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Section of Ophthalmology and Section of Neurology
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DISCUSSION ON TUMOURS OF THE OPTIC NERVE

Mr. A. C. Hudson: The total number of recorded cases of primary tumours of the optic nerve and chiasma is less than 350. Most of the tumours can be classified histologically according to their origin in the glial tissue of the nerve, or in the tissues of the nerve sheath. The great majority of the sheath tumours were meningoendothelial.

The glial tumours occurred in the series in the proportion of 3 to 1 meningeal. Both types of tumour are rather commoner in the female than in the male. There is a striking difference in age-incidence. 40% of the glial tumours caused symptoms during the first five years of life, but not one meningeal. 60% of the glial tumours came to notice in the first decade, as against 24% of the meningeal; and 90% glial, as against 50% meningeal, in the first two decades.

Both types of tumour, when intra-orbital, cause exophthalmos, usually very slowly progressive. The direction of the exophthalmos is most commonly straight forwards; but sometimes it may be downwards and outwards, especially in the case of large tumours. Exophthalmos has been associated with pain in some of the meningeal tumours, and with slowly increasing hypermetropia in one case of each type of tumour.

Movements of the eyeball are often little or not at all affected by a glial tumour, a point first noticed by v. Graefe as indicative of freedom from tumour formation of the most anterior part of the nerve; in the case of meningeal tumours on the other hand limitation of movement is common, and may be complete in advanced cases, the eyeball being fixed to the cup-like anterior surface of the tumour.

Progressive defect of vision, or amaurosis, of the prominent eye is almost invariably found with both types of tumour. It has preceded exophthalmos in many cases of glial tumour, in one case by as much as twenty-four years. In the case of meningeal tumours on the other hand the failure of vision is usually explicable as the direct result of pressure of the tumour. Amaurosis, or defective vision with hemianopic field, in the prominent eye, associated with hemianopic field, and usually defective central vision, in the other, is evidence of extension of a glial tumour to the chiasma; a similar affection without exophthalmos is met with in cases in which the intracranial portion of the nerve and the chiasma are affected.

Ophthalmoscopic examination usually reveals optic atrophy or, less commonly, papilloedema. In two cases extension of a glial tumour to the nerve head has been discovered with the ophthalmoscope, and in two cases it has been found post mortem. In view of the fact that meningeal tumours not infrequently extend through the sclerotic to the choroid it is remarkable that no corresponding fundus change has been noted.

Skagrams may show the shadow of an intra-orbital tumour. Extension of a glial tumour backwards beyond the apex of the orbit is frequently indicated by enlargement of the optic foramen. Martin and Cushing have pointed out that, with glial tumours of the chiasma and intracranial portion of the optic nerves, the sella turcica may have a gourd-shaped outline, attributable to enlargement of the optic foramina and forward extension of the sella under the anterior clinoid processes.

Prognosis.—As regards the glial tumours it is a remarkable fact that, in spite of the high percentage of cases in which removal of an orbital tumour has been complete, in only one case (Seefelder, 1931) has a recurrence of the tumour in the orbit been recorded, while subjects of incomplete operation have been found free from recurrence ten and a half and twenty years later. In other cases there has been no recurrence fifteen, eighteen and a half, nineteen, and twenty-four years (two cases) after operation.

Meningeal tumours recurred in 15%, of cases, at periods from two months to twenty-five years after operation. The tumour recurring after two months was removed, and had not recurred again after two years, while another tumour, which recurred after seven months...
and was removed, recurred again after nine years. A liability to recurrence is not surprising when it is borne in mind that these tumours have not infrequently been found to have invaded neighbouring structures, six times the sclerotic and the choroid, three times muscle, and once the optic nerve head.

As to expectation of life the data available are too scanty to be of much value, except in so far as they indicate the gravity of signs of involvement of the chiasma by a glial tumour. In all of the 13 cases in which death occurred under observation (at periods of one month to four years after the patient first came under notice), and in the three cases in which it occurred immediately after operation, there were symptoms of chiasmal or other intracranial disease.

Many years ago I suggested that certain peculiar features in cases of glial tumour—history of defective sight before the appearance of signs of tumour, often of many years standing, and sometimes dating from the first few months of life; absence of recurrence of tumour in the orbit after incomplete removal, and the ill-defined transition of the tumour tissue through tissue showing neuroglial proliferation into normal tissue, in spite of the absence of malignant characteristics—might be explained on the supposition that the tumours were manifestations of an overgrowth of neuroglia in tissues which had previously been exposed to some deleterious influence, and were therefore not true neoplasms, but manifestations of a degenerative gliomatosis.

Verhoeff, in 1932, expressed the opinion that the tumours were true gliomas composed of cells derived from astrocytes; at the same time he made the following comment: "It may be of considerable practical importance that within the nerve-stem the growth does not advance by invading the original structure, but by causing the pre-existing neuroglia in the vicinity of the tumour to proliferate and take on the character of the tumour tissue. This would seem to indicate that some substance is produced by the tumour which stimulates the contiguous neuroglia. The possible practical importance of this observation lies in its indication that removal of the largest part of the tumour may do away with the assumed stimulating substance, and thus prevent further extension of the growth." It appears to me that this conception would place the tumours in quite a different category from true neoplasms.

The histological researches of Lundberg, inspired by the pioneer work of del Rio-Hortega, and reported in 1935 in a valuable monograph, showed that of the nine glial tumours examined all were oligodendrocytomas. No indication is given that he regarded the tumours otherwise than as true neoplasms arising in previously healthy tissue.

The evidence as to the relationship of v. Recklinghausen's disease and glial tumour of the optic nerve and chiasma, which was first adduced by Goldmann in 1893, has since then been strongly reinforced by the discovery of a considerable number of cases in which both affections were manifested in the same individual. An association of meningal tumour with neurofibromatosis has also been met with in a few cases. A conception of glial tumour formation as analogous to the phenomenon in neurofibromatosis of a true neoplasm arising in previously abnormal tissue would accord with the clinical picture.

Dr. del Rio-Hortega (Abstract): The paper deals with those tumours of the optic nerve which develop in its own parenchyma and derive from its own cells. Tumours arising in the nerve sheaths, those which infiltrate the optic nerve from adjacent structures, for example, the retina, and metastatic tumours are excluded.

The old classification as sarcomas, myxosarcomas or gliosarcomas has been abandoned. The modern denominations of polar spongioblastomas and schwannoid oligodendrocytomas are not yet definite.

These tumours are certainly gliomas, similar to the cerebral gliomas, but they have a special picture. They are formed by very elongated cells arranged in bundles and plexuses. These cells are commonly bipolar, but they may have three and more processes though this astrocytic type is very rare. Among them are often small rounded cells similar to oligodendrocytes.

The interpretation of these cells is rather difficult. They could be considered atypical astroblasts, since among them there are some astrocytes which may indicate a progress in the differentiation. They could be interpreted, too, as atypical schwannoid oligodendrocytes, since among them there are other types of oligodendrocytes. But it is impossible to interpret them as polar spongioblasts without providing an artificial solution for a problem that is not yet solved.

1 In Penfield's "Cytology and Cellular Pathology of the Nervous System".
Therefore, the denomination of these tumours may be longicellular astroblastoma, or schwannoid oligodendrocytoma. Their cells have no spongioblastic characters. They are elements in a degree of differentiation corresponding to the astroblasts and astrocytes, but morphologically they are more similar to the schwannoid oligodendrocytes.

From the differentiation of their cells it is possible to conclude that tumours of the optic nerve belong to a group comprising: (1) Tumours of the optic nerve. (2) Tumours of the optic chiasma. (3) Many tumours of the corpus callosum. (4) Many tumours of the medulla oblongata. (5) Cerebellar astrocytoma.

These tumours are morphologically linked without interruption. All these tumours have abundant bipolar, elongated cells, associated with more or less abundant astrocytes poor in processes. Clinically they all have a moderate malignancy.

[Dr. del Rio-Hortega demonstrated a series of photomicrographs illustrating his paper. It is hoped to publish his contribution in full at a later date.]

Mr. E. Wolff: Hudson (1912) in his classical paper was the first to raise his voice in protest against the usual classification of these tumours into intra- and extradural. Verhoeff (1922) in an admirable contribution entitled “Primary Intraneural Tumours (Gliomas) of the Optic Nerve” gave further evidence why the above method of describing these growths would not do. My contribution to-day will be mainly to point out certain aspects of the pathological anatomy of these tumours and to try and show how this determines their method of spread. In order to do this I have found it indispensable to compare them with their intracranial counterparts.

According to MacCallum (1936) gliomata of the brain are rarely sharply outlined either by their colour or their consistence, but shade off insensibly into the surrounding brain substance. Their position can be made out in the cut surface fairly well, however, by the swelling, the increased vascularity and translucence and, by the haemorrhages and necroses which are usually present. There are some forms, indeed, which are so diffused through the brain substance that it is difficult to determine their outline even with a microscope. Gliomata do not as a rule extend to the surface of the brain and never pierce the meninges.

Under the microscope most gliomata present a fairly uniform mass of cells rather small in size with numerous protoplasmic processes which join in a tangle with those of other cells and thus produce a network of delicate filaments. Great variety is seen in the form and arrangement of these cells. They are frequently found to have a rather abundant cytoplasm with many long processes extending in all directions so that they have acquired the name of astrocyte or spider cell. Others are much simpler in outline and they have very few prolongations. In many gliomata they are especially condensed around the blood-vessels, in others there are minute spaces about which cells are arranged radially with a flat or curved foot at the edge of the space and a long frayed-out cell body extending peripherally to become entangled with the other cells.

Degenerative changes, haemorrhages and necroses are frequent in these tumours. They may lead to such widespread destruction of the tumour that only a thin rim of tumour tissue is left. It is not infrequent in such cases to find that the debris of the tumour cells and blood has been replaced by a clear fluid, so that the whole area appears as a thin-walled cyst with only some pigment and traces of tumour tissue in its walls to indicate its original nature.

Trotter (1918) states that the glioma is a true tumour of the brain substance and possibly the only one. Cushing and his associates have shown that the differentiation between glioma and sarcoma may be extremely difficult and that the more thorough the histological examination the fewer appear to be the cases of true primary sarcoma of the brain. There are also general grounds for supposing that true sarcoma is unlikely to arise in the brain substance. It may certainly be said that glioma must be regarded as the classical brain-substance tumour and that cases of supposed sarcoma should be regarded with caution.

A striking characteristic of all gliomas is their very slight tendency to invade non-neural tissues.

Dural endothelioma spreads on both aspects of the dura. Internally it presses on the brain in which it may make a large and deep impression but without, until the latest stages, becoming fixed to the brain substance.

The changes described are exactly like those which occur in the optic nerve tumours. It thus becomes clear that since the optic nerve is no nerve at all but a part of the brain its tumours will be, in all essential features, identical with those of the brain, and just as there is really only one brain tumour, the glioma, so there is only one intraneural tumour.
of the optic nerve—also the glioma. The endothelioma in both cases is a tumour of the meninges.

The differences in the manner of growth between the intracranial glioma and endothelioma and those of the optic nerve are due to anatomical differences and especially to the arrangement of the non-neural tissues. The glioma of the optic nerve usually starts some 10 mm. behind the globe in the region where the arteria centralis enters, and it seems to me extremely likely that the profound changes that take place when the mesodermal central artery is enclosed in the backward extension of the choroidal cleft may have an important bearing on this site of election for the origin of these tumours. From this point the tumour tends to grow towards the brain so that that part between it and the eye tends to be free from growth. The reason for this is that, as stated before, the growth has little tendency to invade non-neural tissues, for anteriorly we have the arteria centralis with its connective tissue sheath and also the much denser septa present in this anterior part of the nerve. These naturally do not form an absolute barrier, for occasionally cases have been reported where the growth has reached the papilla.

The next point that calls for explanation is the presence of the growth in the subarachnoid space. Why does it get through the pia and not through the dura which is made of the same tissue? The answer appears to lie in the fact that hundreds of processes, the septa, pass from the pia into the nerve, and also in the structure of the septa themselves. A cross section of the optic nerve reveals that a number of the connective tissue septa are “incomplete”, and it is probable that the growth gets into the septa at these gaps. The growth separates the constituent fibrils of the septa and so produces a characteristic appearance: in a low-power view of a cross section of the nerve at an early stage of the growth it does not appear grossly altered. The septa merely appear widened as do the enclosed spaces between them. Proceeding peripherally along the septa the growth reaches the pia whose constituent fibrille are also separated by the growth. The pia, however, although widened by the tumour can usually be made out separating the intra- and extra-pial portions of the growth.

As stated before the growth does not get outside the dura, and this has an important bearing on the difference between the clinical features of the glioma and the endothelioma.

The dural endothelioma of the optic nerve, like that of the central nervous system, spreads on both sides of the dura. Internally it will press on the optic nerve which may be compressed to a thread but is not invaded by the growth except perhaps at the latest stages. Externally, not being in contact with bone, it does not produce those remarkable changes in the walls of the orbit so characteristic of the changes produced in the skull by the intracranial dural endothelioma. In fact it grows freely in the orbit till, eventually, it will have the shape of the muscular cone. Anteriorly it grows round the back of the globe, pressing on it and causing an artificial hypermetropia. Also it will eventually form a cup for the back of the eye and, continuing its growth forwards, may be palpated through the eyelids. Incidentally the endothelioma is much more likely to interfere with the ciliary vessels and so produce those pigmentary changes in the fundus (as shown in a case of Sir John Parsons and published by Neame and myself, 1925) which Wagenmann and others have described after cutting these vessels experimentally in the rabbit.

Intra-ocular extension is rare both in glioma and endothelioma. But in the former the spread is along the optic nerve to the papilla, while in the latter it is through a canal for a posterior ciliary artery or nerve, so that the swelling inside the eye resulting from the tumour is peripapillary. The swelling of the disc which so often accompanies endothelioma of the optic nerve is therefore not due to the intra-ocular extension of the growth as it may be in the glioma, but to a papilledema the result of interference with the venous or lymph drainage.

REFERENCES

Trotter, W. (1918), in Choyce's "System of Surgery".
Verhoeff, F. H. (1922), Arch. Ophth., 51, 120, 139.

Professor Geoffrey Jefferson said neither in the case of meningeal tumours nor in that of intrinsic glial tumours of the optic nerve could one say that the intra-orbital portion was the only part involved by the tumour. One spoke of meningioma of the optic sheath: surely such a tumour might be expected to be found only where that
sheath existed, that is, within the orbit, and in the main that was true. On the other hand, a meningioma centred on the anterior clinoid process or about the sphenoidal wing might seed itself into the optic sheath and produce there the effect of a sheath meningioma. Thus there might always be a doubt concerning a sheath meningioma as an isolated process. It might be part of a larger, perhaps undisclosed, tumour, and this might be the explanation if a case ran a course of an unfavourable character. The link would be with the meningiomas en plaque and of the sphenoidal wing, but although he had seen and operated on several of these cases he had not had the opportunity of verifying the state of the optic sheath in any.

He had had more than one discussion on optic sheath tumours with Harvey Cushing, who was extremely reluctant to accept the view that a sheath meningioma did exist as a perfectly individual tumour. He showed an example of one of these meningiomas en plaque to illustrate the unroofing of the optic canal in the hope of saving the vision in the affected eye. He showed it for two purposes, first as an example of the type of change he was talking about, and secondly as illustrating the transfrontal approach to the orbit through its roof. The roof had been cut away and carried back so as to uncover the optic nerve. The picture of the optic nerve canal beforehand did not show any great thickening, and it seemed likely that what had happened was that the tumour had actually invaded the sheath. He showed it also because it illustrated the neurosurgeon's approach to the orbit, which he thought very much superior to the external approach, not only from the point of view of cosmetic result, but because the view and the actual approach to the tumour were better, and it was, moreover, a relatively simple operation which carried no mortality.

His next case was an example of what seemed, at present at all events, to be a pure sheath tumour. This was in a young man aged 23, who had suffered increasing loss of sight in the right eye, and had slight external strabismus and exophthalmos. The vision in his left eye was normal, and his fields were normal. The eye had that elastic feel which was rather characteristic of tumours of the optic nerve which increased the mass of the nerve and produced protrusion in a perfectly mechanical way, quite apart from any other structure or engorgement or anything else in the orbit.

The eye in this case was excised, and he discovered what an unsatisfactory method of approach the trans-palpebral or ordinary frontal approach to the orbit really was. Until the eyeball had been removed one could not tell what might be lying behind it, and it was impossible to get far enough back towards the optic foramen to make a really good removal. In this case the excision of the affected nerve surgically and pathologically left much to be desired. The tumour was a sheath meningioma of the optic nerve, and in spite of the incompleteness of the removal there had been no sign of recurrence during the five years since the eye was excised, a fact which bore out what Mr. Hudson had said about the long life of some of the meningiomas. This was one of the cases which was followed by radiography during the whole time to see whether or not there was any indication of extension of the process backwards, a development undoubtedly more common in glomatous tumours of the nerve than in sheath meningiomas, because the gliomas more definitely passed through the optic canal than the sheath meningiomas.

The remaining cases of this series—of which there were seven—were gliomas of the optic nerve and the optic chiasma. He asked his colleagues at the Royal Eye Hospital at Manchester to look up their records and this had made possible the study of another nine cases of optic nerve tumour, about half of them in children. From what Dr. del Rio-Hortega had told them it was quite clear that there was nothing really specific about the tumour of the optic nerve. He had shown the sort of polymorphism of the optic glioma which was shaded out over a background of similarity. The tumour was always the same thing, although it might have a considerable difference of appearance. It could be duplicated in the brain-stem, the pons, and the corpus callosum.

These facts were borne out by the clinical cases. The first was the case of a girl aged 12, who was admitted to the Manchester Royal Infirmary on the medical side because she had had a fit and had fallen into the fire and burnt her hand. But in addition some weakness had been observed down the left side of her body. She was at that time an ill child. She had developed a squint at the age of 18 months. Mr. Hudson had already mentioned at what an early age these troubles might begin. At the age of 5 she was seen by an ophthalmologist who said she was blind in her right eye. The left eye at that time was normal. She went on from then to be perfectly well, went to school and was always at the top of her class, until she approached the age of 12, when she began to suffer from headaches and this
weakness down the left side of her body developed. A photograph of her hands showed a certain worm-like movement of the left hand, and this made the diagnosis of increasing interest. An X-ray view of the skull showed the undercutting of the anterior clinoid process from the sella turcica. The sella turcica was practically obliterated, and there was a "gourd-like" extension below the anterior clinoid process, which Cushing and Martin thought might be very characteristic of optic glioma. He showed an illustration in point from Cushing and Martin. In the case he was describing the optic foramen was more than double the size it should be.

Here, then, was the problem: a child of 12, lately suffering from fits and severe headaches; on examination an atrophic disc in the right eye, a choked disc in the left, with some atrophy behind it, also some numbness on the left side, and X-ray evidence of enlarged sella and enlarged optic canal. The diagnosis was a tumour of the right optic nerve extending into the chiasma, and it seemed to be certain that the origin must extend into the subthalamic region and involve the nucleus subthalamicum. That proved to be the case.

Here Professor Jefferson showed a diagram of the brain as constructed from the clinical analysis, and indicated the tumour of the optic chiasma extended backwards into the brain-stem, and furnished a complete vindication of what Dr. del Rio-Hortega had just said about the unity of these processes extending from the pons and so forth right forward into the nerve behind the globe of the eye. Histologically it was seen to be the same kind of growth as Dr. del Rio-Hortega had described.

The next case was that of a boy aged 9, who had proptosis of the right eye and typical stigmata of von Recklinghausen's disease. He had actually under his skin here and there small subcutaneous neuromata. He showed one illustration of this case in order to demonstrate that the changes of the chiasma did not necessarily reflect themselves in the way that might be imagined in the sella even when there was a massive tumour. He had hoped that it might be possible in this case to cut the nerve intracranially, but the involvement of the chiasma made that impossible. The case showed that even with a tumour of this size it was not inevitable to get any great changes in the sella itself. The tumour was a glioma.

The case following furnished rather a lesson in diagnosis. A boy, aged 12, had complained for some years of failing vision in both eyes. He had no signs whatever of von Recklinghausen's disease. The story was one of visual failure. He had bilateral optic failure and an open sella turcica with no great depression of its floor. The cause of the visual failure seemed very doubtful. For the previous five years his sight had remained about the same, and then began to get rather worse. A ventriculogram showed relatively small ventricles and quite evidently a large tumour of the optic chiasma. At operation a firm white tumour was discovered which was at first thought to overlie the optic nerve and chiasma, and preparations were made to remove it by dissection, under the impression that as it became reduced in size the optic nerves would come into view. However, after the preliminary steps had been taken it was seen that the tumour was actually in the optic chiasma, and not just pre-fixed to it but extending in the optic nerve, and he was only just prevented in time from undertaking a removal which would have left no optic apparatus at all. The effect of the biopsy was not to depress the vision very much, and five years afterwards, although his vision was not by any means good, he was still able to get about. There had been a gradual deterioration, but the case again showed the extraordinary malignant attenuation of these tumours. They were fascinating cases both clinically and pathologically. Now that their nature was known, even the biopsy which he had made in this case was an unnecessary step. He would not say that one was always certain without an operation that the patient, unless he had von Recklinghausen's disease, had a glioma of the optic nerve or chiasma. But from experience with these cases he thought they could rest assured that the pathological process extended so far inward into the actual structure of the chiasma and optic nerve that it was extremely unlikely one could do the patient any good by operation, and one might easily be tempted to an intervention which would do harm. The only occasion on which good might be done was when the tumour was localized to the intra-orbital portion of the nerve.

Dr. Beaton Hird said that he had seen five cases, two belonging to other surgeons, and three of his own which he would briefly describe.

The first case was a typical one of glioma of the orbital portion of the right optic
nerve in a girl aged 15. He first saw her in the Birmingham and Midland Eye Hospital in March 1923, when she came on account of failing sight in the right eye of several months' duration. The eye had become a little prominent, and there was marked papilloedema in that eye. The movements were perfect, and the left eye normal. The sight of the right eye was reduced to less than \( \frac{1}{6} \). Measurement was made with an exophthalmometer, and the eye was found to project 17 mm. as against 13-5. The pupil reactions were normal. The X-ray view of the orbit was negative. He asked permission of the parents to explore the orbit, and was allowed to do so, but not to do more at that time. The external rectus was resected and the optic nerve examined but he could not satisfy himself then, in March 1923, that there was any definite swelling of the nerve. Slowly the eye became more prominent. It was measured for a number of months, gradually the protrusion increased and the papilloedema gave way to a marked optic atrophy, the left eye still remaining normal. By November of that year, eight months after his first observation of the case, the exophthalmometer reading gave an increase of 5 mm. over that found at the first observation. Permission was obtained to explore the orbit again and to remove the eye and the tumour if he found one. This time it was obvious that the optic nerve was very swollen right up to the back of the globe, and that the eye was blind he removed the globe and the tumour. It could be seen from the illustration [shown] that the extreme end was still very thick; the nerve had been cut clean in two; it was extremely difficult in that child's orbit, with the nerve so thick, to get right back to the entrance of the orbit and not cut the nerve across. He took hold of the proximal end with a strong forceps and drew it as far forward as he could so as to get round to the optic foramen. The pathological report was a glioma of the optic nerve, and that patient, although he must have left behind some intracranial portion of the nerve involved, remained absolutely free from recurrence in the orbit or any involvement of the chiasma while under periodical observation over five years. After that he lost sight of her; she left the district, and he did not know what had happened, but from what they had been told in the present discussion it was quite likely that she was still perfectly well.

This case illustrated the method he then employed to try to get right behind the growth. He had been interested to hear of Mr. Jefferson's roof approach, and it sounded to him a very good way of getting at the optic nerve tumour and seeing the full extent of the growth.

The second case was a male aged 41, seen for the first time by him in August 1936, but he had first of all gone to the Birmingham and Midland Eye Hospital and then had been passed on to the Neurological Department of the General Hospital. He had a papilloedema, a drooping of the upper lid and some evidence of ocular paralysis on the right side. It was felt that probably, as he had developed a complete ophthalmoplegia, he had a meningioma in the region of the great wing of the sphenoid. On examination on August 7, 1936, there was some ptosis of the right eye, but only slight protrusion, almost total loss of movement except downwards, contracted field of vision with marked receding angles, and visual acuity only equivalent to counting fingers. There was no evidence of involvement of the sensory nerves of the orbit, and there was a marked feeling of resistance when the eye was pushed backwards into the orbit. The left eye was normal in all respects. On August 14, a week later, he explored the right orbit and could then feel the optic nerve right up to the globe very enlarged. The same method of removal as in the first case was performed. The whole of the optic nerve right from the very back of the globe to the optic foramen had been converted into an absolutely rigid mass of cartilaginous consistency, and for that reason one could well see why the eye could not have been moved at all. The loss of movement may have been partly paralytic, certainly a great deal of it was mechanical. When he had stripped all the muscles off he could not move the globe. He cut the nerve and took hold of the posterior part and brought it forward, dissecting with his finger around the stump right back to the optic foramen. In this case there was definite erosion of the orbital roof posteriorly. The growth was reported pathologically as an endothelioma of the optic nerve sheath. The case has been under observation for three and a half years and there has been no recurrence whatever either locally, in the orbit or evidence of intracranial spread, and yet in this case the intracranial portion of the optic nerve must have been involved.

The third case was that of a married woman aged 25, who had suffered from headache
all her life but much more so during the two years before she came under observation. During the previous two months she had had symptoms of failing vision. On examination the right eye was blind and the left vision very blurred. There was considerable papill-oedema in each eye, more so on the right side, with some exudate and hemorrhage. The pupil in the right eye did not react to light. It was quite obvious that something was involving the optic nerve on the right side intracranially, but he was not prepared to make a diagnosis of the exact cause. The X-ray report was negative. The sella was quite normal, showing none of the peculiarities described by Cushing and Martin, nor was there anything else to help in the diagnosis. Mr. F. A. R. Stammers, Surgeon to the General Hospital, exposed the optic nerve on the right side by the frontal route and a swelling was found, a tumour of the intracranial portion of the optic nerve, extending forward half an inch from the chiasma which was involved to a certain extent. A small portion was taken for examination and proved to be glioma.

Although this was all that was done the patient's headaches ceased. The left eye, which had very considerable papill-oedema which greatly interfered with vision, made a gradual recovery, and the vision was practically ⅘ in that eye. The disc was a little pale and the field full. But it seemed to be very remarkable that merely a temporary decompression and exploration of the nerve should have been able to do so much good. He had expressed the opinion with regard to this case that if an operation was not done quite soon the patient would be blind in both eyes. It was of great interest that such a recovery should have occurred.

He congratulated Mr. Jefferson on one of his cases in which there was such a brilliant diagnosis. It was necessary to take into account optic atrophy which might follow a papill-oedema or be of primary type. There was a possibility of temporal field defect in the opposite eye. The X-ray changes not only of the pituitary fossa but also of the optic canal and the optic foramen would quite likely in a certain number of cases prove of the utmost importance in the diagnosis. These cases also appeared to have considerable loss of vision, and, lastly, in a certain number of them would be noted various signs of the involvement of the hypothalamic region.

Mr. Humphrey Neame referred to four cases of which he had had experience during the last twenty years. One point he wanted to stress particularly was the time factor. One of his cases was a child of 1½ years with proptosis, which from the history had come on rapidly, and he was afraid of sarcoma. Over a number of weeks, however, during which he watched the case, he was not convinced that the proptosis was increasing, but he thought it wiser to remove the eye and clear out the orbit, and there proved to be a typical gliomatosis. The second case [1] an endothelioma, was interesting on account of the age of onset, which was as late as 79 years. The third case [1] was a boy of 14 when first seen. The growth was removed, but not the eyeball; the eye was in no way useful, but he thought that in the case of a working boy the socket occupied by the eyeball was better than the fitting of a useless glass eye. The growth went right back to the optic foramen and was not by any means completely removed. The back part of the growth had broken down into a porridge-like mass. That was in 1923; he saw the boy fifteen years afterwards and he was still perfectly well.

Mr. Neame then proceeded to show slides illustrating these cases. In the fourth case [2] he pointed out the position of the endothelioma, going right up to the back of the eyeball, the eyeball sitting in it as in a sort of cup, of course preventing movement completely. The picture of the glioma in the child of 1½ years showed the expansion of the optic nerve—a point which Mr. Wolff had emphasized—without the destruction of its pattern, and the extension of the growth through the pia to the outside so that the nerve was surrounded by this cellular tissue.

REFERENCES

2 Neame and Wolff, ibid., 1925, 9, 610.

Professor Geoffrey Jefferson, in replying on the discussion, said what was so interesting to pursue was the extent to which tumours of the optic nerve could be confined to the nerve in its orbital portion. If no very precise information had come forward in that discussion there had at least emerged the idea that there was certainly no a priori reason why a tumour should not for a time be confined to the nerve in the orbit.