Pseudo-glioma / by E. Treacher Collins.

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PSEUDO-GLIOMA.

By E. Treacher Collins.

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That the diagnosis of glioma of the retina is still often attended with considerable difficulty is shown by the fact, that, during the four years from July, 1888, to July, 1892, of the 1,020 eyes which were excised at the Moorfields Hospital, 24 were removed because they were supposed to contain a glioma of the retina, and in 7 of these the pathological examination subsequently showed this not to be the case.

These cases, in which the appearances in the eye simulate closely those of a true glioma of the retina, are termed pseudo-glioma, a term which, in that it implies no definite pathological condition, is a bad one, but is of considerable use clinically, because it includes three distinct conditions of the eye, which, with our present knowledge, are not only very difficult to differentiate from true glioma, but still more difficult to distinguish from one another. Defining pseudo-glioma, then, as any condition of the eye liable to be mistaken for true glioma, the term may be applied to three classes of cases--

1st. Those in which there is a persistence and thickening of the posterior part of the fœtal fibro-vascular sheath of the lens, or an atypical development of the anterior part of the vitreous, with or without a persistent hyaloid artery.

2nd. Cases in which large masses of tubercle occur in the choroid.

3rd. Cases in which there has been inflammatory effusion into the vitreous, following a retinitis and cyclitis, and in most cases accompanied by detachment of the retina.

(1.) *Congenital Defects at the back of the Lens.*

Of the first class of cases I have recorded in full two examples in Part I of the present volume of these Reports, pp. 92—96. In each of these there was a mass of elongated cells at the back of the lens, into which the hyaloid artery, which was persistent and patent, passed forwards and broke up. This mass of cells was either the posterior part of the fibro-vascular sheath of the lens, which, instead of disappearing, had, on account of the persistence of the hyaloid artery, become much thickened; or an irregular development of the anterior part of the vitreous. Situated behind the lens, it gave rise to a white reflex, and, having blood-vessels coursing through it, was naturally taken for a glioma of the retina. To these two cases I now add the following:—

CASE 1.—*Persistence and thickening of the posterior fibro-vascular sheath of the lens. Hæmorrhage into the lens. Diagnosis of glioma retinæ.*

Maud H., aged 9 months, was brought to the Moorfields Hospital, as an out-patient, on August 26, 1891. Her parents had noticed some difference between her two eyes when she was three weeks old, and lately their attention had been called to a peculiar appearance in her left eye, by a neighbour.

The pupils of the two eyes were equal; nothing abnormal was detected in the right. A grey reflex was seen in the left, which, after dilatation of the pupil with atropine, appeared to be a soft-looking mass in the vitreous, close behind the lens, having a large hæmorrhage on its surface. A red reflex could be obtained around this opacity, through the margins of the lens, in all directions. The tension of the eye was normal. Glioma of the retina was diagnosed, and the eye excised on August 29.

Pathological Examination.—The measurements of the globe are antero-posterior 19 mm., lateral 18 mm., vertical 18 mm. The cornea is clear, the iris and anterior chamber normal. The lens is more globular than usual, measuring 6·5 mm. laterally,

4·5 mm. antero-posteriorly; at its posterior pole is an opacity with a reddish stain on its surface in the outer part. The vitreous is detached from the retina posteriorly; no remains of its central artery can be seen. The retina is a little folded at the ora serrata, and has one or two other slight creases in it. There is no new growth in connection with it.

Microscopical Appearances.—Sections that pass through the pupil show, in the lens, considerable spacing out of its fibres, and some breaking down of them into irregular hyaline masses and hyaline globules; it is doubtful how much of this change is the result of the hardening reagents.

The anterior capsule appears healthy; it is lined in the normal way by a single layer of cells which terminate in their usual position in the nucleated zone of the lens. On tracing the capsule backwards from the nucleated zone, it is seen as a normal capsule, unlined by cells, for a short distance, then on both sides of the section a number of nucleated fibres appear on

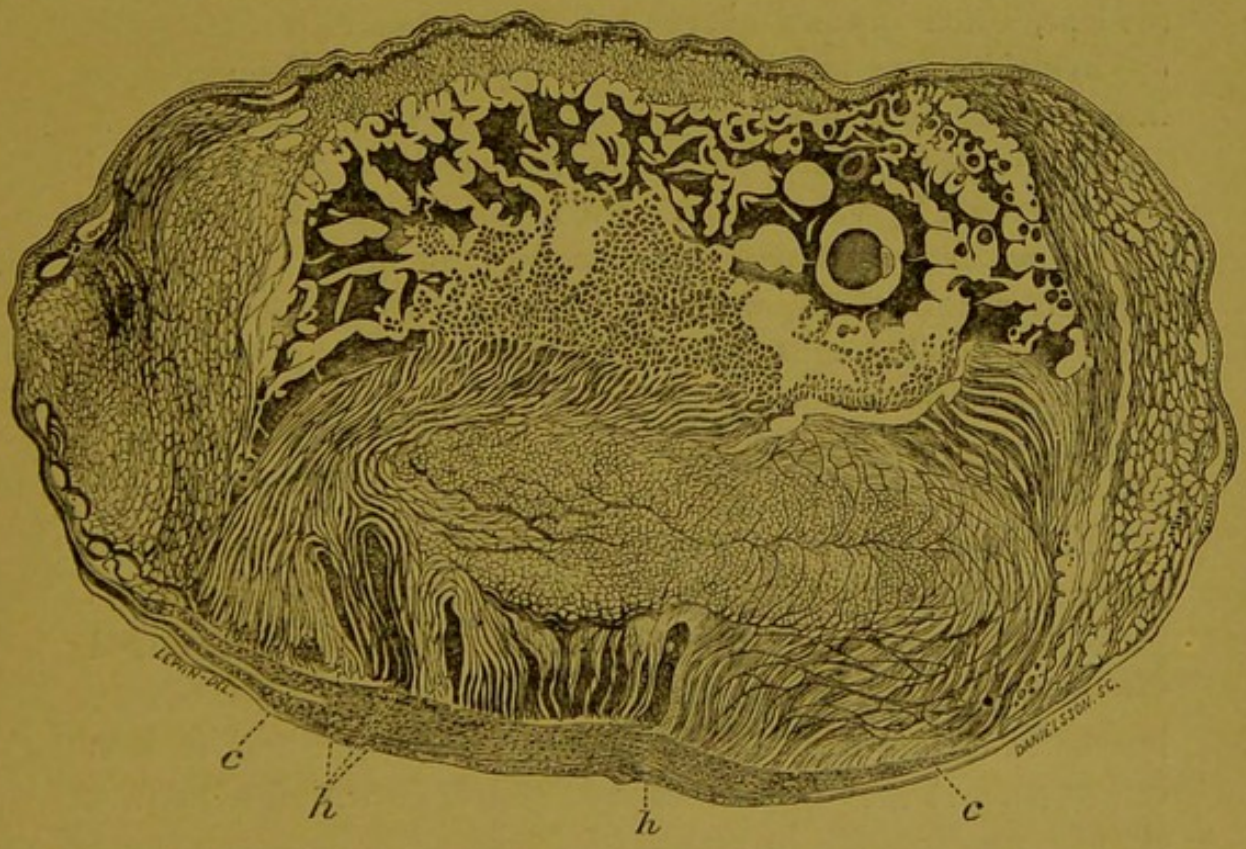

FIG. 1.—Showing the microscopical appearances of the lens in Case 1. There is a mass of nucleated fibres at the posterior pole; here the capsule (*c*) is deficient. In the lens substance in front of the nucleated fibres are several hæmorrhages (*h*). The lens fibres are much disorganised.

its inner surface, and further back some fibres of a similar nature on its outer surface also.

At the posterior pole of the lens the hyaline structure of the capsule is quite lost, there being only a mass of fibres and nuclei. Some sections taken outside the pupil show a similar condition of lens capsule to that at the posterior pole; in those, however, taken furthest out, the hyaline capsule is continuous, with nucleated fibres on each side of it. In these sections through the outer part of the lens, there are collections of red blood corpuscles between the lens fibres at the posterior pole. These corpuscles have stained a rusty brown colour with eosine, less pink than usual. No blood vessels can be seen in their vicinity, either in the lens or amongst the fibres behind it.

The most likely explanation of the appearances seen in this eye seems to be that there was some defect in the development of the posterior capsule of the lens, and that the hyaloid artery was late in disappearing, which led to a persistence and thickening of the posterior fibro-vascular sheath. The hæmorrhage in the lens, which appears old, can only have come from a branch of the hyaloid artery previous to its disappearance. Hæmorrhages into the lens must necessarily be of extremely rare occurrence.

Alt* says, "Hæmorrhagic cataract has been once examined and described by von Graefe. He found the lens fibres brown, which colour was caused by granular and crystallised blood-pigment within them, while their shape was unaltered. The capsular epithelial cells, too, were filled with the pigment. It could not be ascertained, in this case, whether the lens-capsule was intact or ruptured."

The next case is of particular interest, because its true nature, viz., persistence of the hyaloid artery and of the posterior fibro-vascular sheath of the lens, was diagnosed when it was first seen. Subsequent changes in the eye, however, seemed rather in favour of glioma, and it was removed. It serves to illustrate points to which attention should be directed, in order to distinguish between these two affections.

* Lectures on the Human Eye, p. 194.

CASE 2.—*Persistence and thickening of the posterior fibro-vascular sheath of the lens. Persistence of the central artery of the vitreous. Lens itself, at first clear, becoming opaque.*

William M., aged 4 weeks, was brought as an out-patient to the Moorfields Hospital on March 31, 1892. The mother stated that she first noticed a white appearance in his right eye, three weeks after his birth. On examination a greyish-white opacity, with a somewhat metallic lustre, was seen behind the lens; in its centre was a small, dark, round, slightly depressed spot with fine blood vessels coursing through it. The lens itself was quite clear, and a red reflex could be obtained round the extreme margin of the opacity in all directions. This last point, together with the colour of the opacity and the central dark spot in it, all seemed in favour of the case being one of a persistent hyaloid artery and posterior fibro-vascular sheath, rather than a glioma of the retina. No operation was therefore recommended.

At the end of July the patient was again brought to the hospital, and the mother said the white spot in the right eye seemed to be getting larger, and that for about the last month she had noticed "a dull speck right inside his left eye." A careful examination was then made under chloroform. In the right eye the anterior chamber was very shallow, more so than when first seen. The whole lens had become of a milky-white colour, so that the points before seen at its posterior part were not now visible. The tension was normal. In the left eye the lens was quite clear, and nothing abnormal could be detected in the fundus.

The symptoms now exhibited in the right eye seemed to indicate something of a progressive nature. The probabilities of the case being one of glioma were thought to be such as to make it advisable that the eye should be removed. It was accordingly excised on August 4, 1892.

Pathological Examination.—The eye-ball was opened in the fresh state. The lens, which is milky-white throughout, easily separates from its capsule. Behind the posterior capsule is a dense white membrane. Passing right through the centre of the vitreous from the optic disc to this white membrane, is a thin, grey band; it expands slightly where it joins the optic disc.

The vitreous is of good consistency, and the retina is in position. In the centre of the inner half of the globe, a little distance from the ora serrata, is a white patch, having the appearance of atrophy of the choroid with disturbance of pigment around it. There are also two small white spots at the ora serrata, in the centre of the outer half.

Microscopical Examination.—The white membrane behind the lens capsule is seen to be composed of a dense mass of fibres and cells; there are a few small blood vessels in it containing red blood corpuscles. All the ciliary processes are adherent to this membrane, being directed towards the posterior surface of the lens and not to its sides. There are thin prolongations forwards from the dense membrane at the back of the capsule, round its sides, and over its anterior surface. In front of the anterior capsule it consists only of a thin layer of scattered fibres and cells. Epithelial cells line the inner surface of the posterior capsule as well as the anterior.

In the patch described as situated in the centre of the inner half of the globe, the retina is seen to be much altered and adherent to the uveal pigment layer, the cells of which have undergone considerable proliferation. The rods and cones cease at the border of the patch, as also does the outer granular layer. The inner granular and nerve fibre layers are thickened and irregular; there are some small extravasations of red blood corpuscles in the latter. The choroid beneath this patch shows no inflammatory changes; there is a slight depression in its elastic lamina, otherwise it appears normal.

(2.) *Tubercle of the Choroid.*

The difficulty in diagnosis which sometimes occurs between cases of tubercle of the choroid and glioma of the retina was pointed out by Dr. Brailey,* and more recently by Jung,† who records one case of tubercle diagnosed as glioma, and one of glioma diagnosed as tubercle. The following are the details of an eye that I have examined, very similar in several respects to the first of Jung's cases,

* Trans. Ophth. Soc., vol. iii, p. 129.

† V. Graefe's Archiv, xxxvii, iv, p. 125.

as in it the optic nerve was invaded by tubercular growth.

CASE 3.—*Tubercle of choroid invading optic nerve. Detachment of retina. Case diagnosed as glioma retinæ.*

Robert Y., aged 2, was admitted to the Moorfields Hospital on May 3, 1889. His right eye was said to have been bad about ten weeks. There was general injection, total posterior synechiæ, a small hyphæma, and a yellowish reflex from behind the lens. The tension was increased. The eye was thought to contain a gliomatous tumour of the retina, and was excised the next day.

Pathological Examination.—The eyeball is much enlarged; antero-posteriorly it measures 22 mm., laterally 20 mm., and vertically 20 mm. There is considerable bulging of the posterior part of the sclerotic, which is of a grey colour. The optic nerve immediately behind the globe is enlarged; it measures 5 mm. across; the section of it has an unusually greyish soft appearance. A second portion of the nerve has been removed; the distal (ocular) end of this measures 5 mm., and the proximal (cerebral) end 3 mm. The lens is misshapen, being rounder than normal; antero-posteriorly it measures 6 mm., laterally 8 mm. The whole of the posterior half of the globe is filled with a greyish-yellow flocculent mass. No pigment layer separates it from the sclerotic, which latter is thickened. In front of the greyish-yellow mass is seen the detached and crumpled retina, only separated from the back of the lens by the remains of the shrunken and fibrous vitreous. There is some separation of the ciliary body from the sclerotic anteriorly.

Microscopical Appearances.—Covering the front of the iris and stretching across the pupil is a newly formed layer of fibrous tissue. The iris and ciliary body are much infiltrated with small round cells. There is an extensive hæmorrhage between the ciliary muscle and sclerotic. The layers of the detached retina are much disorganised; it is infiltrated with round cells, as is also the shrunken vitreous between it and the lens. Behind the detached retina, completely replacing the choroid, and involving the sclerotic, is a mass composed of numerous conglomerated nodules, having the typical histological appear-

ance of tubercle; in parts, giant cell systems, the nuclei in the giant cells being arranged peripherally; in others, various sized areas undergoing caseation.

The optic nerve is throughout much infiltrated with round cells; these are densest in the trabeculæ of fibrous tissue between the nerve fibres. In the central portions of the nerve the changes are more extensive than in the peripheral. Here several giant cells with peripherally arranged nuclei are seen; there are also patches of caseous degeneration in it. (See Plate.)

(3.) *Inflammatory Exudation into the Vitreous, with or without Detachment of Retina.*

The third variety of cases which may be included under the heading pseudo-glioma are far more frequently met with than the other two. Mr. Nettleship, in 1882, read a paper before the Ophthalmological Society, entitled "On certain cases of Destructive Ophthalmitis, simulating Glioma, in Children," in which he gave the most important points of such published cases as he was able to find, and discussed the subject very fully. In bringing forward a fresh series of 11 cases, in all of which the eyes have been examined pathologically, I hope, besides emphasising the facts he has pointed out, to add a few new ones, which may help to elucidate this somewhat obscure affection.

As is well known, in these cases the eye symptoms are frequently preceded by some acute febrile condition, in many cases by head symptoms of greater or less severity; of my 11 cases, head symptoms are noted in 6.

Mr. Nettleship says:—"The convulsions, screaming, and unconsciousness, of which a history is often obtained, might point to some form of meningitis of which the ocular disease was an occasional consequence. I must confess that in a certain number of the cases, where the history of cerebral disturbance has been clear, this explanation has seemed to me at the time very probable. It is supported by the well known fact that purulent irido-

choroiditis occurs in some cases of epidemic cerebro-spinal meningitis. Professor Förster, in his valuable chapter in Graefe and Saemisch's handbook on the relation between ophthalmic and general diseases, states positively that sporadic meningitis, especially in children under 5, is a common cause of the eye changes we are considering; he does not, however, give any details." He goes on to ask the following questions:—"Should meningitis be proved, we shall still have to ask why and how it does sometimes cause inflammation of the uveal tract instead of optic neuritis; how is the mischief set up, and why is it so much more common in children than adults?"

In Case 13, recorded near the end of this paper, the eye was excised in an early stage of the disease, and the patient ultimately died; the *post-mortem* showed extensive inflammation of the meninges at the base of the brain, which was probably started by middle ear disease. Mr. Nettleship, in Trans. Ophth. Soc., vol. v, has recorded a case, in some points very similar to the above. It was one in which purulent irido-cyclitis with opaque vitreous occurred in a young child suffering from a febrile disease. Death occurred in six weeks, and cerebro-spinal meningitis and purulent disease of the middle ear were found.

These two cases seem to prove that the inflammatory changes in the eyes of children which simulate glioma retinæ are sometimes preceded by meningitis, and they render it highly probable that in all the cases in which cerebral symptoms are obtained some inflammation of the meninges has occurred.

The connection between the intra-ocular inflammation and the meningitis might be embolic, or one of direct extension along the optic nerve. Through the kindness of Dr. Arkle, I was able to obtain the optic nerves and commissure of Case 13 for microscopical examination. The appearances which they present are suggestive, though not conclusive, of direct extension. There was marked papillitis and inflammation of the ocular end of the nerve,

also of the optic commissure, the cerebral end of the optic nerve and the membranes around them, as far as about the apex of the orbit. The stump of the optic nerve, however, left in the orbit, exhibited but slight hyper-nucleation; possibly the inflammation in it had somewhat subsided since the removal of the eye.

In most of the other cases there was papillitis or inflammatory change in the ocular part of the nerve. Sufficient of the latter, however, had not been removed to exclude the possibility of an extension of the inflammation back from the eye.

The occurrence of middle ear disease in the two cases above mentioned is of particular interest. In Case 13, no complaint was made of the ear, and it was not until the patient had been a week under observation, and some inspissated material was removed by syringing, that an abscess was discovered in the left tympanum. In Mr. Nettleship's case, the ear disease was not recognised during life, but the middle ear and the mastoid cells were found to contain a good deal of thick pus at the *post-mortem* examination. Neither in this case nor in Case 13 was there any bone disease, and the lateral sinuses in both of them appeared healthy. No microscopical examination of the auditory nerves was made, to see if there was any extension of inflammation along or around them.

That the meningitis was secondary to the purulent disease of the middle ear is an easy and probable explanation of its occurrence, and it suggests a new point for enquiry in these cases. That the enquiry should not be merely restricted to the statements of the mother of the patient is shown by the two cases here referred to. It should include an examination of the ears themselves. In the other cases, included in this paper, this point has only been partially gone into, as many of them had passed from observation before its importance was recognised. In 4 of the 11 cases some ear affection is noted.

In my anatomical examination of the eyes, I have endeavoured to determine the order in which the structures became involved, and the course of the disease. As the specimens are usually obtained only when the disease is far advanced, this is not easy. I have, however, been fortunate in obtaining one in which only four days (Case 13) and another in which two weeks (Case 14) had elapsed between the onset of the inflammatory symptoms and the excision of the eye. My specimens seem to show that the following is the sequence of events:—

The affection begins as an inflammation of the retina (Case 13), the exudation from the vessels of which passes into the vitreous, the hyaloid membrane of the latter becoming adherent to its inner surface (Cases 5, 6, 8, 11, 12, 13, and 14). The pars ciliaris retinæ is usually soon involved, its elements undergoing extensive proliferation (Cases 8, 12, 13, and 14). Later, inflammation extends to the stroma of the ciliary body and iris, nodules of round cells forming in them (Cases 6, 7, 12, and 14). Occasionally neither the iris nor ciliary body becomes at all affected (Cases 5, 10, and 11). The choroid more often escapes than the anterior portions of the uveal tract (Cases 9, 10, and 13); when it is implicated, that part bordering on the optic nerve is most often inflamed (Cases 6, 8, 11, and 14). There is nearly always marked proliferation of the epithelial pigment cells on its inner surface. Some of them grow into the substance of the retina (Cases 5, 8, 9, and 10); patches of them may remain adherent to its outer surface when it has become detached (Cases 6 and 12). These proliferated epithelial pigment cells subsequently seem to give rise to hyaline structures (Cases 5, 9, 10, and 11), or to undergo fatty degeneration, crystals of cholesterine forming amongst them (Cases 6 and 11).

The pigment epithelium of the ciliary body occasionally grows inwards in the form of long tubular processes (Cases 8 and 9). Some of the inflammatory exudation

which has collected in the vitreous may pass forwards between the ciliary processes, iris, and lens, and, being of a very plastic character, cause adhesion of these structures to one another (Cases 6, 8, 12, 13, and 14). Later, fibrous tissue and blood vessels develop in this inflammatory exudation; the former contracts, and in so doing draws the retina away from the choroid (Cases 4, 6, 7, 8, 9, 10, 11, 12, and 14). Should it be adherent to the root of the iris it will retract it, deepening the angle of the anterior chamber at its periphery (Cases 4, 6, 8, 12, and 14). Sometimes the root of the iris gets pressed forwards into contact with the cornea, probably as a result of increase of pressure in the vitreous chamber from plastic exudation into it (Cases 10, and 12). When the vitreous has become adherent to the lens capsule, and fibrous tissue develops in it and contracts, the latter becomes puckered, a considerable projection forming at the posterior pole of the lens (Fig. 2. Cases 8 and 14). A contracting band of fibrous tissue behind the lens tends also to push it forwards, shallowing the anterior chamber in the centre (Cases 4, 6, 7, 9, 11, 12, and 14).

In conclusion, I will summarise the points to which attention should be directed for the purpose of distinguishing these cases from one another, as well as from glioma. In some, as will be drawn from what has already been stated, it is impossible to be certain as to their nature; in others, a diagnosis can only be arrived at from the balance of evidence offered by several small points, not from one symptom alone.

The Appearance of the Opacity.—In glioma of the retina the appearance of the opacity behind the lens varies considerably, according to the relation of the growth to the retina; when it springs from its outer surface, growing between it and the choroid (glioma exophytum), the growth is viewed clinically through the retina, and a mass with a smooth surface is seen, having enlarged retinal vessels on it, close behind the lens. If, however, it springs

from the inner surface of the retina, growing forwards into the vitreous (glioma endophytum), then, on looking into the eye, the ragged surface of the growth itself is seen far back, often with little secondary floating nodules in front of it, and no retinal blood vessels on its surface.

The reflex obtained from a persistent and thickened posterior fibro-vascular sheath is usually greyer than that from a glioma, and this grey opacity may be confined to the central portions of the posterior part of the lens, a red reflex being seen through it at its extreme periphery in all directions. When the central hyaloid artery is persistent and patent, some of its branches, smaller than retinal vessels, may be seen coursing through the grey membrane, and occasionally, as in Case 2, there will be a central spot in it, suggestive of the termination of the central hyaloid artery.

An inflammatory membrane behind the lens may have new blood vessels developed in it, but these are smaller than retinal blood vessels.

There is nothing, so far as I know, distinctive about the appearance of the opacity, seen in a case of tubercle of the choroid which simulates glioma.

Condition of the Anterior Chamber.—In glioma the lens is often pushed forwards, and the anterior chamber uniformly shallow.

Should it be deepened at its periphery and shallow in the centre, the case may be diagnosed as one in which there has been inflammatory exudation into the vitreous and circumlental space which, in organisation and contraction, has drawn back the root of the iris, and pushed the lens forwards. I believe, then, glioma may be absolutely excluded.

The anterior chamber in cases of persistence of the posterior fibro-vascular sheath is sometimes very shallow.

Condition of the Iris.—Posterior synechiæ are common in cases beginning as retinitis with exudation into the

vitreous, and may be met with in connection with tubercle of the choroid. Their occurrence does not exclude the possibility of a case being one of glioma, for occasionally, though rarely, it is associated with an inflammation of the uveal tract.

The presence of a remnant of the pupillary membrane, would be suggestive that the other appearances seen in the eye were due to some congenital abnormality.

Tension of the Eye.—The tension in infants' eyes is often very difficult to determine; in older children it is a point of importance. In 57 eyes with glioma of the retina, to the notes of which I have been able to refer,* the tension was estimated immediately after excision. In 33 of these it was increased, in 1 doubtfully increased, in 19 normal, in 2 minus, and in 2 the eye was shrunken. Of the two which had minus tension, one was staphylomatous, with an extra-ocular growth posteriorly, and in the other the accuracy of the record is, I think, not very reliable. There is as yet no definite proof that in the early stage of glioma of the retina, as in the early stage of sarcoma of the choroid, the tension is minus. Dr. Brailey,† writing on this point, says: "I have been able to draw no evidence in support of this my first point (— T. and intra-ocular tumour) from retinal glioma, perhaps because in this disease the friends of the patient rarely suspect anything wrong previous to the establishment of the tension."

As the second eye of a patient is often, on ophthalmoscopic examination, found to be involved, when he has been brought for glioma of the other, the question of the tension in the early stage of the disease ought to be easily settled.

In glioma of the retina there would not be the same

* Most of these are cases the other particulars of which are given in the tables published by Mr. Lawford and myself in vol. xiii, pp. 20 to 36; the others are eyes which have been removed at Moorfields Hospital since these tables appeared.

† R.L.O.H. Reports, vol. x, p. 276.

tendency to early pressure on the posterior ciliary arteries that there is in sarcoma of the choroid, arresting the blood supply to part of the ciliary body, and so cutting off the nutrient fluid of the vitreous, causing it to shrink.

If, as has been asserted, eyes with glioma of the retina occasionally shrink, these would probably at one time have minus tension. The evidence which has been brought forward on this matter was discussed by Mr. Lawford and myself in the present volume of these Reports. Case 15 recorded in this paper is one in which the left eye contained an evident glioma, and the right, the first to be affected, was shrunken. Both were excised, and the shrunken one, as well as the other, was found full of gliomatous growth (Fig. 3). The cornea of the shrunken one had been perforated, and the lens was absent. It could not, however, be definitely determined whether the new growth in it commenced before the eye shrank or afterwards.

In cases of pseudo-glioma, with detached retina and exudation into the vitreous, the tension is frequently minus; it may, however, be increased (Cases 10, 12, and 13).

History of the Case.—The history of fits, unconsciousness, attacks of screaming, ear disease, one of the acute specific fevers, or of symptoms of syphilis preceding the eye affection, would be in favour of the case being one of ophthalmitis. If the opacity was noticed at or soon after birth, the case would probably be either glioma, which is occasionally congenital, or a persistent fibro-vascular sheath. Should the symptoms have been produced by a tubercular mass, there might be evidence of lesions of a similar nature in other parts of the body.

CASE 4 (*Register No.* 886).—*Fibrous tissue formation in vitreous. Detachment of retina. Retraction of root of iris. History of a fit.*

William F., aged 15 months, was admitted to the Moorfields Hospital on July 11, 1882. His mother stated that she first

noticed a white mark in his left eye six weeks previously. The child had been ill for a fortnight, during which time he had a fit which lasted a quarter of an hour.

She had one other child, aged 3, and had no miscarriages.

In the patient's left eye the iris appeared atrophied; the pupillary margin was close to the cornea, and the ciliary margin was retracted. There were some posterior synechiæ and a white glistening reflex from behind the lens. The tension was minus. The right eye was apparently healthy. The left eye was excised the same day.

Pathological Examination.—There is an umbrella-shaped detachment of the retina; between it and the lens is a dense mass apparently composed of fibrous tissue. The outer part of the iris is drawn backwards so as to make the periphery of the anterior chamber very deep, while the centre is very shallow, owing to the approach of the lens to the cornea. No microscopical examination was made.

CASE 5 (*Register No.* 959).—*Detachment and inflammation of retina. Shrunken vitreous. No history of illness previous to eye affection. Subsequent history of deafness.*

Sidney F., a healthy looking boy, aged 5, was admitted to the Moorfields Hospital on November 4, 1882. His mother stated that three weeks ago she noticed what she described as "a scum" in the patient's right eye. On covering his left eye it was found he could not see with his right. On examination, the anterior chamber of his right eye was seen to be of good depth. The pupil was dilated, and behind the lens was a white appearance simulating that of a glioma. The periphery of the iris was not retracted. The eye was excised the same day. In reply to an enquiry with regard to her son's health, made in November, 1891, the mother wrote, "That he was not at all strong, and that he suffers very much at times from deafness."

Pathological Examination.—There is umbrella-shaped detachment of retina; it is much folded and puckered. The vitreous is much shrunken. A colourless fluid, full of cholesterine crystals, escaped from between the retina and choroid on opening the eye. A small, rounded, firm nodule projects from the inner surface of the choroid a little to one side of the optic disc.

Microscopical Appearances.—No inflammatory changes are seen in either the iris or ciliary body. There is slight but not marked increase of cells in the shrunken vitreous. The retina shows extensive changes; its blood vessels appear large and around them there is considerable cell exudation; there are some small hæmorrhages in it. The retinal layers are much disturbed, with thickening and spacing out of its structure in places, and increase of its fibrous tissue elements; no rods and cones can be recognised. There are scattered cells in it containing pigment, chiefly in the outer portions. The choroid is congested; there is œdema of the supra-choroidal lymph space. The uveal pigment layer in places is very deficient in pigment; in others, the cells are several layers thick. The rounded mass a little to one side of the optic disc is composed of layers of a hyaline structure, in places regularly laminated, in others very irregularly arranged, and having flattened cells between them; some of these contain pigment. The tissue, where it is regularly laminated, resembles very much the structure of the cornea. The uveal pigment layer ceases, and is folded back upon itself, where this mass commences. The elastic lamina cannot be traced beneath the mass, but seems to fuse with it. There is some round-celled exudation in the vascular layers of the choroid around it. The optic nerve shows considerable increase in the number of staining nuclei between its bundles of fibres, also between its pial and dural sheaths; this increase extends for some little distance behind the lamina cribrosa, but, on approaching the cut end of the nerve, it is less marked.

Case 6 (*Register No.* 1763).—*Fibrous tissue formation in vitreous. Detachment of retina. Head symptoms soon after removal of eye, and frequent headaches since.*

Frederick A., aged 9, was admitted to the Moorfields Hospital on April 7, 1885. His right eye was said to be inflamed and painful about Christmas; it remained bad for about a week; there had been no inflammation in it since. The colour of the eye was said to have changed during the last month; occasionally he had pain in the eyeball and around it. Three years ago he had "inflammation of the lungs," and was very ill. The child himself gave an indefinite history of a blow on the

eye from a stone about Christmas-time. On examination, his left eye appeared healthy, V. = 6/6. His right was slightly shrunken, the iris was discoloured, the pupil inactive to light except consensuously. There was a white reflex from the fundus, and the tension was slightly minus. On the supposition that it contained a new growth, the eye was excised the following day. He was subsequently seen on February 24, 1892. He then stated that after leaving the Hospital he was laid up in bed for a fortnight with "headache and lightheadedness;" that he has never been strong since, and frequently suffers from dull headaches. He has never had any discharge from the ears. There were no signs of past neuritis in the left eye.

Pathological Examination.—The anterior chamber is shallow in the centre, and deeper in the periphery, due to pushing forwards of the lens and retraction of the root of the iris. The iris is adherent to the lens capsule at the upper part. There is umbrella-shaped detachment of retina. The vitreous is shrunken, and has what appears to be inflammatory effusion into it immediately behind the lens. On the outer surface of the detached retina, chiefly in the upper half, are several small, granular-looking, rounded projections, and close to the optic disc are some similar-looking growths. There is a large quantity of firm subretinal effusion. The choroid appears normal.

Microscopical Appearances.—The posterior of the two uveal pigment layers on the back of the iris is at the pupillary border separated from the anterior, and adherent to the lens capsule. There is some increase in the number of round cells in the tissue of the iris in this region. There is more marked increase in the ciliary body between the muscle and the uveal pigment. The choroid is thin; there is increase of cells in it at the margin of the optic disc, but not much elsewhere. The lens shows some changes in the neighbourhood of its nucleated zone on one side; instead of flattened nucleated fibres there are large globular nucleated cells, and the cells lining the capsule extend round farther than usual. Adherent to the root of the iris on one side, and filling the circumlental space, is a dense mass of fibrous tissue, with scattered nuclei, patches of brown pigment, and blood vessels in it; similar tissue exists between the posterior surface of the lens and the detached retina, ad-

herent to both. The retina is much puckered, and all its tissue is spaced out; here and there rods and cones can be seen. Adherent to its outer surface are masses with numerous slit-like spaces in them, which appear to have had crystals of cholesterine dissolved out from them. In parts these masses are composed of nucleated cells of an epithelial type, with fine granules of brown pigment in them; they are like uveal pigment cells, but less densely pigmented. In other parts these masses are composed of fat globules, scattered pigment granules, and a homogeneous substance. The optic nerve, immediately behind the lamina cribrosa, is much infiltrated with round cells; there is also some accumulation of them between its pial and dura-sheaths.

Case 7 (*Register No.* 1943).—*Detachment and thickening of retina. No history of illness previous to eye affection.*

Bessie R., aged 16 months, was admitted to the Moorfields Hospital on October 23, 1885. Her mother stated that patient's left eye had always looked "strange and small." When she was about 7 months old the colour of it changed, and it moved up and down continually. Patient's general health was good. There were two other children in the family living, one with chorea; and two had died of bronchitis. On examination the right eye was apparently healthy. The pupil of the left was irregularly dilated, there being numerous posterior synechiæ; from the outer part of the fundus was a white reflex. Tension normal. Glioma of the retina was diagnosed, and the eye removed the next day.

Pathological Examination.—The anterior chamber is very shallow on the inner side, the iris being almost in contact with cornea. The iris is adherent to the lens capsule in its whole extent. The lens is large, measuring antero-posteriorly 5 mm., transversely 7 mm.; there is some opacity of its outer part. The ciliary processes are very small. There is umbrella-shaped detachment of of the retina; at the lower and outer part where it is folded on itself it is thicker and denser than elsewhere. The choroid and optic nerve appear healthy. No microscopical examination was made.

CASE 8 (*Register No.* 2162).—*Semi-organised fibrous tissue formation in vitreous and circumlental space. Retraction of root of iris and detachment of retina. History of fit a few days previous to eye affection.*

William C., aged 7 months, was admitted to the Moorfields Hospital on September 30, 1886. His mother stated that six or seven weeks ago he had had a fit, and for two or three days after took little notice of anything; since then he had been losing flesh. She first noticed something the matter with his right eye a few days after the fit; it was then blood-shot. It had only begun to "get small" last week. There had been no injury to the eye. There was no history of consumption in the family. She had two other children, both healthy. On examination, the tension of the right eye was found to be minus, the pupil small and slightly eccentric, and not quite clear. The iris was almost in contact with cornea at its pupillary margin, but somewhat retracted at its periphery, leaving there a shallow anterior chamber. No fundus reflex could be obtained. The eye was excised the same day.

Pathological Examination.—The iris is very intimately adherent to the lens capsule; it is retracted at its periphery, and then, bending sharply, follows the anterior surface of the lens. There is a projecting knob from the posterior pole of the lens into the shrunken vitreous. The retina is detached and folded into a fairly firm mass; it appears to be adherent to the posterior surface of the lens. It retains, by means of a narrow cord, its attachment to the optic disc. The sub-retinal space is filled by a material of a spongy consistence. The choroid is deeply pigmented and drawn inwards to a slight extent at the anterior part.

Microscopical Appearances.—An organised inflammatory membrane stretches across the pupil. There is adhesion of the pupillary border of the iris to the lens capsule on one side of the sections. The inflammatory membrane extends throughout between the posterior surface of the iris and the lens; it is merged at the root of the former with a mass of semi-organised fibrous tissue situated in the circumlental space. This is continuous again with structure of a similar character, in some places more highly developed than others, and with newly-

formed blood vessels in it, which stretches across the globe in the ciliary region, and which unites the posterior capsule of the lens to the detached and folded retina. This tissue appears to have resulted from inflammatory exudation into the vitreous, which has become partly organised into fibrous tissue, and by its contraction drawn back the root of the iris, caused the projection at the posterior pole of the lens, and detached the retina. The pars ciliaris retinæ is much thickened by cellular infiltration and proliferation. The uveal pigment of the ciliary body has, in one part, prolongations from it inwards, in the form of tubular processes. The retina is much infiltrated with cells, and the limit of its inner surface can scarcely be made out from the mass of cells in the shrunken vitreous; there are patches of pigmented cells in its substance. The ciliary body has several large nodules of round cells in it. The choroid shows hardly any changes; just at the margin of the optic nerve on each side there is some infiltration of it. The portion of the optic nerve left attached to the globe has marked hypernucleation; there are inflammatory products between its pial and dural sheaths.

Case 9 (*Register No.* 2361).—*Fibrous tissue formation in vitreous. Detachment of retina and retraction of root of iris. History of illness some months after eye affection first noticed. A younger brother similarly affected.*

Reginald A., aged $1\frac{1}{3}$, was admitted to the Moorfields Hospital on June 23, 1887. His mother said she noticed his right eye to be different from his left soon after he was born; he had "a cast in it." She had first noticed something in the pupil in March, 1886. In September the patient had a severe attack of sickness and diarrhœa; he was very ill for a week, and she thought he would not recover. He did not lose consciousness. He had never had measles or scarlet fever. He is her only child, and was born at full time. On examination, he was found to have lateral nystagmus of both eyes. There wa a white reflex from behind the lens in the right, and the anterior chamber in it was very shallow. It was excised the following day. Three and a half years after the excision he died of diphtheria, having had good health in the meantime.

Pathological Examination of Eyeball.—It is small, concentrically shrunken. The iris is pushed forwards at its pupillary part. The lens is clear, and nearly globular in shape. There is an extensive, shallow detachment of the retina, it being much folded. Behind the lens is some opaque lymph adherent to its posterior capsule and to the retina. At the lower and outer part the choroid and retina are abnormally adherent, and there are several small hæmorrhages.

Microscopical Appearances.—No inflammatory cell infiltration of the uveal tract is seen, but there is considerable thickening of the uveal pigment. At the posterior part of the ciliary body there is some overgrowth of the uveal pigment in the form of tubes, which are seen cut both transversely and longitudinally. On the inner surface of the choroid there are several small hyaline masses, surrounded by uveal pigment. The detached retina, in which the fibrous tissue elements are much increased, also has some patches of pigment in it. Between the retina and lens is some fibrous tissue and some elongated cells. The optic nerve shows slight hypernucleation, and some increase of cells between its pial and dural sheaths.

On January 14, 1892, the mother of this patient brought her fourth child as an out-patient to Mr. Tweedy (Reginald was her first). He was then aged 4 months, and she stated he had a discharge from his eyes when he was first born. When about two months old he had been very feverish, and had whooping cough. He had always been very irritable, screaming a great deal, especially at night. He had never had any fits, or any discharge from the ears, or snuffles. At one time he had some spots on the skin of his arms and legs, but there are none now. In the right eye the anterior chamber was shallow, there was one posterior synechia, and the periphery of the iris seemed retracted; there was a yellow reflex with red lines on it behind the lens. In the left eye there was the same yellow reflex; the anterior chamber was shallower, being markedly shallower in the centre than at the periphery. The pupil was not so large as in the right eye, and there were more posterior synechiæ.

Her second and third children were alive and well, and had had no eye affection. She had had no miscarriages.

CASE 10 (*Register No.* 2783).—*Detachment of retina. Root of iris in contact with periphery of cornea. History of a fit and of a discharge from the ear.*

Victor K., aged $2\frac{3}{4}$, was admitted to the Moorfields Hospital on January 30th, 1889. His mother stated that when the patient was six months old he had a fit, and that his right eye turned inwards. For the last eight months she had noticed his right eye "gradually increasing in size." The child appeared quite healthy and showed no cerebral symptoms or paralysis.

In his right eye the pupil was dilated and had a very marked black margin to it. From behind the lens, which was clear, a yellowish-green mottled reflex was seen, with a hæmorrhage anterior to it. The tension was normal. It was doubtful if the child could tell light from dark with the eye or not. It was excised the next day.

He was seen again in February, 1892, and appeared then in good health. Questioned with regard to his ears, his mother said that, ever since he was a baby he had had a discharge on and off from the right, and that occasionally something seems to swell in it and break.

There were no signs of past neuritis in the left eye.

Pathological Examination.—The eyeball measured 21 mm. antero-posteriorly and 20 mm. laterally. The periphery of the iris is in contact with the posterior surface of the cornea, narrowing the angle of the anterior chamber. The vitreous is shrunken, and the retina detached from the optic disc up to the ora serrata. There is some gelatinous substance, with cholesterine crystals and the remains of old blood clot, between the detached retina and the choroid.

Microscopical Appearances.—The whole uveal tract is thin, but in no part of it is there any sign of inflammation. The iris is very thin; there is an abrupt bend in it a little distance from its root, where it ceases to be in contact with the cornea. The uveal pigment extends round its pupillary border and along its anterior surface for about half its extent. The sphincter muscle is tilted upwards at its pupillary border. The ciliary muscle is very much atrophied, and the ciliary processes pass inwards towards the margin of the lens almost at a right angle. The lens has cells lining the posterior capsule. The vitreous

shows a few elongated fibre cells in it in places. The detached retina has, throughout, increase of its fibrous tissue and diminution of its nervous elements; there are numerous scattered patches of pigment in it, and also irregular patches, which stain deeply with logwood, and in parts are slightly granular in structure, probably due to calcareous degeneration. On the inner surface of the elastic lamina of the choroid are several hyaline masses surrounded by pigment epithelium. This latter is in places thickened, and in others absent.

The optic nerve shows some hypernucleation and some increase of fibrous tissue; there are some round cells with deeply staining nuclei between its dural and pial sheaths. The lamina cribrosa is slightly curved backwards.

CASE 11 (*Register No.* 3344).—*Detachment of retina. Exudation into vitreous. No history of illness previous to eye affection.*

William F., a pasty-looking child, aged 3, was admitted to the Moorfields Hospital on February 19, 1891. His mother stated that about two months previously she had first noticed something "shining bright" in his left eye, and that this had gradually become more marked. He had had no previous illnesses, no fits, and no injury to the eye. He shows no signs of hereditary syphilis, and there was no family history of importance.

His right eye appeared normal. In his left, the lens was clear, and a mottled yellow reflex was seen behind it. Blood-vessels, probably retinal, were visible, and the sparkle of cholesterine crystals from behind them could be seen. Tension normal. The case was thought to be probably one of glioma of the retina, and the eye excised a week later.

Pathological Examination.—The anterior chamber is very shallow, the lens being pushed forwards. The vitreous is much shrunken. The retina is detached completely from the optic disc to the ora serrata; there is no new growth from it. Between the detached retina and the uveal pigment, is a fluid containing cholesterine crystals, and a white flocculent substance. Projecting from the inner surface of the uveal pigment layer, are three little masses about the size of hemp seeds,

one at the posterior part of the globe near the optic disc, and the other two a short distance behind the ora serrata. The outer surface of the detached retina has some white deposit on it.

Microscopical Appearances.—The ciliary body and iris in the sections examined are free from any cell infiltration. The latter appears thin, and the ciliary processes are atrophied. The choroid is also thin; there is some round cell infiltration of that portion of it which has the raised mass on its inner surface at the posterior part of the globe.

The lens appears healthy. The vitreous is much shrunken; there is some cell exudation into that part which is in contact with the inner surface of the detached retina. The retina has considerable diffuse, inflammatory cell infiltration throughout it; the chief accumulation of round cells is around its blood-vessels.

The raised masses mentioned above, on the inner surface of the choroid, consist of layers of a hyaline substance, with flattened cells between them, and collections of cells of irregular shape, with scattered pigment granules in them.

There are also in these masses, granules of pigment not contained in cells, and slit-like spaces which look as though they had contained crystals which have become dissolved out, probably cholesterine crystals. The elastic lamina appears to be situated on their outer surface, though it cannot be traced all the way in the sections.

The small portion of the optic nerve left attached to the globe has much infiltration of round cells between its bundles of nerve fibres, and between its pial and dural sheaths.

CASE 12 (*Register No.* 3516).—*Infiltration and new formation of blood vessels in vitreous. Detachment of retina. Root of iris partly in contact with cornea, partly retracted. Head symptoms. Loss of power in right arm and leg.*

William R., aged 9 months, was admitted to the Hospital for Sick Children, Aberdeen, under the care of Dr. Mackenzie Davidson on September 8, 1891. I am indebted to Dr. Davidson for the specimen, and for the notes of the case.

On admission, he had an enlargement of the right side of the scrotum, which was supposed to be a hernia, but which turned out to be a unilocular non-congenital hydrocele. His

mother stated that nothing was noticed the matter with his left eye until after he had a fit two days previously; then dimness came on, and the child complained of great photophobia and pain.

Upon examination, there was found to be acute iritis. A few days later he was noticed to be drowsy and irritable when touched. Sensation as far as could be made out was everywhere acute. The right arm, if used at all, which was very seldom, was never used from the shoulder; the grasp on that side was feeble. There was no wasting of the muscles of the arm, but generally the child was puny, feeble, and badly nourished. The reflexes were all present. Hearing was acute.

On September 25, the iritis was noted as being still active, though less marked. The iris was *bombé*, and T. +. There was a grey reflex from behind the lens. Apparently he had no perception of light with the eye. Drowsiness was still marked; he was very irritable, and cried a good deal. His right leg was thought not to kick so vigorously as the left. There was no sickness.

On October 2, the left eye was enucleated under chloroform.

On the 15th, the condition of the child was noted to have greatly improved; he was gaining flesh. He still used his right arm and leg less than the left. The hydrocele had disappeared without any special treatment.

The child was subsequently seen on November 6, 1891, and February, 1892; on both occasions he appeared quite well, had no head symptoms, and used the right arm and leg freely.

Pathological Examination.—The anterior chamber is shallow. The lens is *in situ*. The retina is completely detached, from the optic disc to the ora serrata. The vitreous is shrunken, infiltrated, and yellow. There is some disturbance of the pigment epithelium on the inner surface of the choroid.

Microscopical Appearances.—There are some small scattered patches of round-cell infiltration throughout the substance of the iris. A newly-formed membrane fills the pupil, which is attached to the lens capsule, and is continuous with a layer of inflammatory exudation which there is between the iris and lens; this joins exudation of a similar character in the circumlental space.

The angle of the anterior chamber is closed by adhesion of the root of the iris to the posterior surface of the cornea at its periphery. At the point where the iris ceases to be in contact with the cornea, it bends directly backwards, and there is an abrupt bend in it again forwards, where it comes in contact with the lens. The ciliary body has considerable round-cell exudation into it; there is considerable proliferation of its uveal pigment and of the elements of the pars ciliaris retinæ. The choroid has scattered nodules of round cells in it, and there is some enlargement of the lymph space between it and the sclerotic.

No division can be made out between the inner layers of the retina and the shrunken vitreous, which are adherent and both intensely infiltrated with round cells. In the masses of cells which infiltrate the vitreous, newly-formed blood-vessels starting from those of the retina are seen to pass. On the outer surface of the detached retina are patches composed of red blood corpuscles, scattered nucleated round cells, and uveal pigment cells.

Case 13 (*Register No.* 3550).—*Acute illness with head symptoms, followed by appearances in eye simulating glioma produced by exudation into vitreous. Death from meningitis thirty-nine days after excision. Middle ear disease.*

Elizabeth Amelia B. was admitted to the Moorfields Hospital on November 9, 1891. Her mother stated that the patient was born at full time; she was quite healthy at birth, but always pale. When 14 months old she had diarrhœa, got very thin, and was several times convulsed. A month later she was taken to the Shadwell Hospital, and said to have rickets. She never had any rash on the skin, or snuffles.

Six days ago patient was sick, felt hot, shivered a little, and was peculiar in her manner, wanting to lay her head back. Four days ago the mother first noticed anything wrong with her right eye; it was then blood-shot, and a day later she observed a white appearance in the pupil. The patient was then taken to Shadwell Hospital and had something dropped into the eye.

She is the fifth child of a family of six, two of whom died

of bronchitis. There is no history of phthisis in either the father's or mother's family.

On examination, the right eye was found to be prominent. The pupil was dilated; in its centre was a white opacity from which thin tags passed to the anterior surface of the iris. There was a whitish reflex from behind the lens; no fundus details could be seen. The tension was +1.

The eye was thought to contain a new growth, and was accordingly excised the same day. The evening temperature was 103·4°. The next day the following note was made: Child has probably meningitis in irritable stage; retraction of head; characteristic cry. Morning temperature, 102·4°; evening temperature, 102·8°.

On November 12th she was transferred to the Great Ormond Street Children's Hospital.

The following is the history of the case from the child's admission to the Great Ormond Street Children's Hospital, under the care of Dr. Cheadle, up to the time of death:—

Condition at time of admission, November 12, 1891. Retraction of head; legs drawn up. Face pale, flushes occasionally. Fontanelle wide, bulges, and pulsates. Signs of irritability; no paralysis. Pupil reacts to light and accommodation. Conjunctival reflex well marked; slight photophobia. No optic neuritis. Plantar reflex brisk. Knee-jerks absent, ? obtained once on left side. No ankle clonus. Pulse, 116; temperature, 102°, 103°, 99°.

November 17. Cervical opisthotonos more marked.

November 19. Ears were examined three days ago, and much inspissated material removed by syringing; no pus. Right membrane ? normal; left apparent membrane opaque and reddened. This morning right membrane crucially incised, and Politzer's bag used; clear mucus bubbled through opening. Abscess of left tympanic cavity demonstrated by Politzer's bag; granulation on inner wall of tympanum had been mistaken for membrane. Ears to be syringed with lot. hydrarg. perchlor. 1 in 5000 twice a day, and alembroth wool to be placed in meatus.

November 22. Vomiting. Respirations sighing. Constant fever.

December 1. Knee-jerks well marked; no *tache cerebrale.*

Retraction of head less; fontanelle not distended; child thinner; vomiting last few days.

December 14. Mr. Ballance trephined the left mastoid at 9.30 P.M. Pus was found in the mastoid cells, and also in the cranium between the dura mater and the temporal bone. There was no evidence of thrombosis of the lateral sinus. The cavity of the tympanum was opened, and some unhealthy granulations scraped out. A drainage tube was inserted, the ends coming through the wound and the external auditory meatus.

December 18. Several right-sided fits, beginning in face and spreading to a slight extent to left side. She rapidly sank, and died at 9 P.M.

Pathological Examination of Right Eyeball.—The white opacity seen in the pupil with fine tags passing to the anterior surface of the iris became free during the excision of the eye, and floated in the anterior chamber. The lens is apparently healthy. The vitreous has some yellow exudation into it; this is most extensive at its periphery, where it is in contact with the retina, the anterior part in contact with the lens being only slightly streaked. The retina is thickened, especially posteriorly; it has some rucks in it. The optic disc is swollen.

Microscopical Appearances.—The white opacity in the anterior chamber consists of round cells with dividing nuclei, supported in a delicate network of fibres. There is material of a similar nature in the circumlental space. There is a layer of round cells on the anterior surface of the iris, and some increase of cells in its substance. The vitreous shows extensive infiltration of its substance by round cells with dividing nuclei; they are more numerous in its peripheral parts than in its central. The pars ciliaris retinæ and nerve fibre layer of the retina are both swollen, and infiltrated with round cells; in the latter they are grouped especially around the blood-vessels. The optic papilla is swollen. The portion of the nerve left attached to the globe shows hypernucleation, and there is exudation between its pial and dural sheaths. The choroid in the sections examined shows no changes. In the posterior part of the ciliary body a nodule of round cells is seen.

Post-mortem Examination (made 60 hours after death by Dr. Arkle).—Weight 13½ lbs.; body emaciated; *rigor mortis*

passing off (weather cold); skull cap and wedge-shaped piece of occipital bone removed; skull cap only slightly adherent; fontanelle open. There is marked thickening of the arachnoid, especially at junction of brain and spinal cord; some excess of fluid in sub-arachnoid space; brain removed; it shows evident signs of chronic meningitis. The signs are most intense in the interpeduncular space, where there is a fair amount of firm, coherent, yellow lymph. This lymph surrounds the optic commissure, which is hid from view. The 3rd nerve is also surrounded; and three or four patches extend on to the pons. The inflammatory process has extended along the fissure of Sylvius on each side and up over the front of the corpus callosum, so that it reaches the vertex in the median line above, and rises on the cerebrum half way to the vertex from each side. It shows itself on the convolutions in many minute patches of firm, yellow, opaque lymph. The meninges are thickened and opaque, and there is an extensive, fine, but intense, capillary injection of the vessels. On section the grey substance has everywhere a very pink colour. The brain substance is fairly firm. The posterior cornua of the lateral ventricles are a little dilated, but, beyond slight injection of the 3rd ventricle, all is quite natural in appearance. The veins of Galen are patent. There is no tubercle anywhere.

The trephine opening reaches the dura mater in the anterior external angle, between the base of the petrous and squamous portions. There is no change in the inside of the dura mater at this spot. The lateral sinus is empty and healthy looking, and this hardly looks the focus of the inflammatory process. The arachnoid is thickened and injected as far as the cervical enlargement of the cord, but otherwise the cord is healthy. No tubercle can be seen anywhere. Thoracic organs removed. Heart and lungs quite healthy: no tubercle. Abdominal organs, liver, spleen, kidneys, and peritoneum quite healthy; no tubercle. Intestines and stomach normal; no tubercle anywhere.

Microscopical Appearances of the Optic Nerves and Commissure removed post mortem.—The membranes around the optic commissure have extensive round-cell exudation into them. There is also exudation around the blood vessels passing into it.

Sections of both optic nerves a little distance from the

commissure show excess of round cells between the pial and dural sheath, and hypernucleation of the nerve, most marked at its periphery.

Sections from about the middle of the right optic nerve show similar inflammatory changes, though less pronounced.

The stump of the right optic nerve, left in the orbit at the time of excision, has its divided end closed over by the turning in of the dural sheath. There is some atrophy of the nerve fibres and increase of fibrous tissue in this region. Further back the tissue around the central vessels appears œdematous, but there is only slight increase of cells in the space between its sheaths and in its tissue. The left optic disc and orbital portion of the nerve appear healthy.

CASE 14 (*Register No.* 3615). *Exudation and fibrous tissue formation in vitreous. Detachment of retina. Retraction of root of iris. History of discharge from ear three months previous to eye affection.*

Charles H., aged 10 months, was admitted to the Moorfields Hospital on February 9, 1892. His mother stated that two weeks previously she first noticed something wrong with his left eye. She describes it as being blood-shot, the pupil being small, and its looking like a fish's eye. Two months ago he had a rash on the skin of his arms, legs, and buttocks, and about three months ago a discharge from his right ear; there was a little lump in the neck on the right side about the same time. He had never had any fits, and was a healthy looking child. On examination, the pupil was found to be small. The root of the iris was markedly retracted, so that the anterior chamber at the periphery appeared deep, while in the centre it was shallow. There was a reddish reflex from the centre of the pupil, and a white reflex from below. The tension of the eye was minus.

Pathological Examination.—The iris and cornea are almost in contact in the centre, some little distance is left between them at the periphery. The lens is altered in shape, it has a small round nob projecting backwards from it at its posterior pole (Fig. 2). Immediately behind the lens, and adherent to its capsule, is the shrunken fibrous vitreous, with a patch

of yellow infiltration in it about the centre. It passes backwards as a yellow cord to the optic disc. The retina is detached

FIG. 2.—The lateral half of the eye in Case 14; it shows the anterior chamber shallow in the centre, deeper at the periphery, a projection backwards at the posterior pole of the lens, a shrunken vitreous, and detached retina.

from the optic disc to the ora serrata, but it is not everywhere in contact with the shrunken vitreous. Anteriorly it is much puckered.

Microscopical Appearances.—Between the detached retina and the posterior surface of the lens, and adherent to them, is a mass of irregular fibrous tissue and cells. The mass is most fibrous at its periphery, and most cellular at its centre. It passes forwards on each side into the circumlental space, and is adherent to the root of the iris. Backwards it is prolonged as a thin pedicle to the optic disc. The root of the iris and the ciliary body have small patches of round-cell infiltration in them. The elements of the pars ciliaris retinæ and uveal pigment of the ciliary body show extensive proliferation. The choroid appears thin, but only shows inflammatory infiltration at the margin of the optic disc. There is round-cell exudation into the nerve fibre layer of the retina, chiefly around the larger blood vessels. The rods and cones are much shrunken and degenerated. In the nerve fibre layer anteriorly are a few hæmorrhages. There is marked hypernucleation of the optic nerve, and exudation between its pial and dural sheaths.

CASE 15 (*Register No.* 3420).—*Glioma retinæ affecting both eyes, in one of which there has been perforation of the cornea and shrinking.*

Victor A., aged 1 year and 4 months, was admitted to the Moorfields Hospital, on June 4, 1891. The history given by his mother was as follows:—The child was born at full time, and

nothing was noticed the matter with his eyes until he was a month old; then she observed what she described as a hole in his left eye. Previous to this there had been no discharge from it. It afterwards became blood-shot, and gradually shrank. When the patient was 8 months old his right eye was first noticed to be defective. She took him to a hospital, and was told he had "glioma," but excision was not advised. There was no family history of any importance; patient was the youngest of twelve, ten of whom were living.

Upon examination, a vascular yellowish mass was seen behind the lens in the right eye, also some small floating bodies in the vitreous. The iris appeared vascular and discoloured; the pupil was eccentric, being displaced upwards and inwards, and having a marked black ring all round its pupillary border.

The left eye was shrunken, the cornea being small and semi-opaque. Both eyeballs were excised the following day.

Pathological Examination.—The right eye measures 21 mm. antero-posteriorly, 20·5 mm. laterally, and 20 mm. vertically. The anterior chamber is shallow, its angle being closed. The whole retina is detached, and involved in a new growth of a mottled-grey and white colour on section, with some streaks of hæmorrhage in it. The lens appear healthy; the growth is in contact with its posterior surface.

FIG. 3.—The lateral halves of the two eyes in Case 15. The left is much shrunken and full of gliomatous growth, the lens being absent. The right is of normal size; glioma involves the whole retina.

The left eye, much shrunken, measures only 12·5 mm. antero-posteriorly and laterally. The vertical diameter of the cornea is much diminished; it is thickened, as also is the sclerotic. The whole of the interior of the globe is filled by a grey substance; there is no lens in it.

Microscopical Appearances.—Right eye. The new growth is

composed of the characteristic round cells of glioma, nearly all nucleus; it has stained in the usual patchy way.

The whole retina appears involved, so that scarcely any of its normal tissue can be seen. The growth stops a little short of the lamina cribrosa; there is some hypernucleation of the nerve, which is probably inflammatory. The pars ciliaris retinæ is involved. There is no inflammatory exudation in any part of the uveal tract.

Left eye. The growth filling the globe resembles, in the character and arrangement of the cells, that in the right. It is typically gliomatous. There are changes in the choroid, indicative of past inflammation in it. The cornea is vascular, and neither Bowman's nor Descemet's membrane can be distinguished; it has evidently been perforated.

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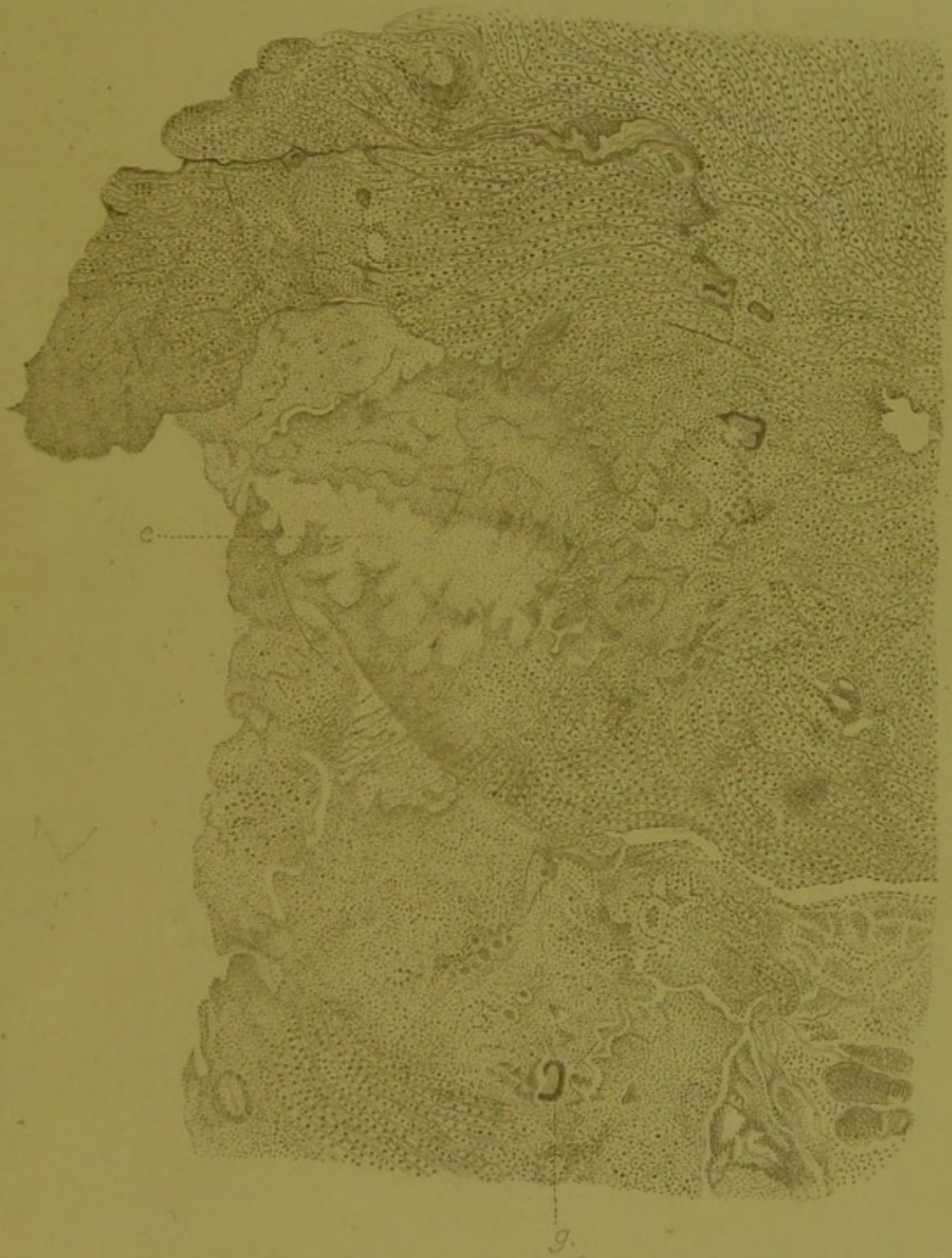
EXPLANATION OF PLATE.

This Plate shows a portion of a Section of the Optic Nerve in a case of Tubercle of the Choroid (Case 3). The letters *g*, *g*, point to giant cells, and the letter *c* to a patch of caseous degenration.



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