Amaurotic Family Idiocy. (Tay-Sachs' Disease.)*

Edward F. Leonard, M.D.,

Chicago.

Assistant Professor in Neurology, School of Medicine, University of Illinois; formerly Assistant Physician, Jacksonville State Hospital.

Case Histories.

Case I.—Male, 17 months old, Hebrew, second child. Patient first seen June 27, 1916. The first child of these parents is a boy 6½ years old and appears healthy, physically and mentally. The father is 32 years of age, the mother 27 years of age, not related and first marriage. Father born in Austria, mother in Russia. Family history negative. No nervous or mental trouble traceable. No drugs or alcohol used on either side.

Pregnancy: Mother well during pregnancy. Child born at full term, forceps, weighed 8½ pounds, no fever. Nursed child up to four months; then milk gave out and changed to bottle.

Personal History: There was no distinct nor definite disease up to ten months, when the patient had a severe bronchitis that lasted ten days, coughing a great deal. The child became thin and lost in weight. Legs and arms became weak and he had difficulty in drawing up the legs; he could neither hold head up nor sit up. The mother believes that at six months the child acted like other babies of that age; would laugh if tickled, but did not do so during my examination. Mother thought child could see before illness, as he would try to grasp at things and would play with a rattle. At time of examination would not grasp at rattle of own accord, but would take hold of one if put into his hands. After illness he became yellow, and

*Read before the West Side Branch of the Chicago Medical Society, January, 1917.
moaned and fretted a great deal, and the slightest sound caused him to jerk.

Before illness the bowels and kidneys appeared normal; after illness child suffered with constipation. No trouble at teething, and no convulsions. Child never made any attempt to crawl.

Examination showed a poorly nourished child; circumference of head 19 inches; anterior fontanelle open. The head was thrown back and supported by the mother's hand. The pupils reacted to light, and patient would turn head toward the direction of a sound.

Knee, biceps, triceps reflexes increased. Babinski and Oppenheim present on both sides. Arms and legs were spastic. Child died October 31, 1916, of bronchopneumonia.

Case 2. Female, aged 15 months, first and only child, Hebrew; father born in Germany, mother born in Russia. Child at birth appeared normal, was examined by writer July 19, 1916, father reporting at that time that patient had not been well since it was seven months old. At time of birth forceps were used, mother being in labor for 18 hours. Child breast-fed for eleven months; first tooth cut at the age of nine or ten months. The father stated that the child seemed normal when two months old; when it was seven months old, a picture was taken, at which time it was noticed that something was wrong, for at the photographer's it would not pay any attention to the toys used to attract its attention. During the fifth or sixth month, however, the patient observed light, but the parents at that time noticed that the child could not hold her head up; up to that time she could not sit up, in fact never did. The child took liquid foods, but no solids; did not suffer from any of the diseases of childhood. The limbs seemed weak and the child was restless.

The father and mother are both living. The father had a struggle to secure an education, and since marriage, more or less of a struggle to earn a livelihood. The grandparents on both sides are nervous.

Examination: The child seemed well nourished, but pale. Head 19½ inches in circumference and anterior fontanelle open. Eyes would move from side to side when child was tickled. At times the child seemed able to follow a pocket-light. There was some strabismus. The child did not follow examiner's finger when placed in front of eyes. When finger was raised the eyes looked upward.

The head, trunk and extremity muscles were weak. At times limbs would straighten out and child become rigid. The head fell back, and child could not lift it, and it felt like a weight on one's arm. There was moisture of the hair of the scalp. The deep reflexes were increased. The least noise caused the child to suddenly jerk. Very often during the examination there was a moaning cry from the patient.

During the early part of October, 1916, the child developed a gastro-enteritis, and two weeks later a number of epileptoid convulsions came on. Last saw the patient on October 31, after a series of convulsions.

From the history, general appearance and examination of the patients, a provisional diagnosis of amaurotic family idiocy with hydrocephalus was made, and patients referred to Dr. G. F. Suker, Chicago, for eye ground examination. He reported that the eye findings were typical of Tay's-Sachs' disease.

DESCRIPTION OF THE DISEASE.

Definition. Reviewing the literature one finds that this is a rare disease, occurring in family groups, characterized by the gradual onset of blindness and a dark red spot in place of macula lutea, with mental and physical impairment, and ending invariably in death.

Historical. On account of the eye trouble Warren Tay of London, in 1881, was the first to describe a peculiar disease of the cerebro-spinal system occurring exclusively in childhood. He called attention to the affection in a child of twelve months. In the same family three similar cases occurred.
Sachs, after extensive study of the affection, described his first case in 1887, not knowing that Tay and Kingdon had previously published theirs. Sachs collected 27 cases in the literature, his own being included in the number. Kaplan published two cases, and has since seen six others. Cases and studies of the disease have been reported by Claiborne, Patrick, Kuh, Jacobi, Hirsch, Peterson, Cotton, Hirschberg, Frey, Beard, Collier, Carter, Falkenheim, Holmes, Poynton, Apert, Haverach and others. Holden, Mohr, Treacher, Collins, Schumway, and Buchanan have examined the eyes postmortem. F. W. Mott\(^1\) gives the microscopic and chemical changes in central nervous system, of two cases of this disease.

**Etiology.** Different views are held concerning the probability of a congenital or an acquired origin of the disease. Four theories have been advanced to account for it:

1. Cortical agenesis (Sachs).
2. Primary cortical degeneration (Russell and Kingdon).
3. A toxic degeneration of the motor neurones (Hirsch). He is inclined to regard amaurotic idiocy as a form of infection originating in the intestinal canal.
4. Degeneration resulting from an inherent bio-chemical property of the protoplasm of the nerve cells (Holmes).

Coriat believes that on account of the normal characteristics up to the ages of 4 and 10 months, that the disease is not really an idiocy, but is a form of dementia, as the macroscopic and micro-

Race. All the recorded cases have occurred in the offspring of Jewish parents, except one case reported by Turner.\textsuperscript{2} Speilmeyer, Higier, Vogt, Dercum, and others, have described as a juvenile form of the same disease, a condition with many similar symptoms. It sets in between the ages of 8 and 12, and occurs in other than Hebrew families. It has a more chronic course, and there are no changes in the macular region.

Syphilis. Absence of syphilis has been distinctly noted in most of the histories, and it does not appear to have any relation to congenital syphilis; although Dr. Geo. E. Price,\textsuperscript{3} of Philadelphia reports a positive Wassermann reaction on blood-serum in a case of a Hebrew boy aged sixteen months.

Maternal trauma. Injury to the mother during pregnancy has been reported in several instances.

Pathology. Uniform degenerative changes in ganglion cells of the gray matter throughout the whole nervous system; the ganglion cells were increased in size, containing a globular nucleus; the cell membrane and cyto reticulum were intact, but the Nissl bodies had entirely disappeared. There was a destruction and breaking off of the dendrites and axis-cylinders. The cerebral convolutions were of a primitive type; microgyri, an absence of the tangential fibres, and a decrease of fibres of the white matter.

The medulla, corpora quadrigemina, geniculate bodies, 3d or 4th cranial nuclei, and the cells and fibres of the optic tract showed degenerative changes. There is also a degeneration of the ganglion cells of the retina. Changes have been found in the pyramidal tract. The blood vessels were found normal. Mott found in his two cases that the posterior spinal ganglion cells, and the sympathetic ganglion cells showed disappearance of Nissl substance. He says: “It is therefore probable that every nerve cell in the body is thus affected more or less.” He believes that the essential feature is a failure in the elaboration of the nucleo-proteids of the neurons as evidenced histologically by the disappearance of Nissl granules.

F. Peterson found change in the suprarenal glands. McKee found changes in the thymus gland; Gordon found enlargement of the thyroid.

Ocular changes. The appearance of the optic disc is pathognomonic in the disease. Fay, Wadsworth, Carter, Beard, Westcott and others have studied and described it. The change in and around the macula lutea is the important diagnostic sign. Beard describes it as follows: “Surrounding the fovea centralis, concentric with it, and two or three times its size, is a liver-colored disc. The disc is the center of a zone of grayish-white which gradually fades away into the normal red-orange of the eye ground. As clear cut as a coin is this livid disc. It is not irregular in outline as is the case in acute inflammatory conditions, where the surrounding retina is infiltrated, nor is it cherry-red or carmine, as in those cases, but it is distinctly brownish. It is larger than the fovea; that is to say, instead of marking the area which is occupied by the cones alone, it marks that which is devoid of the ganglion cells. The whitish zone that surrounds the center is also

highly characteristic. It is nebulus rather than cloudy. It is almost white at the circumference of the liver-colored disc, thence gradually thins away to nothing, but is translucent and exhibits some color throughout. It does not obscure the retinal vessels which enter it. It only serves to make them more distinct by contrast, so that one is able to trace the tiniest of them right up to the central spot.

Symptoms. A child born normal and healthy seems to all appearance to be getting along nicely until about the fourth or eighth month, when it is noticed there is some weakness of the muscles of the neck, which leads to an inability to hold the head erect. (It appears top-heavy.) This weakness gradually extends to the trunk and limbs. The little patient can no longer hold up its head, sit erect or grasp anything. The paralysis at first is flaccid, later changes to one of spasticity with atrophy. The reflexes are either normal, a trifle subnormal, or exaggerated, according to the stage of the disease. The functions of the body are below normal, and marked pallor supervenes. Early, and associated with this general weakness, there is a gradual recession of its previous mentality, the first signs being simply a dullness, a loss of interest in objects or playthings which before attracted its attention; it does not seem to notice mother or nurse, and cares less and less for play. Associated early with the physical and mental weakness there is a disturbance of vision, and this may partly account for the child's early lack of interest. Rapidly the child becomes blind. Periodical convulsions are present in some cases.

Strabismus, nystagmus and irregularities of the pupils and dysphagia further show involvement of the muscular system. In some cases the head is enlarged and the fontanelles still open. The pulse is often rapid. Bronchial attacks and gastro-intestinal disturbances are frequently present. In some cases there is increased sensitiveness to touch and sound and the slightest noise in the room startles the child. Frequently, jerky movements of the limbs are noticed.

Prognosis. The malady runs a course of about two years, and invariably terminates fatally, marasmus, pneumonia or convulsions causing death. Of the twenty-seven cases of Sachs, only one lived to the age of six years. Sachs sums up the chief symptoms as follows:

1. Mental impairment observed during the first months of life and leading to absolute idiocy.
2. Paresis or paralysis of the greater part of the body, and this paralysis may be either flaccid or spastic.
3. Reflexes may be normal, deficient or increased.
4. A diminution of vision terminating in absolute blindness.
5. Marasmus and a fatal termination, as a rule, before the age of two years.
6. Occurrence of the affection in several members of the same family.

Treatment. The treatment is symptomatic. Some authors, believing the disease is due to a toxemia, or that the maternal milk is deficient in those agents which are of primary importance in the development, physical and mental, of the child, recommend removing the child from the
breast, and the child given fresh-drawn cow’s or goat’s milk. Most of the cases have been breast-fed. It has also been suggested to try small doses of adrenal gland, thymus, thyroid, or pituitrin. It has also been suggested that in any future cases a careful chemical examination be made of the mother’s milk.

BIBLIOGRAPHY

Posey and Spiller: The Eye and Nervous Diseases, page 532.
Carter: A. of Oph., XXII, 1894.
Hirsch: Jour. of Mental and Nervous Dis., 1898, XXV.
Also numerous text-books and medical papers.