PAPILLOEDEMA

FIG. 1.—Papilloedema or 'choked disc' due to raised intracranial tension. In this instance the papilloedema was due to a frontal lobe tumour.

NEURO-OPHTHALMOLOGY

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Neuro-ophthalmology is essentially a post-graduate study, which not only presupposes a knowledge of neurology, neuro-surgery and ophthalmology, but also of many other branches of medicine. For instance, consider a patient suffering from severe headaches, who has developed a squint and changes in the optic disc, followed by blindness of one or both eyes with the Wassermann reaction of the blood positive. The neuro-ophthalmologist, aided by his ophthalmoscope, has not much difficulty in giving his opinion that the

diagnosis is a syphilitic condition at the base of the brain.

The ophthalmoscope may be looked upon as the special instrument of the neuro-ophthalmologist.

In this article some of the common conditions of the fundus which will meet the eye of the neuro-ophthalmologist are described.

Plate 1 is that of papilloedema of the optic nerve. It is a photograph which has been coloured. Such an appearance should be easily familiar to medical practitioners and neurological students, but the

THE NORMAL FUNDUS

FIG. 2.—On the right is the optic disc with some choroidal pigment around its edge. The surface of the optic papilla is paler in colour than the surrounding retina. In the centre of the papilla is the normal physiological pit which is much paler in colour than the surrounding surface and, at the bottom of the papilla, the lamina cribrosa is faintly seen. The arteries are lighter in colour and are seen emerging from the depths of the physiological pit. The veins are darker in colour. To the left is the normally pigmented macula. Note that where the arteries cross the veins there is no kinking.

beginner, at first glance, is confounded by the changed aspect of the disc. If a vessel is followed to its source, it will be noticed how it disappears and then briefly appears again at its termination. The inflammatory oedema around the disc is responsible for this disappearance of the vessels. Now compare Plates 1 and 2. The latter is the ophthalmoscopic appearance of the normal fundus oculi. The edge of the disc is well defined, not always showing the black choroidal pigment. The disc surface is not so deeply pink in colour as the surrounding retina. The veins are of larger calibre than the arteries, and the physiological pitting at the centre of the disc may be quite marked, often showing fine markings at its depth, which are the

fibres of the sclera called the lamina cribrosa. The vessels do not stand away prominently from the surface of the disc. Refer back to Plate 1. Here the disc edge is indistinct; the veins are engorged and stand away from the disc surface and the physiological pit has disappeared. The surface of the disc is a deeper colour.

To measure the height of these swollen vessels the observer must relax his accommodation and turn up the convex lenses of the ophthalmoscope until the highest number is found with which the highest or most protruding vessels are distinctly seen. Then turn the light on to another part of the fundus. The vessels will be found to appear indistinct. Rotate the lenses back to the one with

CONSECUTIVE OPTIC ATROPHY

FIG. 3.—The fundus of a blind woman who suffered from an intracranial tumour (probably a tuberculoma) in childhood, showing clearly the white lines accompanying the vessels peripheralwards. These are not seen in primary optic atrophy.

which such a vessel is distinctly seen. The difference between these two numbers indicates the height of the papilloedema; e.g. if the lightest vessel on the disc is seen sharply with a +6 and the fundus vessel with a +3, then the height of the papilloedema is 3 diopters.

The following changes take place in the development of papilloedema:—

(a) First there is an increase in the calibre of the veins and increased redness of the disc with a blurring of the upper and lower nasal margins.

(b) Oedema, on and around the nerve head begins to appear and the nasal and temporal edges of the disc are lost, so that the entire sharp edge of the disc has disappeared.

(c) Later there is a decided increase in the elevation of the surface of the disc and the veins continue enlarging. Oedema and minute haemorrhages form and the physiological pit is obliterated.

(d) In the most acute stage (Plate 1) the picture is a most puzzling one; portions of the vessels on this area are seen lying on a whitish background together with minute haemorrhages. However by changing the lenses in the ophthalmoscope from

the highest to the lowest the levels of the various structures can be perceived.

Often in the normal eye the veins appear large and tortuous, but when these are associated with any symptoms of disease (not only of the nervous system but also of the body generally), they should be carefully kept under observation. The condition known as pseudo-neuritis where there is no swelling of the disc surface, seen most commonly in young people, should be kept under observation for months since some such cases have turned out to be real papilloedema.

Papilloedema occurs in 80 per cent. of intracranial tumours. The depth of the papilloedema varies from a slight swelling to one of five to six diopters. Up to eight diopters has been observed. Subtentorial tumours produce a severe form of papilloedema owing to the anatomical structure found in the posterior portion of the cranium. In the lesser degrees of swelling it is difficult to determine by means of the ophthalmoscope whether the papilloedema is a passive oedema due to raised intracranial pressure (pleurocephalic oedema) or due to inflammatory oedema of the

OPAQUE NERVE FIBRES

FIG. 4.—This peculiar appearance, which in many cases strongly suggests a papilloedema, is due to the presence of the myelin sheath of the nerves in the retina which normally ends behind the lamina cribrosa. Rarely these white patches are seen separated by some distance from the optic disc, but when, as in this picture, the white area more or less surrounds the optic edge the retinal vessels are seen to disappear and appear again at the edge of this area, giving the impression that the vessels are obscured by oedematous exudates. The medullary nerve sheath areas are always characterized by brushlike extremities.

nerve head (optic neuritis). In the former there may be no disturbance of vision; in the latter there is some loss of function. However, in the former if the intracranial pressure is not released, the pressure on the nerve head will cause great loss of vision, even complete blindness. Continued pressure on the optic nerves brings a changed appearance of the disc. There is a decided subsidence of the vascularity of the papilloedema and increasing pallor of the disc; the vessels become more normal in calibre or even show a shrunken appearance.

The retinal arteries may show accompanying white lines due to thickening of the perivascular sheaths. The following statistics are from Marchesani as to the occurrence of papilloedema:—

Intracranial tumour	..	..	186
Lues cerebri	..	..	7
Tuberculosis cerebri	..	..	2
Cerebral abscess	..	..	6
Meningitis	..	..	3
Encephalitis epidemica	..	..	1
Tower skull	..	..	7

PRIMARY OPTIC ATROPHY

FIG. 5.—The optic disc is greyish white with a sharp edge and a normal choroidal ring. Frequently the colour of the disc in primary optic atrophy is of a marble whiteness. The physiological pit is present and the size of the vessels is normal or slightly reduced. The remainder of the fundus appears normal. When pigment is present in the retina surrounding the disc due to inflammatory changes it is never so black or definitely outlined as in the normal choroidal pigment.

Hydrocephalus	5
Cranial injury	7
Aneurysm	1
Hyperpiesis or nephritis ..	39
Polycythaemia	2
Leukaemia	1
Lymphogranulomatosis ..	1
von Recklinghausen's disease ..	2
Syringomyelia	1
Sinus or orbital disease ..	10
Venous thrombosis	2
Ocular causes (' ex vacuo ')	2
Unexplained	19
	304

Such an appearance as in Plate 3 is known as consecutive optic atrophy; this is in contradistinction to secondary optic atrophy, a condition which follows optic neuritis or papillitis and is the result

of inflammation of the nerve and retina (neuroretinitis).
Plate 4 is inserted here to teach the student not to confound the appearance of opaque nerve fibres with that of papilloedema—a common mistake. It should be noted that the opaque nerve fibres are most commonly restricted to one portion of the edge of the disc but, as in Plate 4, there may be greater involvement of the edge of the disc. The vessels dip in and come out of these bundles and simulate the obscuring of the vessels by oedema; the surface of the optic disc, however, is not raised. The medullated nerve sheath areas are always characterized by their brushlike extremities.
Primary optic atrophy (Plate 5) is the term applied to the condition of the disc when the optic nerve is degenerated. Compare Plate 5 with Plate 2. In the latter note all the minute vessels on the surface of the disc; the former does not show any vessels on the surface of the optic nerve. The

PARTIAL PRIMARY OPTIC ATROPHY IN DISSEMINATED SCLEROSIS

FIG. 6.—Compare the pink colour of the inner band of nerve substance with the pale appearance of the outer half. The pallor extends to the edge of the disc.

normal disc has a soft pink tint which contrasts with the central physiological pit, whereas in primary atrophy the surface is equally white all over. Bear in mind the following contrasts:—

Primary Optic Atrophy

- (a) Sharp edges.
- (b) Physiological pit present.
- (c) Normal choroidal pigment as in Plate 2.
- (d) Sheaths of vessels invisible.

Consecutive Optic Atrophy

- (a) Blurred edges.
- (b) Physiological pit filled in.
- (c) Finely scattered irregular pigment.
- (d) Sheaths of vessels visible as white lines accompanying the vessels as far as the equator of the eyeball (see Plate 4).

Primary optic atrophy may be produced by lesions of the retina due to disease or poisons; by lesions of the optic disc (as in glaucoma), or of the nerve itself (as in tabes dorsalis); by inflammation, growths or injuries. Disseminated sclerosis is responsible for more cases of pallor than sinus disease. However, the pallor of disseminated sclerosis is practically always on the temporal side of the disc, involving the papillo-macular bundle. Fractures of the base of the brain often pass

through the optic canal and such a lesion is generally followed by primary optic atrophy.

Plate 6 illustrates what is known as partial primary optic atrophy. The temporal portion (papillo-macular bundle) of the disc has become pale, whilst the nasal portion is still pink. House physicians are often dubious about this condition but examination of every case of disseminated sclerosis will soon convince the observer of its genuineness. The writer has seen several cases of papillitis or optic neuritis in patients with disseminated sclerosis but these form a very small percentage of cases seen.

The nerve head is affected in the disease known as neuro-myelitis optica (apparently a close relative of disseminated sclerosis). One sees a bilateral papillitis, accompanied by blindness, followed by resolution and leaving behind only a slight pallor of the entire disc surface. The visual function in this last-mentioned condition may eventually not be affected or only so for minute perception of colours.

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