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Histochemical Study of the Brain in an Atypical Case of Amaurotic Idiocy

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With 8 Figures in the Text

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The following is a description of the clinical, pathological and histochemical findings in a child suffering from an atypical form of amaurotic idiocy. The findings in this case considered together with other reports in the literature, indicate that amaurotic idiocy might not represent a nosological entity caused by a single, well defined metabolic derangement, but rather a morphological and clinical syndrome which includes a number of different though akin metabolic derangements.

Clinical Data*

The patient was the second son of healthy unrelated parents. Both parents were Ashkenazi Jews, the father's family originating in Poland, whereas the mother's ancestors lived for the last five generations in Palestine. The first born (brother to the patient described in this article) was a spontaneously delivered boy, who weighed at birth 3500 gm. Development was normal during the first six months of life, but at 7 months the mother noticed arrest and regression of development. The examining physician (Dr. H. ROETHLER) found decorticated posture and spasticity of the lower extremities. The infant could not hold its head and examination of the fundi revealed a typical finding for Tay-Sachs' disease. The physician was later informed that the child died at the approximate age of two years and that no autopsy had been performed.

The second born, also a son, was spontaneously delivered after an uneventful pregnancy. Weight at birth 3800 gm. The infant was examined by Dr. ROETHLER at the age of 5 months. Until that time his development was reported to be normal. During the last weeks prior to its examination the infant was running an undiagnosed sub-febrile temperature. Clinical examination at this stage, including ophthalmological study was not particularly contributory, except for some hyperreflexia, muscular hypotonia and slight irritability.

At the age of 7 months the infant was re-examined. No further development had occurred during these two months; the child stopped turning over in his bed, obesity developed, and the circumference of the head was 44 cm. Examination of the fundi revealed early changes of Tay-Sachs' disease, with typical findings in the maculae of both eyes, although the papillae were not yet quite pale.

At the age of two the child was amaurotic and an almost completely motionless idiot. At the age of 21/2 years the child was admitted to the Pediatric Department of the Kaplan Hospital after a week's illness, with cyanosis, high temperature and cough. Penicillin treatment brought down the temperature, but the child continued to be subfebrile, unconscious, with repeated attacks of cyanosis and dyspnea. Clinical examination at the hospital revealed an unconscious spastic child with hyperreflexia. Diffuse râles could be heard over both lungs.

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The head was enlarged (circumference 51.5 cm). Liver and spleen were not enlarged. Ophthalmoscopic examination showed atrophy of the optic nerves and typical cherry-red spots. The child died on the 12th day of hospitalization after progressive increase in severity of the dyspnea and cyanosis.

A complete autopsy was not performed. The brain was extracted and sent to the Assaf Harofeh Hospital Department of Pathology already fixed in formalin. Pieces of the brain were kindly sent by Drs. Reif and Sandbank to the author for further study.

**Histological and Histochemical Findings**

Both paraffin and frozen sections of many pieces of the brain were made. The staining methods are listed together with the findings. The pathological process in the gray matter was basically similar in all the areas examined with only slight variations in intensity. The changes in the white matter were less homogeneous, as demyelination was not of equal intensity in the different areas. Topographical study of the demyelinating process was impossible, however, because of insufficient material.

In sections of paraffin-embedded material stained with haemotoxylin and eosin the neurones showed the change typical for amaurotic idiocy. All ganglion cells were swollen, often pear-shaped, and the tigroid substance and the nucleus were usually pushed to one side of the cell. The cytoplasm of these cells appeared finely vacuolated. In most areas there was clear evidence of loss of neurones. In the cerebellum, for example, very few Purkinje cells remained (Fig. 1). In addition to the swollen ganglion cells at least two other types of enlarged cells containing deposits of an abnormal material could be discerned in the gray matter (Figs. 1 and 2):

a) swollen astrocytes of the "gemastete" type, with acidophilic homogeneous cytoplasm. In sections stained with Cajal's gold sublimate method, slender processes could be seen expanding from the bodies of some of these "gemistocytes" (Fig. 3);

b) Gitter cells (compound granular cells) with frankly vacuolated cytoplasm and central nuclei.

In the white matter some oligodendrocytes were surrounded by a wider halo than usual, and there was marked gliosis (Fig. 4). No inflammatory infiltrate was found anywhere. The adventitial cells and periadventitial histiocytes were swollen and often foamy, especially in the white matter.