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**Anatomy.** — “*On the visual centra in the brain of an anophthalmos.*”

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(Communicated by Prof. C. WINKLER.)

Through the Director of the lunatic-asylum Maasoord, Dr. Vos, the Central Institute for Brain-Research came into possession of the brain of a female anophthalmos, who had died at *fullgrown age*. She was moreover an idiot.

The number of investigations of the central nervous system in cases of congenital anophthalmia is a very modest one. It is also — even with regard to the central visual system — not complete. Moreover very general conclusions were sometimes drawn from the partial investigation of one single case (BOLTON). We are consequently of opinion that the communication of the discoveries made in a new case, are not unwelcome. We give a very short account of them in this paper.

1. *Corpus quadrigeminum anticum* on both sides flatter than normally;

2. *Pulvinar thalami optici* in sagittal direction shorter than normally;

3. *Corpus geniculatum externum* almost entirely without the basal prominence;

4. *Occipital lobe*: Besides the remains of a chronical leptomeningitis (existing still more distinctly in other parts of the cerebrum) both lobi occipitales show a somewhat too feeble development. Though the cerebellum is, in sagittal direction, entirely covered, one sees the central part of the dorsal surface of the cerebellum lying more bare than normally, in consequence of the caudal distention of the two cerebral hemispheres. The latter are slightly tapering. The mediobasal parietes of the occipital lobi are likewise shorter than usual. The configuration of the sulci and gyri there falls inside the line of demarcation of the physiological variation. The sulcus calcarinus to the left bends round the rim of the occipital pole, to the right it finishes at a short distance in front of this pole T-shaped. On the convex side one finds, on both sides, remnants of a sulcus lunatus.

*Microscopical examination.* All the above-mentioned visual centra to the left were examined by Pal-preparations and sections coloured according to VAN GIESON. The right ones were coloured according to NISSL (paraffine enclosure, toluidine-blue) the calcarine-region partially. The results are as follows:

1. *Corpus quadrigeminum anticum.* On account of the absence of the visual fibres of the tractus opticus this ganglion is poorly

medullated. This poverty regards the superficial (stratum zonale, certainly not in a considerable degree, possibly not at all. This is in accordance with what CAJAL <sup>1)</sup> ascertained for embryonal preparations, and what one of us concluded from a pathological case <sup>2)</sup>, in contradiction with the current view regarding this subject. The following stratum of medulla (stratum opticum) is on the contrary less rich in fibres; these originate thus for the greater part in the nervus, resp. tractus opticus. In cellpreparations (v. GIESON, NISSL) no distinct difference from normal sections can be ascertained.

2. *Pulvinar thalami optici*. The nucleus, as a whole, is decidedly smaller. It is however very difficult to indicate what anatomical category of fibres has disappeared. The long radiary fibres are beautifully developed, they run distinctly into the capsula interna retrolenticularis, and consequently most likely belong to the projection-system of the cerebral cortex. The cells have a healthy appearance in the central part of the nucleus and in the medial part. In the lateroventral part the cells have possibly drawn a little too closely together, and there is too rich a collection of glia-elements. We have not been able to demonstrate a loss of cells.

3. *Corpus geniculatum externum*. The section was made almost parallel to the entering tractus opticus. On account of the absence of the ventral prominence hardly any vestige of a "hilus" can be observed. Of course there is no question of a medullated tractus- resp. retina-part; in so far as this part is grey in normal preparations one can observe in this anophthalmos a considerable diminution of volume. The frontal part of the ganglion misses thus the scattered thick bundles of medullated fibres, which are seen lying as little blocks amidst the finer network of fibres, the ventral part misses the infiltrating fibres. The medullated lamellae are distinctly arranged in the usual way. They contain however a little fewer fibres than are found in the healthy ganglion. As, also in normal preparations, we cannot find in the retina- resp. tractus-part the "kleinste Elemente" of VON MANOKOW, there is no occasion to ask if they have disappeared. One sees indeed glia-cells in normal numbers, as it appears, and more closely together than with a healthy person. In the ganglion itself one finds both the nucleus principalis (Hauptkern) and the nucleus magnocellularis (ventraler Kranz grosser Elemente) resp. after

<sup>1)</sup> S. R., y CAJAL. Textura del sistema nervioso, 1904. II, 1. p. 477.

<sup>2)</sup> v. VALKENBURG. Contribution à l'étude d. l. substance blanche temporo-occipitale de l'homme, Psych. e. Neurol. Bladen. 1911.

the nomenclature of MALONE<sup>1)</sup> and MONAKOW<sup>2)</sup>. The cells of the former are perhaps somewhat smaller than normal, those of the latter are of the usual size. Neither of the two kinds of cells have a pathological appearance. They are lying only clearly too closely together. The result of this compression is a diminution of the whole ganglion to about  $\frac{2}{3}$  or less than its usual size. The medullated fibres lying dorsally and laterally from the C. g.e. (triangular area of Wernicke and lateral medulla) have an entirely normal appearance, they are only reduced in accordance with the diminution of the ganglion.

4. *Occipital lobe.* This lobe was cut — to the left — from the transversal surface through the confluence of sulcus calcarinus and sulcus parieto-occipitalis backward. The sagittal strata round the posterior shell of the ventricle are extant, of normal colour, too narrow and elongated; there is a tolerable expansion of the ventricle. The latter reveals itself also in so far that the cerebral ventricle is fissure-shaped continued in a medial direction, ventral from the inferior lip of the sulcus calcarinus. The calcar avis is well-developed. At about the middle of the sulc. calcarinus — behind the place of confluence with the sulc. parieto-occipitalis — there appears to exist a transition-convolution (cuneolingual fold) the cortex of which has not the typical characteristic of the calcarina-limitation: the strip of Vicq d'Azyr. As to this strip, which has given a name to the designated part of the cortex (area striata) it extends on all sections over a part, distally over the entire limitation of the calcarina and reaches exactly the occipital pole. The annexed figures show, in normal size, its extension. The interruption through the cuneolingual transition-convolution mentioned above lies between figures 2 and 3. One sees moreover from the reproductions, that the sulcus calcarinus, especially in its distal part, has very little depth. In connection herewith the length of Vicq d'Azyr's strip is on each section considerably smaller than normally.

This added to the abbreviation of the lob. occipitales proves thus a considerable diminution of its extensity:

We found the fibre percentage of the cortex, both round the sulcus calcarinus and the rest of the occipital part, normal.

The cells of the cortex do not show any deviation in the area striata, neither individually nor in their arrangement to strata.

<sup>1)</sup> MALONE: Ueber die Kerne des menschlichen Diencephalon. Abhdlg. d. k. preuss. Akad. d. Wiss. Physik.-Math. Klasse, 1910.

<sup>2)</sup> v. MONAKOW: Gehirnpathologie.

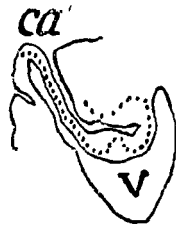


Fig. 1. Immediately behind the meeting of Sulcus calcarinus and sulc. parieto-occipitalis.

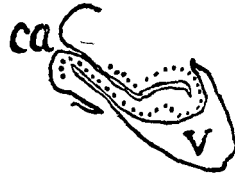


Fig. 2. 6 mm. behind fig. 1.



Fig. 3. 1 1/3 cm behind fig. 2.



Fig. 4. 6 1/2 mm. behind fig. 3.



Fig. 5. 3 mm. behind fig. 4.



Fig. 6. 4 mm. behind fig. 5; occipital pole.

V = Ventricle (posterior shell).  
Ca = Sulcus calcarinus.

We remarked however that in the immediate neighbourhood of the area striata (area 17 BRODMANN) the cortical area (18 BRODMANN) shows a less beautiful development in its large supragranular pyramids than one sees normally. Also in comparison with corresponding sections through this region of an idiot that was not blind, this difference continues to exist.

If we summarise our discoveries, it appears that the primary-optical centra show the deviations that are typical for the consequences of the early enucleation of the two eye-globes on both sides. Moreover that part of these nuclei that is connected with the cerebral cortex, though it may be ever so reduced, has not changed its nature. Entirely in keeping with what might be expected on these grounds, the nucleocortical connection — on account of the diminutiveness of the composing fibre-elements — though it has diminished, in volume, is very distinctly extant. It is exactly the same with the regio calcarina, if not exclusively (according to our view) yet very predominantly (WINKLER)<sup>1)</sup> the boundary of the geniculo-cortical

<sup>1)</sup> WINKLER: Über gelocalisierde atrofie i. h. corp. geniculatum. Versl. K. Ak. v. Wetensch. 1912, bldz. 714.

fibres. In extensity it is reduced in every direction, but the construction is entirely normal.

This discovery is directly opposite to that of BOLTON<sup>1)</sup>, who states for special strata a considerable diminution and moreover admits for anophthalmia a shortening of the area striata in a sagittal direction to half its length. In his one case (p. 203) the area striata did not extend farther than half way the sulc. calcarinus, in so far as it limits the cuneus ventrally. As one sees from the reproductions of our anophthalmos by no means answers this condition; the photographs of the Nissl-preparations prove for the cell-percentage likewise what we communicated above. The latter, besides being contrary to BOLTON's statements, is likewise at variance with LEONOWA's<sup>2)</sup> discoveries in this respect. This author, who disposed of more cases examined however only very young children aged at the utmost 2 months. In our opinion greater conclusive value should be ascribed to our case.

We cannot decidedly ascertain the signification that must be attached to the comparatively less beautiful and complete development of the large supra-granular cells in area 18. It is well-known that English investigators (CAMPBELL, MOTT, BOLTON) are accustomed to distinguish this cortical area specially as the visuo-psychic area. Though — in our opinion on good grounds — one may only hesitatingly apply such a localising nomenclature to special parts of the cortex, it cannot but be admitted that field 18 is very nearly concerned with the optical impressions which, at any rate, are received in its immediate vicinity — field 17 —.

In this train of thought it would be explicable, that elements which under normal conditions take part in retaining or modifying etc. optical, eventually modified stimuli but cannot perform the principal part of their activity on account of the existence of anophthalmia, show the vestiges of it in their construction. The fact that exactly *these* seem to suffer most under the perpetual optical inactivity of the organism should then be attributed either to their great vulnerability (connected perhaps with their tardy embryogenetic maturity) or to the fact that, exactly by their size, histological modifications are sooner visible. It is at all events a fact that, as we mentioned above, we could not discover any pathological properties in the cells of area 17 itself.

<sup>1)</sup> BOLTON: The exact histological localisation of the visual area of the human cerebral cortex. Philos. Transact. R. S. of London, Series B. vol. 193, p.p. 165—222.

<sup>2)</sup> LEONOWA: Beitr. z. Kenntniss der secund. Veränder. der prim. opt. Centren u. Bahnen u. s. w. Arch. f. Psych. Bd. 28, S. 53, 1896.