eye and Orbit.*)

and the sheath of the optic nerve. This relationship was at one time regarded as the cause of retrobulbar optic neuritis, particularly when operations on the sinuses were followed by its cure. It has now been shown however that retrobulbar neuritis is in the majority of cases an early sign of disseminated sclerosis and a self-limiting disease in which a cure results, *post* and not *propter* surgical interference. It is only fair to say however that a small proportion of cases do occur in connection with sphenoidal and ethmoidal infection. One other site for a dehiscence is the roof of the maxillary sinus.

I do not propose to go further into the anatomy of the sinuses and orbit except to mention the septum orbitale and some of the veins.

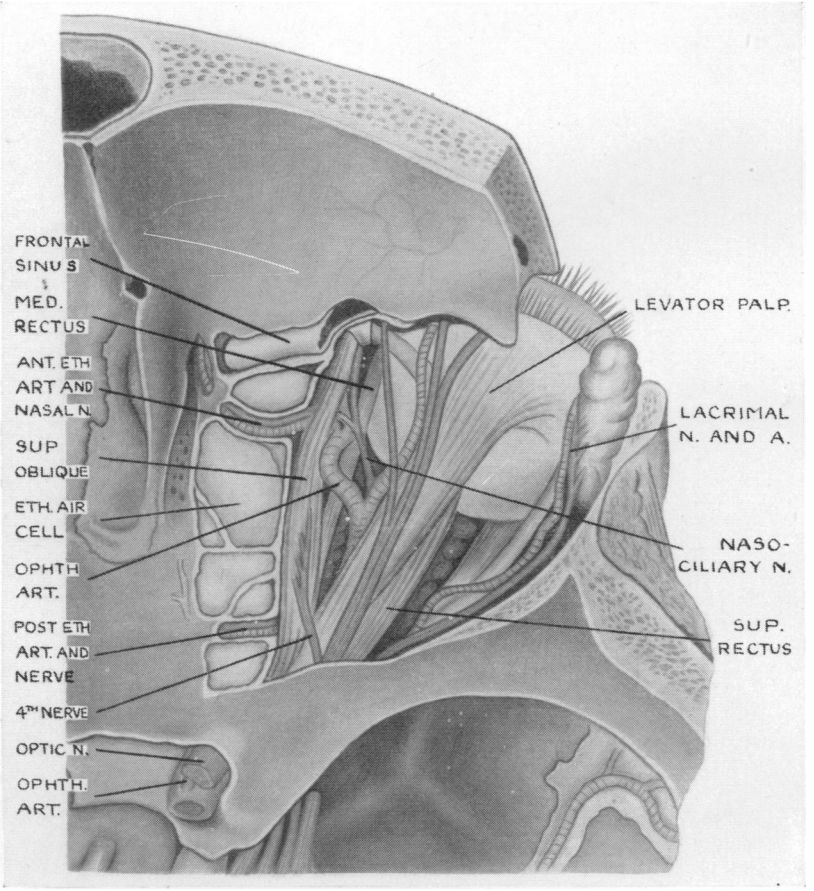

Fig. 2. Horizontal section to show orbital relations of sinuses with periorbita removed.
(*From Wolff's Anatomy of the Eye and Orbit.*)

Another name of this septum is the palpebral fascia. It is attached to the margin of the orbit at the junction of the periorbita with the periosteum and passes centrally to become continuous with the tarsal plates. It is pierced by the fibres of the levator in the upper lid and by an expansion from the inferior rectus in the lower lid. The septum, although a floating membrane which moves with the lids, can prevent orbital effusions extending into the upper lid *en masse*, though infections may pass through via the capillaries, which pierce it.

The veins are important, because although an osteitis of the floor of the frontal sinus, of the roof of the maxillary sinus or of the walls of the ethmoidal cells may spread directly into the orbital tissues, in most cases the spread occurs by a thrombophlebitis of the anastomosing veins. These diagrams modified from Folk and Brunner show the principal anastomoses. The blood vessels of the mucosa of the frontal sinus anastomose with those of the upper lid and the orbital periosteum by

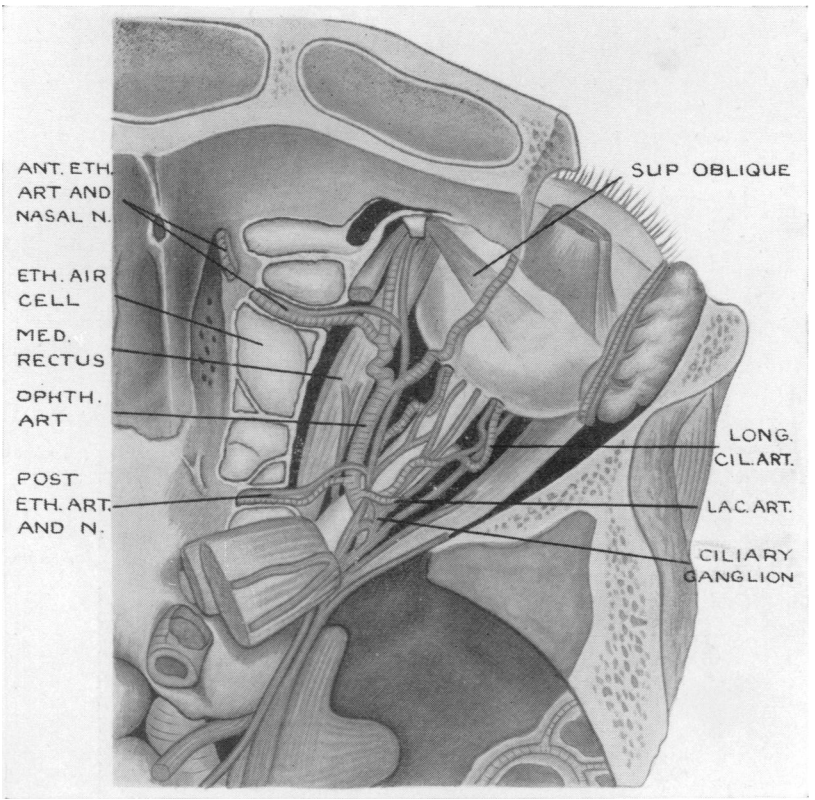

Fig. 3. Horizontal section to show orbital relations of sinuses with levator and superior rectus reflected.
(*From Wolff's Anatomy of the Eye and Orbit.*)

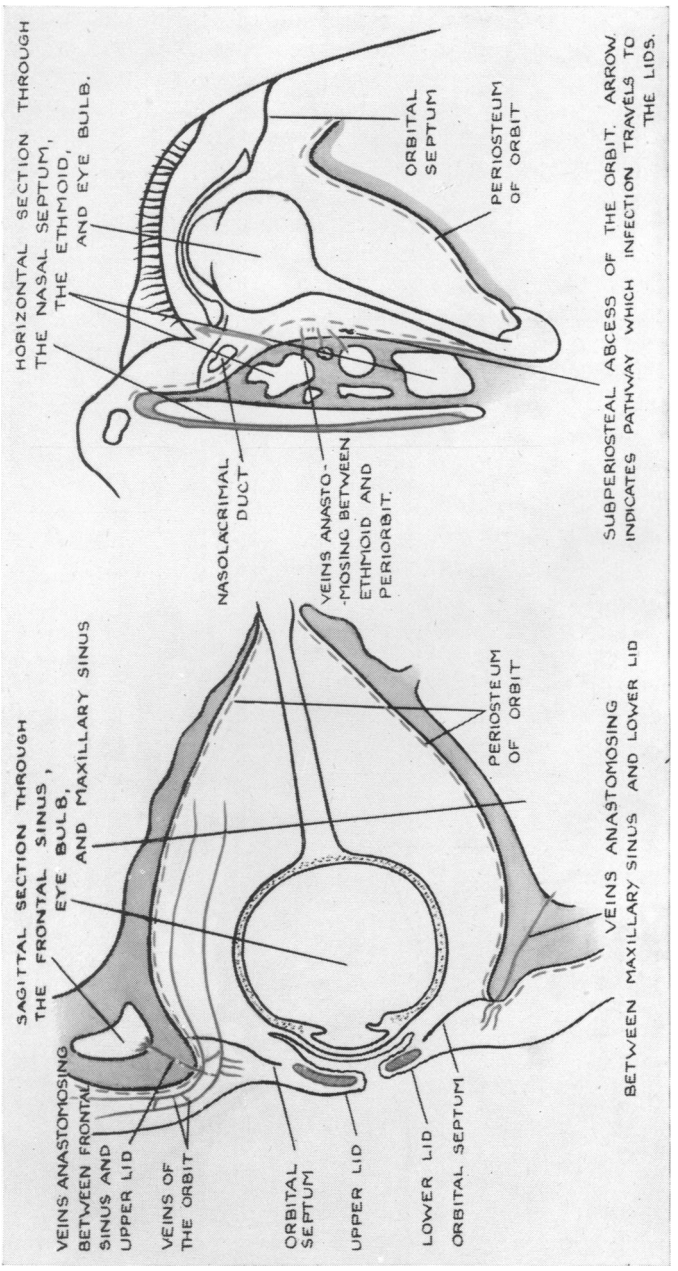

Fig. 4. To show venous connections between sinuses and orbit.
(*From M. R. Folk and H. Brunner's Ear Nose and Throat Monthly* (1944) **23**, 339.)

passing through the floor of the sinus, while those of the antrum pass through its roof to communicate with the vessels of the lower lid and the orbital periosteum. The vessels from the ethmoidal sinuses behave in a similar manner. It will be seen therefore that vessels from all the sinuses communicate both with one or other lid and the orbital periosteum and it is for this reason that oedema of the lids occurs so commonly in sinus infections. So much is this the case, that it is said that oedema of the lids is the most significant sign of ethmoiditis in infants and young children, in whom the number of vessels which pass through the lamina papyracea is surprisingly great.

Inflammatory disease of the sinuses is the commonest cause of ocular and orbital complications, and Birch-Hirschfeld has estimated that this occurs in two to three per cent. of cases, he also estimated that 60 per cent. of all orbital inflammations were due to paranasal sinusitis. This statement was made in 1909 at a time when the importance of sinus infection in producing orbital disease was not fully recognised and the correct figure is probably 70 per cent., though some observers have put it as low as 39 and others as high as 100 per cent.

The frequency with which the various sinuses are responsible varies with age. In infants the frontal sinuses are not present and the maxillary are very small, so it is the ethmoids which are most commonly affected, though the antra can come into the picture, presumably because of their unfavourable position for drainage. After the age of nine or ten the frontal sinuses are more frequently involved, and in the adult all three are affected in about equal proportions. The sphenoidal sinus in Birch-Hirschfeld's series of 409 cases was responsible for orbital infection in only 25 cases while pansinusitis was present in 60 cases.

It is important to bear the figure of 70 per cent. in mind because in the milder cases where there is oedema of the lids, perhaps a little proptosis, but no pain and no definite history of nasal disease, the cause may be a mild sinusitis, which can be found only on careful and repeated examination. The same applies to some cases of chronic and repeated conjunctivitis, and some cases of keratitis and episcleritis though in these it is more likely that the reaction is due to allergy to the toxins of the organism invading the mucous membrane of the sinuses. When the condition is advanced, diagnosis may be even more difficult, the local signs in the orbit seem to point so obviously to the need for an exploratory incision that the need for sinus exploration is overlooked, and as Duke-Elder says " A harmful exploratory incision is made while all the time the lesion causing the reaction and determining the associated systemic symptoms is suppuration in a nasal sinus."

Though not necessarily a diagnostic point, McKenzie has pointed out how some of these patients suffering from apparent orbital cellulitis complicating an acute sinusitis and showing marked swelling of the

upper lid appear to be otherwise quite well. He illustrates his point by a photograph of which this is a reproduction.

Fig. 5. The balloon-like left upper lid suggests a serious condition, but the systemic effect of this is belied by the patient's general appearance, her expression seeming to show even a certain degree of satisfaction at having been able to produce such a staggering reaction. In this connection it should be remembered that the skin of the lids is loose and that swelling of it occurs more easily than in other parts of the body. I have frequently seen, for example, an inflamed meibomian cyst produce a degree of swelling almost approaching that associated with orbital cellulitis.

Fig. 5. Oedematous swelling of left upper lid from sinus infection.
(*From W. R. McKenzie's Acute Sinusitis with orbital cellulitis, Southern M. J.* (1950) **43,** 240.)

I have already said something about spread of infection from the sinuses to the orbit, but, as examinations teach us, it is well to be more systematic and to have a clear idea as to the methods by which this occurs. The first is by direct spread, a process facilitated by the dehiscenses in the bony walls of the sinuses and by the thinness of the walls, which renders them an easy prey to osteomyelitis, the second is by thrombophlebitis of the emissary veins from the sinus. When this happens, the veins in the orbit become infected, with the production of multiple purulent foci, which may extend back to the cavernous sinus and lead to the serious condition of cavernous sinus thrombosis. It is also possible for the optic nerve to become affected in this way, particularly if the posterior group of ethmoidal cells are involved and the sequel is optic atrophy and sometimes thrombosis of the central retinal vein.

The third method of spread is metastatic, by the blood stream. In this event there is bacteraemia and the sinus acts in the same way as other metastatic foci, producing intra-ocular infections such as irido-cyclitis and choroido-retinitis, without necessarily any orbital involvement.

In the same way as there are different methods of spread of infection so there are different forms of orbital inflammation and four main sub-divisions are recognised (Duke-Elder) according to the type of tissue primarily affected. We thus have, with involvement

(1) of fibrous and fatty tissue, orbital cellulitis and abscess ;
(2) of the bony walls, osteo-periostitis, which does not spread to the orbital contents so long as the peri-orbita is intact ;
(3) of the orbital veins, thrombophlebitis with multiple orbital foci of suppuration ;
(4) of the episcleral space, inflammation of the capsule of Tenon, sometimes called tenonitis. This from the semantic standpoint is not a good word, since it should mean inflammation of M. Tenon in the same way as Roentgenology should mean the science of being Roentgen.

Before describing the clinical aspects of what might be termed the full-blooded orbital cellulitis, mention should be made of reactive oedema, which can be a puzzling condition to diagnose. I have already mentioned the relatively enormous swelling of the lid which can occur in the presence of an inflamed meibomian cyst or even a stye, and the same can happen if the inflammatory focus is localised in some neighbouring structure, especially in the para-nasal sinuses. It is more common in children than in adults and, to make the diagnosis more difficult, the oedema can affect not only the lids but also the tissues of the orbit. In consequence of this, there may be also some proptosis and limitation of ocular movements, with resulting diplopia, though these are usually slight in degree.

Here are two pictures (Fig. 6.) of a case reported by R. C. Gamble in a

Fig. 6. Reactive oedema of left lids.
(*Modified from Duke-Elder's Textbook of Ophthalmology. Vol. 5, p. 5388.*)

child aged seven months. The first shows the appearances on admission with swelling of the lids on the left side and possibly some proptosis, the second the result of treatment to the nose, which caused rapid improvement in 24 hours and complete recovery in five days.

I have recently had what I think must have been a similar case, though it occurred in a woman aged 73, who 10 months previously had noticed some pain in the left eye when looking at a theatre stage or cinema screen. Six weeks before admission to the National Hospital she noticed double vision, since when there had been a slowly increasing proptosis of the left eye. On examination there was slight left ptosis, complete paralysis of the external rectus and the left eye was proptosed straight forward. There was some tenderness on palpation of the globe and visual acuity with correction was 6/12. There were no general symptoms, the Wasserman was negative, as were the X-ray films. There was no sign of a naso-pharyngeal carcinoma—a condition which can be associated in its early stages with a solitary external rectus palsy. In order to exclude the presence of a new growth, an incision was made through the left eye brow and deepened into the orbital fat but no tumour could be felt and a portion of orbital contents taken for biopsy showed nothing abnormal. A fortnight later, complete ptosis was present and there was limitation of eye movement upwards and outwards. The condition of the eye gradually improved, the proptosis diminished and the external rectus regained its power though it took over a year for this to become complete.

This illustrates how difficult the diagnosis may be, so it will not be out of place to give a few pointers. The first and most obvious one is the lack of general symptoms, the patient although equipped with swollen lids and possibly a proptosed eye does not appear to be as ill as would be expected if there were an abscess in the orbit. Allied to this is the rapid diminution in oedema following the application of hot compresses under a pressure bandage and the lack of tenderness on palpation of the globe. On the negative side are local tenderness and limitation of eye movement in any particular direction, either or both of these signs being taken to indicate the presence of a true orbital inflammation. The second of these, however, is not completely reliable, because in the patient I have just told you about there was an external rectus palsy in addition to ptosis.

Treatment of this condition is necessarily that of the causative sinusitis, the orbit being left severely alone apart from application of compresses.

Summing up, the most important point in the diagnosis is to know of the existence of reactive oedema and not to assume that every case showing oedema of the lids and proptosis is necessarily one of orbital infection.

While on the subject of oedema, it may be helpful to show you a diagram which appears in a paper by Folk and Brunner. (Fig. 7.) It is only of use in the early stages before the lids have become uniformly swollen, but if the patient can be seen sufficiently soon, some guidance

may be obtained as to the site of the original infection by noting where the oedema first appears.

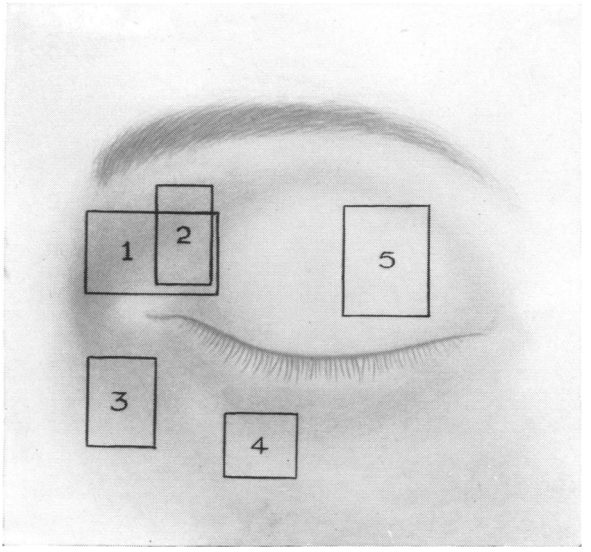

Fig. 7. Sites for initial swelling in various sinus infections, *vide* text.
(*From M. R. Folk and H. Brunner's Ear Nose and Throat Monthly* (1944) **23,** 339.)

These authors state that :—

(1) Infection of the ethmoidal sinuses produces oedema first over the frontal process of the maxilla, being localised above the internal palpebral ligament, later it extends rapidly in a lateral direction.

(2) If the infection is in the frontal sinus, oedema appears first in the mesial or lateral portion of the upper lid. If the temporal recess of the sinus is not present or is uninfected, the oedema involves almost the same area as in ethmoidal disease.

(3) In lacrimal sac infection, a condition which can at times cause reactive oedema, the swelling at first occupies the same area as that in ethmoidal infections, except that it is limited to the area below the internal tarsal ligament. Other methods of diagnosis are available in this condition, such as gentle pressure over the sac causing pus to regurgitate through the inferior lacrimal punctum, or the result of syringing through one of the lacrimal canaliculi. Even with these aids, however, diagnosis can sometimes be difficult. There is a difference of opinion as to the respective roles of conjunctival and nasal infections in the production of dacryocystitis, and as Duke-Elder says " totalitarian views on either side, as is usually the case, are exaggerated."

(4) In infections of the maxillary sinus, oedema appears first in the lower lid ; and, finally,

(5) If the infection involves a well-developed temporal recess of the frontal sinus, oedema is seen first in the lateral portion of the upper lid.

A useful classification of the symptoms of orbital complications of lesions of the sinuses is given by Smith and Spencer, who group them under three headings :

(1) The symptoms of inflammatory changes in the orbit.

(2) The symptoms of disturbances from mechanical causes due to encroachment upon the capacity of the orbit.

(3) The orbital apex or sphenoidal fissure syndrome.

The inflammatory symptoms fall into five groups, of which the first is the oedema I have already described, in which the eye movements if affected at all are only slightly limited, owing to spread of oedema into the orbital tissues, the same being true of proptosis. The second group comprises those cases which develop a subperiosteal abscess. In these there is a localised tender swelling which displaces the eyeball and limits its mobility. The swelling may rupture and discharge pus through the lids.

In the third group the orbital tissues proper are infected by direct extension through the bony wall and fascia or by the veins. In these cases an abscess forms, with resulting protrusion of the eyeball, abolition of its movement, swelling of the bulbar conjunctiva—a condition known as chemosis—and often some interference with vision ; again the pus may come forward and discharge through the lid.

The fourth group is in a way a subdivision of the third, and is called by Smith and Spencer orbital cellulitis to distinguish it from orbital abscess. It is caused by venous transmission of infection and the patient is severely ill with marked pyrexia. The signs mentioned in the third group are present but much intensified. Proptosis is extreme, the eyeball is completely fixed and surrounded by chemotic conjunctiva. Vision is also much disturbed. Pus is often not found but microscopic examination of the orbital tissues shows scattered areas of necrosis, phlebitis and periphlebitis.

The fifth group concerns those cases in which the infection spreads backwards along the veins to produce cavernous sinus thrombosis of the anterior or orbital type. Its occurrence is shown by the well known tendency of the thrombosis to spread to the contralateral sinus via the circular sinus which occurs in about 50 per cent. of cases and for oedema to develop over the mastoid emissary vein. Positive blood cultures are usually obtained though this may also be the case in orbital cellulitis.

Disturbances of the orbital contents from mechanical causes such as tumours, cysts, etc. will be considered later, but something should be said now about the third group—the orbital apex syndrome. Though usually due to trauma, neoplasm, tuberculosis or syphilis, it can also be

caused by infection of a sphenoidal sinus when this extends sufficiently far along the greater wing to involve the fissure and the structures passing through it. The classical syndrome (I.G.Kjoer) comprises, as motor symptoms, paresis of the third, fourth and sixth cranial nerves, with resulting immobility of the eye and an inactive pupil; as sensory symptoms, various disturbances of function in the branches of the ophthalmic division of the fifth cranial nerve according to the degree of involvement of lacrimal, frontal or naso-ciliary branches; and as sensorial symptoms, affections of the optic nerve. There may be optic neuritis when the nerve itself is infected, or papilloedema if it is exposed to pressure. In either case blindness ensues if the condition cannot be relieved. A distinction is made by Kjoer between the sphenoidal fissure and orbital apex syndromes. In the former it is only the structures passing through the fissure which are involved, namely the superior ophthalmic veins, the ophthalmic branches of the trigeminal and the third, fourth and sixth cranial nerves. In the latter—the orbital apex syndrome, the structures involved are the ophthalmic artery with its sympathetic plexus and the optic nerve.

The production of these syndromes by an inflammatory lesion of the sinuses is rare and they are more commonly due to tumours, fractures, haemorrhages and syphilitic periostitis. Sometimes the symptoms are temporary and arise from an osteo-periostitis of the sphenoidal fissure (Collier) which is transient. In the same way as Bell's palsy can follow exposure to cold with resulting periostitis at the stylo-mastoid foramen, so can periostitis of the sphenoidal fissure. In the 40 cases which Collier collected, the great majority showed complete recovery after a period of a few weeks to a few months. It is notable that in these syndromes proptosis is present.

Since this sign is common to all the conditions we have been discussing, it will not be out of place to describe the method used for its diagnosis and estimation when the condition is uniocular. An instrument was devised some years ago by Hertel which bears the somewhat cumbrous name of exophthalmometer. It consists, as you will see in Fig. 8, of a sort of bridge, with two mirrors mounted obliquely at either end and two scales engraved in millimetres. To use it, the two arms are adjusted so that their ends rest on the outer margin of each orbit. The patient is directed to look straight forward and the observer places his head so that the medial end of the mirror is in line with the reflection of the zero mark on the scale. A profile view of the patient's cornea is seen in one mirror and note can be made of its position in millimetres on the reflection of the scale in the other mirror. The process is repeated on the fellow eye, the difference in the readings giving the amount of uniocular proptosis. This method has the disadvantage of requiring a special instrument and is subject to errors which need not be mentioned now as there is a much simpler procedure.

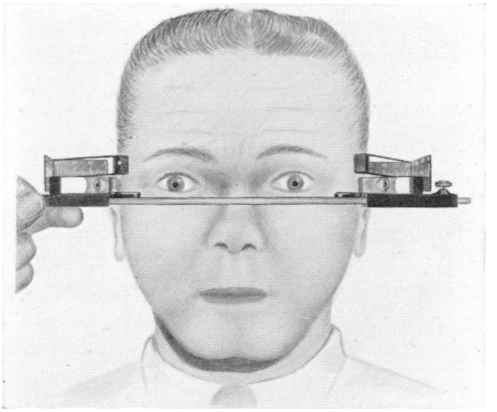

Fig. 8. Exophthalmometer—for explanation *vide* text.

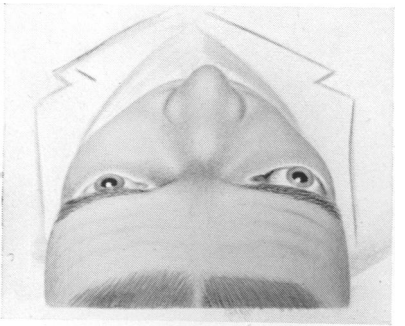

Fig. 9. Proptosis of right eye viewed from above.
(*Modified from Duke-Elder's Textbook of Ophthalmology. Vol.* 5.)

This consists of standing behind the seated patient, closing one eye and placing the other so that it is above the root of the patient's nose, who is directed to look straight ahead. The upper lids are gently raised by the observer's fingers while he moves his head backwards or forwards until the apex of the cornea of the normal eye is just visible. The proptosed eye will, of course, be further forward and the amount of this can be easily estimated, particularly by ophthalmologists, if they remember that a Graefe cataract knife is 3 mm. wide.

Before describing chronic inflammatory conditions of the orbit something should be said about treatment of the acute ones. Here I am treading on delicate ground because being only an ophthalmologist I have not had the experience of treating sinus disease. I am informed by rhinological friends, however, that the use of antibiotics has diminished greatly the need for surgical intervention. I would also like to add that the increasing skill of the rhinologists in treating sinusitis has even more greatly

diminished the need for surgical procedures in the orbit. Howells in a recent and instructive article mentions the necessity of giving these substances very early in the disease, since if an effusion has already taken place it may proceed to suppuration, causing an abscess which will require surgical drainage, even though the antibiotic has prevented the spread of infection.

As an instance of the efficacy of abiotic therapy, I should like to tell you about a case I had some years before this last war. She had been a ward maid at Golden Square and was admitted to St. Mary's Hospital with typical orbital cellulitis, a high temperature and was obviously ill. I was meditating making an incision into the orbit, when Alexander Fleming came across from what was then called the Inoculation Department and asked me if I would agree to his trying a new remedy which had recently come over to him from Germany. He explained to me that it was really a dye and was called Prontosil Rubra. I was of course only too glad to be released from my dilemma and asked him to go ahead, which he did with very satisfactory results. I was talking to Sir Alexander about this case the other day and asked him if it was, as I thought, the first case in which a sulphonamide had been used in this country and he told me that apart from some cases of puerperal infection, he thought it was. It seems appropriate therefore, considering the vast amount of work which has been done since at Golden Square on both the anti- and the a-biotics, that it should be a ward maid from this hospital, who so to speak started the ball rolling. It has rolled a long way since then and it is current practice now in intra-orbital infections to give antibiotics a trial before resorting to surgery—this is especially the case when the eye is still capable of movement.

There is a residuum of cases, however, which fail to respond to chemotherapy and for these something has to be done, but the less drastic the better. If there is obvious evidence of pus presenting under skin or conjunctiva, it should be let out through a free incision and a drain inserted. If the abscess is thought to be deeper, its most likely site is under the periosteum covering the ethmoidal region. One therefore makes a curved incision three-quarters of an inch long midway between the inner canthus of the eye and the midline of the nose, carrying it down to the periosteum. If possible, it should be above the internal palpebral ligament so as to avoid damaging this structure and the underlying lacrimal sac. The presence of the pulley of the superior oblique muscle at the upper inner angle of the orbit should also be borne in mind and, if this region has to be interfered with, the incision should be in front of the pulley, so that the periosteum can be reflected backwards by blunt dissection and the trochlea carried with it. If pus is found, no attempt at radical surgery on the sinuses should be made, though obvious carious pieces of bone may be removed. If no pus is found the periosteal incision may be extended in the hope of promoting drainage.

Should an intra-orbital, as opposed to a subperiosteal infection be diagnosed, access to it may be obtained through an incision in the lid, parallel with the fibres of the orbicularis and in the palpebral sulcus. The position of the incision is regulated by the supposed location of the abscess, but if there is no guide to this, it is best made over the lower and outer quadrant of the orbit. If no pus is found outside the fascia, access may be had to the inner compartment by freeing the external tarsal ligament and dividing the external rectus. If drainage is not free it can be encouraged by use of an aspirator or by short wave diathermy and application of pads soaked in a hypertonic solution.

Drastic surgery is seldom required nowadays, but sudden failure of vision with marked proptosis may indicate the presence of a central abscess and the performance of lateral orbitotomy by Krönlein's or some allied method.

Not all the orbital infections resulting from sinus disease are of the acute variety and it is possible for a chronic inflammatory mass to form behind the eye and simulate a new growth. For want of a better term, these cases are called inflammatory pseudo-tumours, a name introduced by Birch-Hirschfeld in 1909. There are many causes for the condition, e.g. gummata, irritation by cholesteral crystals from organised blood clot, reaction around a foreign body and so on, but I propose to limit my remarks to pseudo-tumours associated with nasal and paranasal sinus disease.

If there is a clear history of preceding sinus infection, diagnosis may be easy, but in the absence of this it can be extremely difficult, since the patient presents all the signs of an orbital tumour even to the presence of a rounded mass palpable through the lids. It is for this reason that so many of the patients with this disease have suffered exenteration of the affected orbit. The contents of such an orbit were sent to me some years ago when I was pathologist at the Central London Ophthalmic Hospital. The patient was a middle-aged man who consulted his doctor for diplopia. Both eyes were prominent but the left was definitely more so than the right and showed paresis of the superior rectus and levator palpebrae muscles. Corrected vision when first seen was 6/9, that of the fellow eye being 6/6. The fundi were normal. As time went on the muscular weakness, proptosis and chemosis increased, and owing to exposure of the cornea a small ulcer developed on it. As there was a strong suspicion of a malignant growth, the eye was enucleated and the orbital contents removed. Pathological examination failed to reveal any sign of a growth, but microscopically one found lymphocytic infiltration round the blood vessels without any proliferative activity in their walls. Here and there were clearly marked lymphatics with cells passing along in the line of their walls. The appearances were consistent with lymphatic hyperplasia subsequent to some mild chronic infection. There was a history of an attack of influenza 10 months previously, followed by severe hemicrania

which spread down the left arm and side of the chest and lasted for a fortnight. The diplopia came on later but the patient could not say exactly when. The relation of these symptoms to the subsequent development of an orbital pseudo-tumour is not of course certain but it seems possible that there was some nasal infection at the time of the influenzal attack which became transferred to the orbit, causing a mild chronic inflammation with proliferation of lymphocytes which, as in tuberculous cases, continued to multiply long after the infecting organisms and their toxins had vanished.

How is one to treat such cases ? If left alone, regression usually occurs in four to six months, so it really comes down to a question of diagnosis. It seems to me that the history is one of the most important points. Anything which might lead to a suspicion of sinusitis having occurred would be of prime importance, also if the proptosis were in any degree bilateral and the lids and conjunctiva became swollen early in the course of the disease, it would tend to exclude a neoplasm. More difficult to exclude is thyrotropic exophthalmos, unless retraction of the upper lid is present, when the patient's facies is characteristic. The differential diagnosis of orbital pseudo-tumour is not really part of my subject, so I do not propose to go into it any further at present except to say that it can at times prove extremely difficult.

Resolution of the swelling can sometimes be aided by a long course of full doses of mercury and iodide, and it is important to watch the corneae and see that they are adequately covered on closure of the eyes. If not, the lids should be united by tarsorrhaphy or corneal ulceration will develop.

Symptoms of disturbances from mechanical causes due to encroachment upon the capacity of the orbit from the sinuses are produced by mucoceles and tumours. Mucoceles occur as a rule between the ages of 16 and 40. One would expect them to be due to retention of inflammatory products from sinusitis, but they usually arise from development of a mucous cyst in the lining membrane of a sinus or from cystic degeneration of a polyp. The contents vary in character and the cyst gradually erodes the bony wall of the orbit, thinning it sufficiently to produce eggshell crackling before it is completely eroded.

The signs depend upon the location of the mucocele and the degree of its development. Should it come from the frontal sinus, the globe is displaced down and out and a swelling appears in the upper inner wall of the orbit. Should the cyst burrow backwards there will be proptosis in addition, and in extreme cases the eyeball may be dislocated forwards between the lids to produce a condition akin to paraphimosis.

Ethmoidal mucocele tends to occur in younger patients than the frontal ones. If it comes from the anterior cells, the swelling appears above the internal tarsal ligament, in much the same position as the frontal mucocele. Occasionally it can present below the ligament and simulate

a lacrimal sac affection. When the cyst comes from the posterior cells, it extends into the orbit behind the eye, producing proptosis and simulating an orbital tumour. Occasionally both sinuses are affected by erosion of the floor of the frontal so that a large single cavity is formed which produces marked proptosis and possibly luxation of the eyeball. Sphenoidal mucoceles occur rarely, but when they do so they can be very puzzling, since they may cause pulsating exophthalmos by erosion of bone at the apex of the orbit allowing contact with the intracranial vessels, thus simulating the signs of an arterio-venous aneurysm of the cavernous sinus.

Malignant growths of the sinuses can of course invade the orbit. Harvey Jackson, in his Hunterian Lecture of 1951, mentioned that the commonest malignant growth of the orbit was a carcinoma of the ethmoid sinus. The squamous type is more serious than the adeno-carcinoma, the latter allowing the eye to retain its mobility and being more amenable to radiation therapy. Other authorities state that carcinoma of the antrum is the commonest neoplasm to invade the orbit. It is a squamous burrowing growth which produces symptoms by invading the apex of the orbit.

Early symptoms, suggestive of growths in these regions are—according to Duke-Elder—epiphora and infra-orbital anaesthesia, particularly when occurring in an elderly patient. These are followed by other signs and symptoms, according to the direction of spread.

This constitutes a mournful chapter in the history of surgery, and even so experienced an authority as Harvey Jackson considers that radical procedures have little to offer and that these growths should be submitted to deep radiation therapy, after preliminary enucleation of the eyeball.

Non-malignant growths, which are many and various, can also spread from the sinuses to the orbit. Merely to catalogue them would not serve any useful purpose so I propose to say a little about differential diagnosis. To my mind the most difficult condition to exclude in a case of protrusion of the eyeballs is thryrotropic exophthalmos, be it uni- or binocular. It is thought to be due to excess of thyrotropic hormone produced by the pituitary in order to stimulate the thyroid to make thyroxin. In some cases this occurs and then there are the classical signs of Graves' disease, but in others it is just because the thyroid is not making enough thyroxin that the exophthalmos occurs. I saw a middle-aged woman recently, for example, who had been taking thyroid extract in order to slim and had developed typical exophthalmos on stopping it. Should the protrusion affect only one eye, as it can do, diagnosis may be more difficult. There is usually however some retraction of the lids, and now and again it may be noted that the pupil on the affected side is enlarged though it remains active to light—both of these signs indicating overaction of the sympathetic and pointing to a thyrotropic cause. In any event, these cases seldom remain unilateral for long and a waiting policy is certainly

indicated, though transference of exophthalmos to the fellow eye is not by any means pathognomic of a thyrotropic cause. I remember a case of unilateral proptosis in a middle-aged man, which went on to become bilateral and several physicians agreed with the suggestion that it was thyrotropic in origin, though it turned out to be a case of bilateral orbital periostitis with enormous thickening of the membrane. Incidentally, we used a method of treatment for the proptosis which was effective in preserving the integrity of the corneae. The eyeballs were too proptosed to admit of the lids being brought together. I therefore removed the emulsion from an old X-ray film and for each eye cut out a disc about 10 cm. in diameter (Fig. 10), a triangular segment was removed, as shown in the figure, the edges being joined by a strip of Elastoplast, so as to form a shallow cone. This was placed so as to cover the eye. By a little tailoring, and the use of Elastoplast, it was possible to make the junction with the face airtight, so that the cornea was exposed to an atmosphere saturated with water vapour, as shown by the presence of condensation droplets on the inner surface of the X-ray film. The cones are somewhat conspicuous and so could not be used for a patient going out of doors. For one confined to hospital, however, they have advantages over tarsorraphy because they allow the patient a certain amount of vision and allow the doctor the chance of keeping the eyes under observation ; also, as I have already said, the cones offer a means of protecting the corneae when there is too much proptosis for it to be possible to unite the lids.

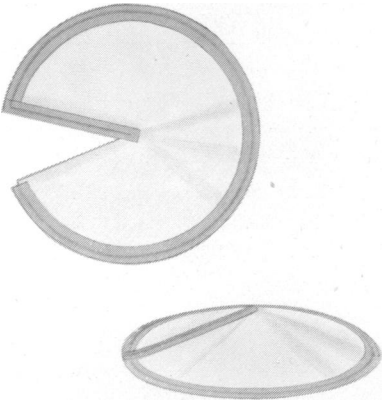

Fig. 10. Airtight eye shield made from X-ray film.

I hope you will not think that what I have said in this lecture has been of too rambling a nature. I often feel that the plight of a lecturer is like that of a modern painter. The old Dutch artists could make their pictures an exact replica of what they were looking at and were duly commended for doing so. Nowadays, however, a picture must at all costs not be photographic, and in the same way a lecture must not be like an excerpt

from a text book, though it ought at the same time to stimulate its hearers to consult them. One which I have found particularly useful is volume 5 of Sir Stewart Duke-Elder's *Text Book of Ophthalmology*, and any who wish to pursue this subject further will find ample information in the chapter dealing with the orbit.

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GIFTS FOR FURNISHING

Gifts of oak chairs for the Great Hall are now virtually completed : these number 34 armchairs for the dais and 200 " side " chairs for the body of the Hall.

In addition there are to be 450 stacking chairs in the Hall. The frames are metal and the upholstery is Bedford cord, coloured blue to match the hide of the other chairs. These chairs, unlike so many that stack, are really pleasing in appearance and quite suitable as gifts or memorials. The Council will be very pleased to receive gifts of these chairs, the cost of which is £5 5s. 0d. each including the engraving of the donor's name.

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