Quite a large bibliography has arisen around these Roman fragments; the most authoritative book is Esperandieu's *Signacula Medicorum Oculariorum* (1904). By the kindness of the Librarian of the Roman Society, 19, Bloomsbury Square, London, W.C.1., I was enabled to consult this work, which is now out of print. It gives details of more than 200 specimens.

Those who are interested in the pharmaceutical side of the collyria would do well to read the small pamphlet on Roman Oculists' Medicine Stamps and Collyria (1925) by Mr. C. J. S. Thompson, Curator of the Wellcome Historical Museum, to whom I am also greatly indebted for assistance. Lastly, I must record my thanks to the Deputy Keeper of the British Room of Roman Antiquities at the British Museum, who kindly gave me all facilities for examining the specimens in his care; and to Sir Alexander Lawrence for so generously allowing me to include his specimen.

ANOPHTHALMUS CONGENITUS IN A PUPPY

BY

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THIS puppy was given me by Professor J. P. Hill, who had received it when it was three weeks old. The investigation of the visual cortex was begun in the hope that the area striata might be the more easily discerned in the presence of this defect and thus throw light on the limits of this area in the dog. The localization of this area is on the whole firmly established. The only serious discrepancy arises from the work of Munk. The defect seems to be extremely rare, as Durlacher, writing in 1910, was able to find only 27 cases recorded in the literature.

As will be seen later, this case seems to differ from those previously recorded in that the nervous elements subserving vision were normal. Schwalbe states in his description of this condition that the optic nerves may be absent, that the lateral geniculate may be small or absent and the pulvinar reduced, and in the occipital cortex the stria of Gennari and the internal granular lamina are wanting. The principal descriptions of the changes in the central nervous system come from the publications of Bolton and Leonowa.

Bolton investigated the area striata in a new-born child in whom there was complete congenital anophthalmus. His main conclusion was that the area striata was reduced in extent. It occupies

the usual position in the stem of the calcarine fissure but only extends backwards for rather more than half the length of this sulcus, the posterior extremity of the area reaching only as far as the posterior cuneo-lingual gyrus. Below the fissure it is confined to the lower lip and to the lingual gyrus. Microscopically the outer layer of granules and the stria of Gennari are confined to about two-thirds of their normal extent. The other layers are unchanged. This amount of reduction is the same as that found in old cases of optic atrophy.

Leonowa studied several cases of optic atrophy and congenital anophthalmus. His material was stained with carmine which is not a very suitable stain for cell stratification. Altering his terminology to agree with more recent usage his conclusions were as follows. The lamina zonalis shows a few wide blood-vessels. The lamina granularis externa shows a reduction in the number of cells, large pericellular spaces being evident. The lamina pyramidalis shows a marked reduction in the number of cells. In the deeper portions of this layer the cells are more nearly normal. The lamina granularis interna is absent and there is no stria of Gennari. The remaining laminae are practically normal. He concludes that in anophthalmus the lamina granularis completely fails and he proceeds to the generalization that this lamina and the stria of Gennari only develop when the visual area is functionally active.

The observations presented here were made on a male puppy three weeks after birth. It appeared to be quite healthy and presented no other anomaly than the anophthalmus. Externally the eyelids had formed and though there was a line of division visible on the surface yet deeper they were still united. The orbits were of normal size and were filled with fibro-fatty tissue. No trace of the bulb of the eye could be found. The optic nerves were reduced to a mere thread and consisted of connective tissue only. The third, fourth, and sixth nerves could not be found in the tissues of the orbit. It is unfortunate that this orbital tissue was not examined by serial microscopic sections since by this method minute remnants of the bulbus oculi have been found. Thus Parsons, Natanson, Hess, and others have always discovered some trace of mesodermal elements of the bulbus oculi. No trace of the eye muscles was observed, and no change in the bony orbit. It is interesting to note that others have noticed that though the bulb may be absent yet the eye muscles are developed. From a review of the gradations of this defect it is obvious that—from microphthalmia to complete absence—there can be no doubt that malformation occurs at a very early stage in development and that in all cases normal development has begun.

When the base of the brain was examined it was found that the optic chiasma was reduced to a mere thread and that the optic tracts were invisible. The third nerve was picked up as a tiny strand issuing from the sulcus oculomotorius. The fourth and sixth nerves seem to have entirely disappeared. The brain stem was separated from the hemispheres and a drawing made of the dorsal surface (Fig. 1).

FIG. 1.

Dorsal view of brain stem.

From the figure it will at once be seen that the pulvinar, the lateral geniculate body, and the superior quadrigeminal body are well developed and exhibit no sign of any reduction in size. The brain stem was subdivided into blocks and cut into sections. The sections were stained with toluidin blue. The ocular nuclei are prominent and well developed and composed of cells which appear normal in every respect. The disposition of the third nerve nucleus and the richness of its cellular content show no abnormal change. Although no attempt was made to identify in detail the disposition of the cell groups of the individual eye muscles, it was apparent that these groups were present. In comparison with the figures of other observers one could be quite certain that no

alteration in the grouping of the cells had taken place. Moreover, the nucleus of Edinger-Westphal occupies its usual position and is of normal extent. The fourth and sixth nuclei were also apparently normal in all respects. The individual cells show no chromatolysis. The cells stain normally and the Nissl granules are abundant and sharply defined. We were surprised to find no

←N. of E.
Westphal

↓
Median Raphe.

↓
Nucleus Oculo-motorius.

PLATE 1.

Microphotograph of the third nerve nucleus.

changes in these nuclei for either we could find no trace of these nerves or, as in the case of the third, only a mere thread.

In Plate 1 is reproduced a microphotograph of the third nerve nucleus and the nucleus of Edinger-Westphal. The normal macroscopic features of the dorsum of the mid-brain are paralleled by the microscopic observations. The disposition of the cells shows no reduction and the individual cells appear normal in every way.

The cerebral hemispheres are normal in size and the pattern of the fissures is of the usual complexity. The mesial surface is well indented by a sulcus splenialis, the posterior part of which is the sulcus calcarinus of Elliot Smith. The horizontal fissure crossing the area striata—the sulcus interstriatalis of Elliot Smith or the

FIG. 2.

Lateral view of hemisphere.

FIG. 3.

Mesial view of hemisphere.

posterior calcarine of Cunningham—is well developed. The area striata occupies an area the extent of which corresponds to the limits assigned to it by Campbell in his work on cerebral localization. The area is bounded on the external surface by the sulcus lateralis, on the mesial surface in front by the retro-splenic or sulcus calcarinus of Elliot Smith. Below it is limited by the sulcus recurrens. It is therefore extended to the full limit of its usual area (Figs. 2 and 3).

The brain was embedded in celloidin and sectioned. One hemisphere was stained for cells by toluidin blue. The other, which had been fixed for several weeks in bichromate was stained by the Weigert-Pal method.

The cell lamination appears to be normal in every way. The individual laminae are well defined, and, measured against the

PLATE 2.

Microphotograph of the area striata.

same laminae in a normal dog, there is perfect agreement in the width of each lamina.

The characteristics of each lamina compared with the normal are as follows (Plate 2).

The lamina zonalis is the same width in both and is the usual acellular layer.

The lamina granularis externa is equally inconspicuous in both.

The lamina pyramidalis shows a succession of cells gradually increasing in size from the surface towards the deeper portion of the layer. In both the normal and the abnormal the cells are very regularly arranged and closely packed together. No difference can be observed between the two and they are both of the same width.

It is in the lamina granularis interna that changes are most likely to be found. The lamina is divisible into an outer and an inner portion with the stria of Gennari between them. The outer layer is the broader of the two and its small granular cells are the more numerous. The stria is narrow and not very conspicuous. This description applies equally well to the normal cortex as to the cortex of the anophthalmic puppy. At first the cells of this lamina in the abnormal animal showed a difference in that the granular cells stained less intensively than the cells of the other layers. Using the same fixative (formalin) and the same stain the same slight difference in staining intensity was shown in these granular cells in the normal dog.

The lamina ganglionaris is rich in cells of Meynert. They form a most characteristic layer of prominent cells of large pyramidal form. These are equally numerous in the normal and abnormal dog.

The lamina multiformis is the same in both cases and consists of cells of irregular size and sharply marked off from the subjacent white matter.

The Weigert staining was almost completely unsuccessful. This was not due to the method, for the same materials and procedure is in constant use by us and invariably answers most satisfactorily. No fibres were present in the cortex and the majority of the fibres in the optic radiation were non-medullated. It is difficult to be sure if this non-medullation is due to the abnormality or to the age of the animal.

The interest of these results lies in the factors that determine retrograde degeneration and reaction at a distance. Warrington was surprised to find that although he could easily establish retrograde changes in the spinal cells after section of the ventral roots yet on section of the third nerve he could not find corresponding changes in the nucleus. He quotes van Gehuchten, who says that degeneration of the third nerve nucleus after section of the nerve has not been established. Various factors have been suggested to account for this and evidence is accumulating that such factors as the distance of the section from the nucleus, and the manner in which the section is made, play an important part in determining the onset of retrograde changes. For instance, avulsion of the nerve seems more effective than simple section. Perhaps it may be assumed in the case of this abnormal pup that the quiet nature of the degenerative changes explains the absence of secondary effects in the ocular nuclei.

In regard to reaction at a distance Monakow states that the experimental results are conflicting. In his experiments where he enucleated both eyes in a new-born pup and six months later investigated the central nervous system he could find no changes

whatever. He records that all the fibres going to the occipital convolutions were non-medullated. We have found a similar imperfection in the medullation, but are not sure whether this is due to the age of the animal or to the abnormality.

On the contrary all observers are agreed that in old long-standing cases of blindness there are always to be found changes in the mid-brain centres and in the area striata. There would seem to be little doubt that in reaction at a distance the time factor is the important one. This may explain some of the discrepant results obtained in the cortical investigations of tabes and amputations.

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THE RESULT OF TREATMENT BY ARTIFICIAL LIGHT ON PHLYCTENULAR AND OTHER TUBERCULOUS LESIONS OF THE EYE*

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MUCH attention has been paid recently to the action of light upon the body, and although its mode of action is not known, yet, on empirical grounds, it is being used extensively as a form of treatment in disease. We know that life is dependent upon the radiant energy from the sun, and recently it has been shown that the rays of short wave length have a profoundly beneficial effect on the growth and maintenance of the human body.

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