Section of Neurology

President—Air Vice-Marshal C. P. SYMONDS, C.B.

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Orbital Tumours

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WHILST Dr. Walter Dandy's monograph on "Orbital Tumours" (1943) presents many valuable data there remain a number of equivocal points from both the clinical and the pathological aspects of the subject; some of these, it is hoped, are to be clarified in the present paper through the augmentation of the basic material. This additional material for review is provided by a paper under the authorship of Iles and Rendle Short (1943) together with personal cases. Altogether these three series afford a fairly representative cross-section of neoplastic lesions likely to be encountered within, or encroaching on, the orbit, though by no means pathologically exhaustive.

Personal interest in the subject was initiated in 1936 when Mr. Gibb and Dr. Grainger Stewart referred a female child, 4½ years of age, who was suffering from a tumour of the optic nerve. A decision was invited as to the feasibility and advisability of excision of the growth with conservation of the eyeball both for æsthetic purposes and as a controlling influence in the maintenance of normal orbital development. Inquiry of ophthalmological colleagues as to the possible outcome of an eye so depleted of vascular and trophic supplies remained inconclusive. Admittedly Parsons (1942) states that "it is possible in some cases of optic nerve tumour to remove the growth while retaining the eye". Excision of the whole nerve from globe to chiasma was carried out; it contained a tumour some 2·5 cm. in length by 1·5 cm. in diameter (fig. 6). Fortunately the final result of our deliberations is the existence, at the present time, of a healthy girl of 13 years of age, with quite a presentable appearance, both eyes being freely mobile and the blending of these bears favourable expression. Since that time the problems of the diagnosis and treatment of orbital tumours have recurred with rather increasing frequency. Additional material for consideration of the surgery of the orbit has been provided in cases of advanced "exophthalmic ophthalmoplegia", a disease to be seriously debated in its differentiation from orbital tumour when the former is of unilateral distribution.

Incidence.—With what frequency orbital tumours occur is difficult to assess, but they are surely uncommon. True orbital tumours, in other words those limited to the orbital cavity, form a limited number of the three series under review. It may be that tumours lying in the anterior approaches to the orbit are more common, but they do not come to the notice of the neurosurgeon. It is most noticeable how many more women are involved than men.

Differential diagnosis.—The differential diagnosis of "orbital tumour" is so intimately related to that of "unilateral proptosis" that many points of discussion must be formulated along such lines. One of the simplest means of attacking the diagnosis would seem to evolve from a discussion of the several complaints that influence the patient to solicit surgical aid; it is in this manner that the writer proposes to proceed. Those lesions most likely to be confounded are: exophthalmic ophthalmoplegia, certain generalized bone diseases, meningocele or encephalocele, and vascular lesions of aneurysmal or of an arteriovenous fistulous nature.

Symptoms and signs.—The paramount complaint made by patients is that of *unilateral proptosis* wherein there is an irreducible progressive, axial, and non-pulsatile protrusion of one eye. This naturally arises out of the relative disproportion between the volume of the orbital contents and the capacity of the orbital cavity. In order that an expanding, space-consuming lesion be harboured one or more of the following processes must take effect: displacement of normal content, atrophy of normal content, or enlargement of the bony cavity. Each of these, no doubt, plays a part in accommodating the new structure. In consequence of the several possible compensating factors it becomes apparent that the degree of each depends on the amount of the other two—in this way one can best explain the not unusual lack of proptosis in some cases of glioma of the optic chiasma on their invading the orbit. Dandy (1943) draws particular attention to this possibility of orbital invasion without proptosis. However, a chiasmal glioma even with orbital extension is not a tumour

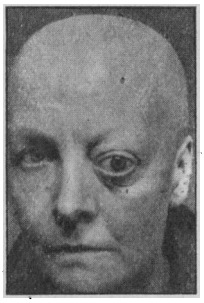


FIG. 1A.

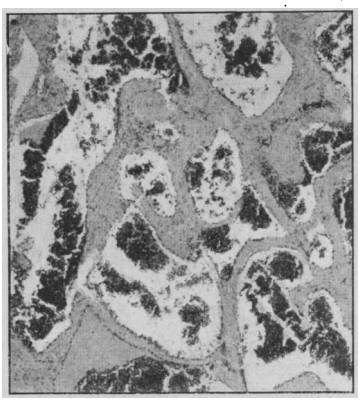


FIG. 1B.

FIG. 1A.—Patient of 46 years, who noticed the proptosis accidentally when trying on hats at a milliner's.

FIG. 1B.—Section of tumour removed at operation. A typical hæmangioblastoma.

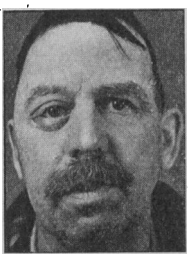


FIG. 2A. — Case with a temporal boss, œdema of the eyelids, and a discharging sinus towards the outer canthus.

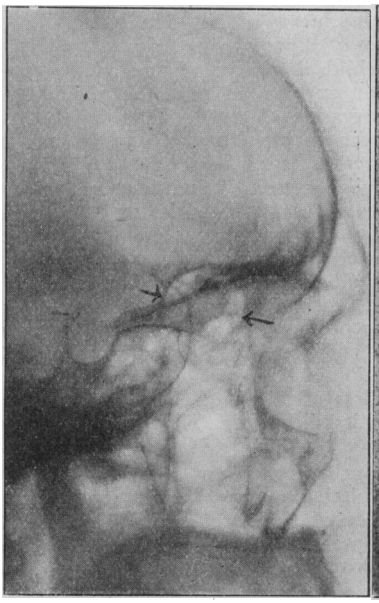


FIG. 2B.—Radiograph showing an erosion described by Dr. Dandy as typifying a case of "Schüller-Christian disease".

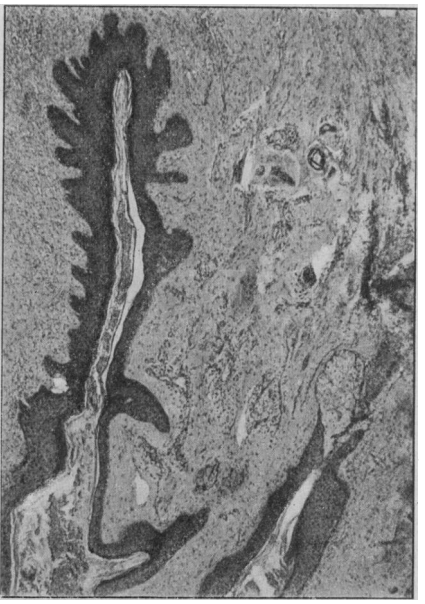
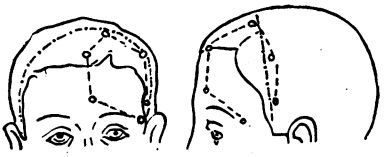
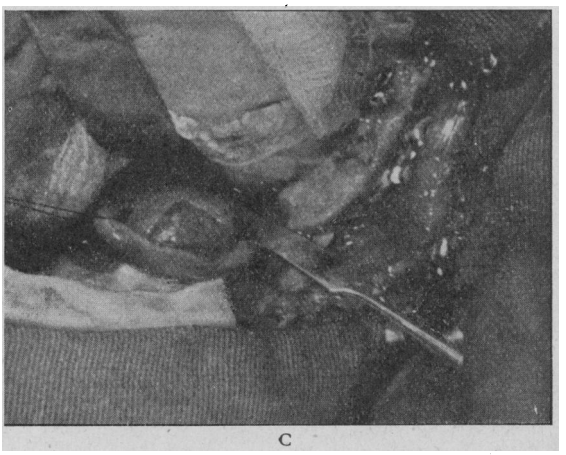


FIG. 2C.—Section shows the dermoid nature of the tumour.



A B

FIG. 3.—Sketches show plan of skin incision and osteoplastic frontal flap. Photograph shows the resultant exposure with a tumour about to be delivered.



C

that one may consider as being "orbital". One may rightly ask what degree of protrusion is necessary before a true orbital tumour is to be suspected? I submit that there is no correct reply to this question, but I would mention that in carrying out prolonged investigations on cases of proptosis of varied origins, Rundle and Wilson (1944) found that of all their cases of proven primary orbital tumours the minimal difference between the measurements of the two eyes was 6·0 mm. The protrusion of the most proptosed eye I have seen so far was of such a dimension that the eyelids occasionally became retained behind the globe, a state comparable with a paraphimosis. These more advanced degrees of protrusion in the writer's experience have resulted from juxta-orbital meningiomata and arteriovenous fistulæ. The absence of, or failure to observe, signs other than proptosis generally leads to a diagnosis of "exophthalmic ophthalmoplegia"; indeed of my series, those cases which had not formed a palpable orbital or associated mass and did not show papilloedema had all, at one time or another, been so designated.

Just as the lack of proptosis does not of necessity prove that the orbit is uninvolved, so the presence of proptosis does not require orbital invasion by tumour. Actually unilateral and also bilateral proptosis are to be seen in correlation with intracranial tumours distantly placed from the orbit. The literature provides records of proptosis in association with subdural hæmatoma, basal tumours of the anterior and middle fossæ, tumours of the cerebello-pontile angle, ventricular tumours and occipital tumours. Jacques Ley (1936) states that when unilateral proptosis accompanies cerebello-pontile angle tumours the proptosis is more common on the side opposite to the brain lesion. The incidence of proptosis with cerebral tumours in general bears different citation at the hands of different writers: while Skydsgaard (1938) gives the figure as 4%, Cushing and Gibbs (1932) say 8%, and Elsberg, Hare and Dyke (1932) describe unilateral protrusion on 1·5 to 2·0% of cerebral tumours. In explanation Cushing and Gibbs offer the following theories: (i) Inverted Horner's syndrome; (ii) Oculomotor paresis; (iii) Hormonal—anterior pituitary; (iv) Compression of cavernous sinus.

When an intracranial lesion of very slow development encroaches upon, but does not extend into the orbit, a further process may be applied in explanation of the accompanying protrusion of the eye. The best example of the process that comes to mind is found in reaction to cysts of the jaw, wherein absorption of the bone adjacent to the lesion takes place and coincident deposition of bone occurs on the surface. This process in my opinion explained the clinical appearances in a young fellow afflicted by an intracranial epidermoid of the middle fossa, involving the pharynx and nasopharynx. In deciding on operative intervention, in this case, one was conscious of the undue risk of supervening meningitis, if not of chemical origin then from infection by organisms inhabiting the nasopharynx. This foreseen but none the less disappointing misfortune complicated the post-operative period with the result that the patient died. Autopsy proved that no direct extension of tumour affected the orbit but the bone between the middle fossa and the orbit had assumed that state of egg-shell crackling so often found in jaws containing dental or dentigerous cysts.

A proportion of the patients describe variability in the extent of the protrusion, as a result of various factors, i.e. change of posture, coughing, straining and sneezing, &c. This is based probably on vascular changes either within the orbit or actually in the tumour, and can be demonstrated clinically by jugular compression. A meningocele or encephalocele, of course, would show variability in similar fashion, but brought about in a different way—by increasing the intracranial pressure. Women patients not infrequently mention that changes are to be seen at, or about, the time of the menstrual cycle: what factor there is behind this is not certain; it may well be the same vascular project already mentioned, but it may equally well be of endocrinal origin. Infective granuloma—the so-called "pseudo-tumour of the orbit"—shows a variability together with which other symptoms such as pain also vary, and it would appear more likely that the change depended upon an exacerbation of the infective process, thereby producing more œdema and greater cellular infiltration, as well as some increase in vascularity. It seems possible that tumours arising in the region of the lacrimal gland may institute variability in yet another way, that is by interfering with the free escape of secretion. Lindsay Rea (1941) states that the proptosis associated with hæmangiomata is influenced by posture, crying or other emotional disturbances.

On occasion one meets a patient in whom proptosis is marked and is said to have been almost of spontaneous development. One of my cases provided this history: he had a chromophobe adenoma of the pituitary which had invaded the orbit (fig. 4). The

protrusion was described as having appeared overnight. The impression was that an acute hæmorrhage into the tumour had occurred. Byers (1901) refers to sudden increase in exophthalmos and explains this as due to effusion into Tenon's capsule and the supravaginal lymph space of the optic nerve.

Visual deterioration.—Coincident with, at times even preceding proptosis, frequently there occurs visual deterioration in one or other of its forms: increasing hypermetropia, diplopia, restriction of the visual field, or diminution of visual acuity. Over a considerable time many tumours exert little influence on vision, but failure to appreciate a change owing to casual examination is responsible for misjudgment in some cases. Only by meticulous charting of the visual fields, applying small objects of 1 or 2 mm., and employing a Bjerrum screen are some of the lesser defects to be revealed. The recognition of such a defect can make all the difference in establishing a diagnosis, or in revealing intracranial involvement.

Strange though it may seem often both visual deterioration and ocular protrusion escape the attention of the patient; as a matter of fact the discovery of either can be purely accidental. A patient will only come to realize the paucity of vision because, for some reason or other, the good eye is temporarily put out of action, involuntarily, as when some foreign body enters the conjunctival sac, or voluntarily as in a patient who closed one eye in an attempt to sight a rifle. This unrevealed loss of vision no doubt accounts for the somewhat infrequent complaint of double vision from patients with these disorders. In like fashion the proptosis is ignored by the patient who, in retrospect, finds that it is of long standing—a woman patient first noted proptosis when trying on hats at the milliner's, yet the prominence of the eye exists in a passport photograph taken four years prior to this incident (fig. 1, A and B).

Diplopia, according to Parsons (1942), is a common complaint in optic nerve tumours. Whether this is so, or not, I cannot say, but of my limited number of these cases not one patient recorded it. The general impression of all cases of primary orbital tumours seen by the writer is that diplopia is not commonly found but was observed in approximately one patient in four. Already the attendant visual failure has been proffered as an explanation in some cases; in others it would seem reasonable to suppose a central suppression of the conflicting image.

Preceding visual deterioration, in what one may term the more absolute forms discussed hitherto, it is possible for relative inefficiency to develop as an increasing hypermetropia. This is brought about by direct pressure on the back of the globe, so compressing it in its anteroposterior axis. It is an unusual finding, having been noted in only one of my series. This, perhaps, is diagnostic of a tumour limited to the orbit.

The eye may be displaced in other directions than directly forwards, particularly by tumours lying at the orbital outlet. As far as I know there is nothing characteristic in such displacement.

Pain.—Generally speaking the outstanding point about pain is the lack of it. Of my patients in only two did pain pervade the picture; both cases harboured inflammatory masses—"orbital pseudo-tumours". So important did it appear in these cases that I am rather of the opinion that it may be a diagnostic feature.

Some reservation is necessary here, for another patient came to me because of pain in the distribution of the second division of the trigeminal nerve, with the diagnosis of "trigeminal neuralgia". He, at a later date, developed proptosis with full realization of the underlying disease—carcinoma of the maxilla. I may say that the original radiographs failed to indicate any difference between the two maxillæ. A similar case is presented in Dr. Dandy's series.

Tumour formation.—Apart from the formation of a mass superficially placed in the orbital outlet, it is unusual for any localized orbital swelling to attract the attention of the victim. More likely is it that a patient will be directed to the surgeon on account of increasing protrusion in the frontal or temporal region due to an underlying meningioma, or other pathological entity. Two patients of my series had had biopsies carried out on such temporal protrusions prior to my seeing them; one of these became infected in consequence, in fact it was the severity of the infection that led to his transfer. Occasionally one is able to feel the anterior margin of a mass tracking over the surface of the eyeball.

Alternative symptoms.—In addition to the above and more common complaints, various other symptoms have been responsible for the appearance of patients: amongst these symptoms may be mentioned ptosis, œdema of the eyelids, chemosis, cranial nerve palsies, an audible bruit, or a discharging sinus. While these symptoms obtrude as direct indicators of orbital involvement, tumours involving the orbit secondarily show in addition the associated clinical signs of their primary origin.

Retraction of the upper lid due to spasm of the levator palpebræ superioris is a rare finding in a case of orbital tumour. Rather is this considered to be an important factor in the differentiation of exophthalmic ophthalmoplegia, wherein this retraction is thought perhaps to be typical. I have a patient with this sign at the present time, in whom there is no doubt of the existence of a tumour, as it is palpable.

Dr. Dandy stresses the high proportion of cases in which, in his experience, both the orbit and the cranial cavity are involved—in his experience 75 to 80%. He also makes the following comment: "As a matter of fact, it is rarely possible before operation to be certain whether or not the tumour also lies within the cranial chamber, as so many of them do." The writer cannot subscribe to this statement. In fact my experience is that, by careful clinical examination, by judicious radiography, and by suitable application of laboratory investigation, not only is the diagnosis of tumour to be reached, but its ramifications regularly revealed, and not infrequently its pathological nature surmised.

Ophthalmoscopic examination.—The ophthalmoscope affords evidence of the escape or implication of the visual pathways in so far as the appearances of the optic disc apply. An occasional detachment of the retina is to be found. Parsons (1942) makes

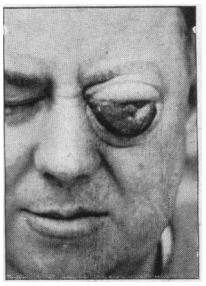


FIG. 4.—A " spontaneous " proptosis said to have developed overnight. Case of chromophobe adenoma of the pituitary invading the orbit.

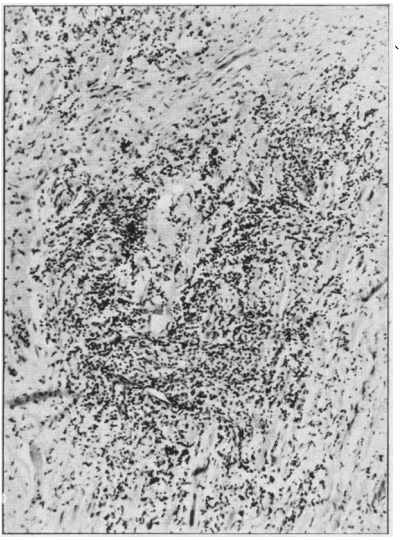


FIG. 5.—Section of an " inflammatory mass " or " orbital pseudo-tumour".

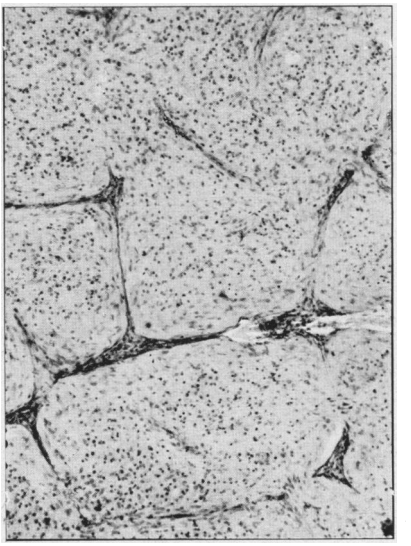


FIG. 6.—Section of " glioma of the optic nerve".

the concise statement that "papillitis may be present especially with optic nerve tumours, optic atrophy is common in other forms". As a generalization this statement holds, but some qualification seems to be indicated. Although primary atrophy would appear to be the final outcome of true orbital tumours, other than those of the optic nerve, no matter the plane of origin, the disc changes brought about in the juxta-orbital tumours are those peculiar to the primary lesion. Thus while primary atrophy is associated with a meningioma developing from the sphenoidal ridge or the olfactory groove, a temporal glioma is prone to produce papillœdema or its derivative, consecutive atrophy. Optic nerve tumours often give rise to gross papillœdema, and sometimes invade the disc.

Duration of the disease.—Naturally the rate of growth will vary with the pathological nature of the tumour. Nevertheless it is no uncommon story to find that an innocent tumour of the orbit has been known to have been present for anything up to twenty years. The cases of longest standing, in my experience, are the "epidermoids". Only by retrospective inquiry may it be possible to gain any idea of the duration, owing to the fact that the patient's attention has not been focused on the existence of an abnormality However, experiences vary; in respect of my limited number of optic nerve tumours, the history has been of somewhat rapid deterioration lasting a few weeks to three or four months: yet Lindsay Rea (1941) says that these tumours grow slowly, citing periods of up to two years. Attention to intermittence or remittence in the clinical history has already been given, this would appear to be especially noticeable in orbital pseudo-tumour.

Pathology.—A recapitulation of all the tumours to be found affecting the orbit would absorb much time, but give little help to our present deliberations. It is with this in mind that one decided to keep to the material at hand and to sort out from it some details requiring clarification. A striking point to my mind, when comparing the three basic series, is their lack of similarity: Dr. Dandy's commonest lesion is in reference to manifestations of "Schüller-Christian disease", Iles' and Rendle Short's paper reports four cases of "hæmangioma", and my own series provides four optic nerve tumours and three orbital pseudo-tumours. The main indication to be read from these findings is the failure of any small collection of cases to conform with the general perspective, and the annulment of that present-day attitude of rushing into the press with records of one or two cases. Another difficulty is the interpretation of the pathology, especially does this refer to "Schüller-Christian disease" and to "pseudo-tumour of the orbit". As I read Dandy's descriptions there would appear to be one case only where any xanthomatous tissue occurs and in which an alternative diagnosis is not available. There is one case in my own series upon which a biopsy was carried out elsewhere, and in the histological report is the following comment: "I would suggest that this is some sort of granuloma. Whether it is associated with a generalized metabolic disorder such as Schüller-Christian's disease one cannot say, although the history might guide one." A section of the tissue removed at operation leaves no doubt that the tumour is of "dermoid" origin (fig. 2, A, B and C). Some of the conditions described as "Schüller-Christian" deposits would appear to simulate the tissues of what, in my series, constitute the "pseudo-tumours" (fig. 5). It is of particular interest that one of the cases of hæmangioma recorded by Iles and Rendle Short had a nævus of the eyelid.

Tumours originating within the eye obviously belong to the realm of the ophthalmic surgeon. What is considered to be the correct treatment for a retinoblastoma that has extended along the optic nerve, in view of the comment of Verhoeff (1922) that retinoblastomas are the only known neoplasms of glial origin which metastasize to distant parts?

Tumours of the optic nerve have been fully investigated by the ophthalmic surgeons, particularly Hudson (1910) and Mathewson (1930). These two observers collected no less than 211 cases comprised as follows: 170 gliomata or 80·56%; 33 meningiomata 15·56%; 8 fibromata 3·8%.

Thus the incidence of glioma is between five and six times that of meningioma. Glioma is certainly a disease of the young: Hudson showed that 75% occur within the first decade, and that the average age of patients suffering from these tumours is 13 years. It is odd to find that Parsons (1942), in referring to optic nerve tumours, comments that "most of these tumours are probably endotheliomata which have undergone degeneration". In the collection of cases under review there are but four tumours arising from the optic nerve, and these are from one of the three series. Three of the tumours proved to be gliomas and were removed from children of 4½, 8, and 11 years of age. The fourth case, a meningioma, was in a patient of 33 years, who developed multiple intracranial tumours in association with generalized neurofibromatosis.

Radiographic examination.—The primary tumours restricted to the orbit generally show little X-ray evidence, perhaps an increase in bony density may be seen occasionally in the presence of the chronic inflammatory granulomata. Therefore unless a tumour is either of an invasive nature or extends beyond the precincts of the orbital cavity radiological verification, in all probability, will not be available. An osteoma, when present, casts such a dense shadow that it can hardly be controversial. Radiographic change takes on one of three forms: localized hyperostosis, sclerosis, or erosion. A localized hyperostosis is unusual in association with orbital implication, but may be seen in a meningioma of the olfactory groove. Sclerosis of bone is best seen with a meningioma of the sphenoid ridge. But of all appearances, changes of an erosive nature are most common, moreover they are very defined on account of the chronicity of the underlying lesion. The most impressive picture is that of an enlarged optic foramen brought about by intracranial extension of a tumour of the optic nerve. With an enlarged optic foramen the contour is important, and not just an increase in size; the dilated foramen must not be of an increase in one diameter alone; it should be circular rather than ovoid, or of other conformation indicating general distension. One may well ask if the optic foramina are always symmetrical, and to what extent an optic foramen can be encroached upon without causing pathological change in the nerve? Investigations by Clegg (1936) showed that the two foramina are by no means invariably symmetrical, indeed symmetry is to be found in but 45% of skulls. He also came to the conclusion that should the optic canal be constricted so that one diameter becomes reduced to 2·8 mm. or less, a normal nerve cannot exist within it. In his investigation he found that skull deformity with optic nerve symptoms occurs twice as often as do optic nerve tumours.

Malformations or erosions of the orbital walls, as from congenital deformities or mucoceles respectively, should be recognizable by their contour and associated radiographical outlines, e.g. the frontal sinus.

When proptosis exists in association with generalized bone disease, the other affected regions of the skeleton will also be subjected to X-ray investigation. By these means the nature of the disease will be diagnosed.

Laboratory investigation.—In so far as investigations of a pathological nature are applied to problems in general I propose to make no especial comment. It is worthy of note, nevertheless, that in no case should operation be carried out for a presumed tumour without a W.R. or Kahn test.

Lumbar puncture may prove of value, both from manometric estimations of C.S.F. pressure and for analysis of the cerebrospinal fluid. In the extension of an optic nerve tumour through the optic canal, an increase of the total protein content of the cerebrospinal fluid may indicate that the subarachnoid space is involved. It may be possible, too, to differentiate between tumours by a like investigation, e.g. a mass is considered to occupy the middle fossa as well as implicating the orbit, is it meningiomatous or of a dermoid nature?—under the circumstances a rise of total protein content of the C.S.F. would favour the former.

The manometric pressure of the fluid, if above the normal, might indicate the intracranial extension of a tumour, although this means of anticipating such a state would not be without risk.

Treatment.—Having considered the patient from the general point of view and having reached the decision that operative intervention is the correct course, there is the question of the best route of approach. Excluding superficial lesions at the orbital outlet which can be dealt with adequately through the lids or the conjunctival sac, there remains the choice between an operation by the Krönlein approach, or a modification of it as described by Crawford, King and Rodgers, and the transfrontal exploration described by Dandy. My opinion concurs absolutely with that of Dr. Dandy in that the transfrontal route is preferable in every way (fig. 3). Through a frontal osteoplastic flap a more direct and more adequate exposure is obtainable, any extension intracranially is approachable, less interference with ocular mobility ensues, and there remains no visible and ugly scar. As for the replacement of a prominent eye by one that in addition pulsates, this is untrue. It is claimed by some that the risk of the operation is greater than by other routes, this also is not borne out when the operation is carried out by a trained neurosurgeon.

Obviously the occurrence of active infection precludes radical intervention. This complication will require the adoption of conservative measures, or the institution of suitable means of drainage. Some more radical form of surgical attack will then prove necessary on a subsequent but delayed occasion.

Rarely it may prove necessary, in control of infection, to eviscerate the eye. It is said that excision of the globe precludes exploration by the transfrontal route owing to the exaggerated risk of meningitis, but such is not the case when there is an adequate interval between the two procedures.

MATERIAL FORMING THE BASIS OF THE PAPER

	Group 1	Group 2	Group 3
Cyst—simple	—	1	—
Dermoid	—	1	2
Fibroma	1	—	—
Granuloma	1	—	3
Hæmangioma	—	4	1
Lacrimal gland tumour	—	1c	1
Meningioma	11	—	1+
Mucocele—frontal	—	1	2
Ethmoidal	—	—	1
Optic nerve tumour—Glioma	—	?1	3
Meningioma	—	—	1
Osteoma	2	—	—
Osteomatous cyst	1	—	—
Schüller-Christian disease	5	—	—
Chiasmal glioma	4	—	1
Lipoma	—	1	—

Group 1 : Cases of Dandy.
Group 2 : Cases of Iles and Rendle Short.
Group 3 : Cases of the author.

c indicates that the tumour was carcinomatous.

Although one case of meningioma is included within the present author's series, it is there purely as representing a type of case. The plus sign indicates that the author has had a number of such cases. Other cases of this type are not included, as they are not truly representative of "orbital tumours".

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Orbital Tumours

By S. P. MEADOWS, M.D.

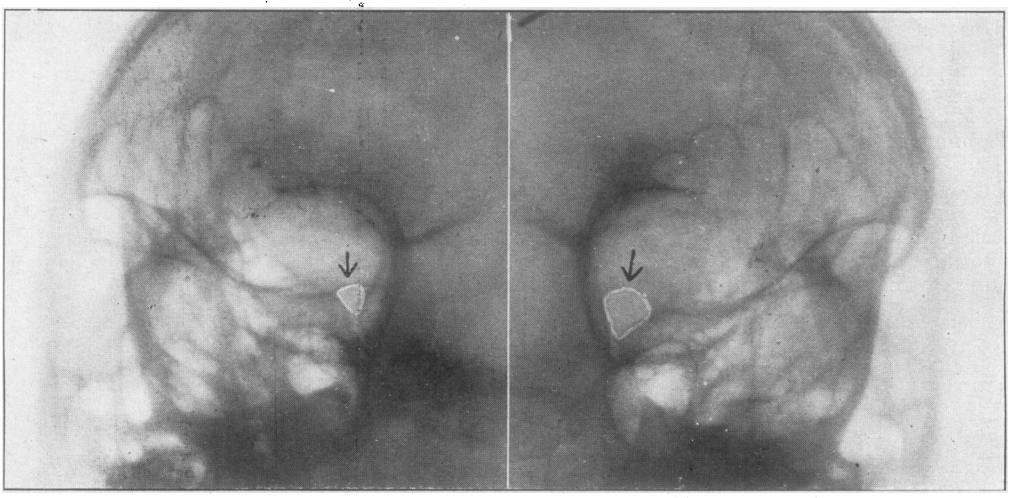
TUMOURS originating in, or involving the orbit by indirect extension, are of considerable interest to the physician, particularly with regard to diagnosis. Unfortunately it frequently happens that some cases are never proved by operation or otherwise, so that cases described are, in a sense, selected cases. Many so-called orbital tumours are not confined to the orbit. There is frequently an intracranial extension, which might be likened to the proverbial iceberg.

I should like to refer to a series of proved tumours involving the orbit seen personally during the past few years, some of them in the Physicians' Clinic at Moorfields Eye Hospital. I have chosen as representative cases: 1 glioma of the optic nerve; 3 meningiomas involving the orbit, one via the nerve sheath and two by hyperostosis; 1 venous tumour or angioma; 2 pseudo-tumours; 1 pituitary adenoma; 1 metastasis from carcinoma of the breast.

Several cases of carcinoma originating in the nasal sinuses and involving the orbit by direct extension have been excluded.

Glioma of the Optic Nerve

CASE I.—A girl, aged 15 years, with fifteen months' history of misty vision in the left eye, without pain or headache. Examination showed primary optic atrophy on the left side, visual acuity reduced to 6/60, and peripheral constriction of the visual field with loss of the lower temporal field and slight exophthalmos (4 mm.). Ocular movements were full. The left optic foramen was enlarged on X-ray examination (fig. 1).



Right optic foramen. Left optic foramen.
FIG. 1 (*Case I*).—X-rays o foptic foramina. (Glioma of optic nerve.)

On March 18, 1940, Mr. McKissock explored the orbit from above (intracranial approach). The optic nerve was enlarged as it joined the chiasm, and on removal of the orbital roof, the nerve was enormously enlarged as it was traced forwards, but became smaller again before it entered the globe. The nerve was excised, the eyeball being left intact. Microscopy of the tumour showed it to be a glioma, and the distal end of the nerve was normal.

The patient was quite well when last heard of, over four years after the operation.

This patient shows the essential clinical features of an intrinsic glioma of the optic nerve. These tumours are rare, only a few hundred being described in the literature. There is a slowly progressive unilateral visual loss in a young person, usually under 20 years of age, followed by gradually increasing exophthalmos, but little, if any, defect of ocular movement. Pain is usually absent. The fundus shows a primary optic atrophy,