

THE OCCURRENCE OF AMYOTROPHIC LATERAL SCLEROSIS IN CHILDREN.

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THE following case came under our observation at the Mineral Water Hospital, the patient having been admitted for stiffness and aching in the lower limbs.

A.L., a Jewess, age 28. Occupation, dress finisher. There was no history of nervous or mental disease in her family. She was the third child of a family of six, all the rest being healthy.

She had had no illnesses to note until the age of ten, when she suddenly developed difficulty in walking. The trouble seemed to be chiefly in the right hip. She stayed in bed for four weeks, after which she returned to school but was eventually transferred to a school for cripples, where she remained for four years. She was able to walk considerably further than she can now, but frequently fell down. Since then the difficulty in walking has slowly and steadily increased. At the age of 23 she noticed that her hands were beginning to become weak and the muscles to waste. This condition has since progressed.

On examination she showed evidence of lower motor neurone disease of the upper extremities. Both thenar eminences, both deltoids and the muscles of the back were weak and wasted, but no fibrillary tremors were observed. There were no objective sensory changes, although the patient complained of some 'pins and needles' in the hands. In the lower extremities the symptoms and signs were those of upper motor neurone disease: markedly spastic gait with decided ataxia, increased tendon jerks, extensor plantar responses on both sides, patellar clonus on both sides. A contralateral response of the quadriceps was obtained from both patellar tendons. The abdominal reflexes were absent. She had slight precipitancy of micturition when she had a cold, but not otherwise, and the organic reflexes were not really interfered with. Objective sensory changes in the legs were absent, and posture sense was accurate, but she complained of some subjective paræsthesiæ.

She presented no signs or symptoms of bulbar paralysis or of any affection of the other cranial nerves, unless an unsustained indefinite nystagmus to the left and a slight tremor of the tongue unaccompanied by wasting or difficulty in speech or swallowing could be taken as such.

The Wassermann reaction was negative in both blood and cerebrospinal fluid and the latter presented no pathological features.

The blood count was as follows:—

R.B.C. 4,784,000. Hb. 90 per cent. C.I. .95. Leucocytes 14,080. Polymorphs 50 per cent. Lymphocytes 34 per cent. Large mononuclears 11 per cent. Eosinophils 1 per cent. Basophils 4 per cent.

DISCUSSION.

The sudden onset of a spastic condition of the legs in a child of ten might suggest a condition such as myelitis, but the slow steady progression culminating in the progressive wasting of hand and shoulder muscles is against this, while on examination she presented the typical signs and symptoms of

amyotrophic lateral sclerosis and her case can be fairly diagnosed as such. The clear history from the age of ten, however, certainly constitutes a clinical rarity which merits consideration.

An examination of the literature of amyotrophic lateral sclerosis discloses a remarkably clear-cut picture of the clinical manifestations first described by Charcot¹ with his usual lucidity so long ago as 1865, but directly we pass from the clinical picture to the study of etiology and pathology we find an equally remarkable lack of uniformity of opinion. It is generally agreed that the three conditions which at one time were described separately, viz., progressive bulbar paralysis, progressive muscular atrophy and amyotrophic lateral sclerosis are all part of the same morbid process, since one may be added to the other in the history of the same patient and no definite sequence in this change can be demonstrated. Some observers have therefore described the condition as motor system disease, since motor cells and fibres whether belonging to the upper or lower neurones are involved, while other neurones of the central nervous system are either completely normal or only slightly affected by the morbid process. Most observers consider that this morbid process is a sclerosis; Naito², however, being convinced that the sclerosis was a definite sequel to inflammation, searched through the motor tract and found a patch of definite inflammation in the motor cortex, the rest of the cortex being little affected. He found that the pyramidal cells were considerably damaged and the cells of the lower layers also suffered; there was a glia reaction which was of an inflammatory character. Some vessels in the brain substance showed great perivascular infiltration and the infiltrating cells were nearly all lymphocytes. He was unable to find any similar patches in other parts of the brain or spinal cord, and concluded that an inflammatory process is responsible for amyotrophic lateral sclerosis and that the inflammation is due not to a toxin, but to an infection. In contrast to this Hassin³ showed that the entire motor apparatus of the central nervous system excepting the nuclei of the ocular nerves is involved in a degenerative process. Warner⁴ in a careful microscopical study of the condition concluded that the following changes could be found:

(1) Reactive pia-arachnoid changes.

(2) Marked degenerative changes in the cells of the anterior horns of the spinal cord, motor nuclei of the bulb and to a lesser extent in the motor area of the cortex; practically none in the occipital, temporal and frontal lobes or in the posterior horns of the spinal cord.

(3) Marked degenerative phenomena of some pyramidal tract fibres.

(4) Accumulation of lipoids in the adventitial spaces of the blood vessels of the entire central nervous system and especially in the areas of the pyramidal tract fibres.

(5) Absence of inflammatory appearances.

Thomson and Riddoch⁵ state that changes similar to but less severe than those in the motor tract may be found in the spinocerebellar tracts; this was probably the case in our patient, since ataxia was a definite feature of her condition.

Grasset and Rimbaud⁶ have described changes in the short association fibres of the cord, while Jelliffe and White⁷ also mention degenerations in the lateral columns and Clarke's column. The frontal cortex may also be involved, as may be the basal ganglia.

From these considerations it is obvious that it is very difficult to define the exact pathological limitations of amyotrophic lateral sclerosis and that many cases described may differ considerably in their pathogenesis. Matzdorff⁸ has sought to get over this difficulty by enlarging the conception of the syndrome and considers that the following may all be grouped together:—

A. Cases of exogenous origin due to toxæmia or infection. (1) The principally nuclear type: (a) chronic progressive bulbar paralysis; (b) spinal muscular atrophy of the Duchenne-Aran type. (2) Mixed nuclear and tract type: (a) amyotrophic lateral sclerosis; (b) chronic anterior poliomyelitis. (3) The principally tract type: spastic spinal paralysis.

B. A familial endogenous class of case: (1) of the nuclear type; spinal muscular atrophy of the Werdnig-Hoffman variety; (2) of the tract type: hereditary spastic paralysis.

When we come to the question of age incidence we find that all authorities are agreed that it is typically a disease of middle age, but there is no unanimity as to whether it can occur in children or not; Oppenheim⁹ describes it as a disease of middle life, observed only in isolated cases in childhood and then in brothers and sisters. He considers the average duration of the disease to be from two to four years, but admits that it may last longer. Similarly Jelliffe and White⁷ state that it is known to occur in children but that it is most prevalent from the age of 30 to 40. They found that the average duration of over 100 cases was two years, but some have persisted for ten years and a few whose diagnosis was questionable for much longer.

Léri¹⁰ thinks that any cases which have been reported as lasting for 10, 15 or 20 years must be cases of myelitis.

In 1905 Gordon Holmes¹¹ described two cases of family spastic paralysis in two sisters, ages 15 and 13 respectively, when they came under his notice. The lower limbs had been the seat of spastic paralysis from birth, the condition first being noticed when they tried to walk. Wasting of the small muscles of the hand had been noticed at the age of five in the elder sister and in the younger sister when she began to write. The picture on examination was similar in every respect to amyotrophic lateral sclerosis as met with in later life.

Analogous family cases have been described, for example by Gee.¹² A father of 37 and a daughter of 12 showed a condition simulating amyotrophic lateral sclerosis, while a son, age 11, had a spastic condition of both limbs, but no atrophy of muscles.

Ormerod¹³ described a case of three brothers out of a Jewish family of 10 children, the eldest of whom, age 23, had spasticity of his lower limbs since the age of six, and the hands had been weak for three years. The small muscles of the hand and those of the legs were uniformly wasted. He also had nystagmus.

The next patient, age seven, had spasticity of the lower limbs but no affection of his upper limbs. A third, age four, had spasticity of the lower limbs and weakness of the extensors of the wrists and fingers.

Maas¹⁴ described the cases of a brother and a sister. Both began to suffer from weakness of the legs about the age of 12. The arms became weak and speech was affected during the next few years. On examination at the age of 29 and 26 they showed characteristics identical with those of amyotrophic lateral sclerosis.

Hoffman¹⁵ described four cases in one family in whom the affliction had first been noticed in childhood and who at the time of examination presented the symptoms of amyotrophic lateral sclerosis with some bulbar paralysis.

The cases of Higier¹⁶, four sisters with amyotrophic and spastic conditions of the limbs, seemed different because they presented marked mental deficiency, while Seeligmüller's¹⁷ group of four children in one family with some spasticity but universal muscular weakness hardly comes under the same class.

Other cases of a similar nature mentioned in the literature are as follows: Bogaert¹⁸ described a case with sudden onset at age of 18 in the right lower limb. Within eight months all four limbs were affected. The first bulbar symptoms appeared less than a year after the origin. In 23 months the disease had advanced to its complete clinical picture and the patient died. The illness advanced by exacerbations with rises of temperature; ophthalmoplegia occurred in the last stages. This subacute course is unusual and resembles that of a progressive subacute encephalitis, but the pathological findings and spinal symptoms seem to point to amyotrophic lateral sclerosis.

Bouchaud's¹⁹ case was that of a boy of 16 who presented a lateral sclerosis, of a hemiplegic type. The patient died at the beginning of the bulbar phase. The evolution was exactly the same as the sclerosis of adults.

Berger's²⁰ case was that of a child of 12 years, which began with paralysis of the motor branch of the fifth nerve; salivation then developed, with difficulty in swallowing and articulation. Facial paralysis especially on the right supervened and then affection of the pyramidal tracts of both sides.

Brown's²¹ case was that of a boy of 15; the onset at the age of 12 was one of typical bulbar paralysis, with progressive bilateral affection of the upper face and dyspnoea. In some weeks atrophy of the arms of the face and of the neck set in, with fibrillary contractions of the whole musculature, exaggeration of tendon reflexes, contractures in the lower limbs, and with ankle clonus constant on the right and intermittent on the left. In addition the following authors have described cases of bulbar paralysis without pyramidal

involvement ; Hoffman²², Thomson²³, Fazio²⁴, Remak²⁵, Trömner,²⁶ Marinesco²⁷. Souques²⁸ describes a case in a girl of 19 with a two to three years' history. Bogaert¹⁸ also describes a bulbar case in a boy of 10.

Certain familial cases of bulbar paralysis in the literature are not typical and show certain characteristics of pseudobulbar paralysis. In Souques' opinion the evolution of bulbar paralysis is much more rapid in the child than in the adult, although he admits there may be exceptions.

To sum up, cases occurring in children are referred to by several authors but in view of the uncertainty of the pathological limits of true amyotrophic lateral sclerosis it is obvious that caution must be exercised in accepting all such cases. Firstly, it may be recalled that two definitely established conditions are described in children which bear some clinical resemblance to the motor system disease in adults, viz. (1) the progressive muscular atrophy of infants, generally referred to as Hoffman and Werdnig's disease, and (2) family spastic paralysis ; neither of these probably has any pathological relationship to amyotrophic lateral sclerosis. Secondly, the late results of such definitely inflammatory conditions as polioencephalitis and myelitis may show a resemblance to the true motor system disease. As an example the following case which has recently come under the observation of one of us may be quoted.

W.L., age 13, male. He was a healthy baby and there was no history of difficult labour or any paralysis at birth.

He was vaccinated at three months. On the third day thereafter he was feverish, vomited, and suffered from a cough and a rash. During the next few days he had several fits.

For three months after the onset of this illness he did not move his left arm at all, and when he began to walk, at two years, it was noticed that the left leg was abnormal and that he did not get his heel to the ground.

On examination at the age of 13 he was found to be suffering from a mild degree of left hemiplegia ; the tendon reflexes were slightly increased on that side, especially the knee jerk ; ankle clonus and sometimes patellar clonus were elicited ; the abdominal reflexes were slightly weaker on the left side and the plantar reflex was doubtful. The muscles were in a state of mild hypertonicity with a certain degree of equinus which yielded to treatment.

In addition, the left deltoid and scapular muscles showed marked wasting, lack of tone and fibrillary tremors, apparently being affected by a lower motor neurone lesion. These also improved markedly with treatment.

In this case of vaccination encephalitis, resembling one recently shown by Dr. J. P. Martin²⁹, both upper and lower motor neurones have been involved. These considerations make us view with considerable suspicion many cases described in the literature as adolescent amyotrophic lateral sclerosis and seem to indicate that true examples of this are of the greatest rarity.

So far as our own case is concerned there is no doubt that when the patient was admitted to hospital and came under observation she presented a reasonably typical clinical picture of amyotrophic lateral sclerosis, slowly progressing, with symptoms of involvement of the whole motor tract, while sensory manifestations were conspicuous by their absence. Purists would probably consider

that the sudden onset of the spasticity at the early age of 10 and the long duration of the condition—which has now lasted for 18 years without doing more than cripple the patient—debar us from describing it as a true case of Charcot's disease. Yet, as has been shown in this study, the clinical syndrome is not so clearly defined as might be supposed and therefore the propriety of including some of these rarer examples under this nomenclature must be left sub judice.

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J Neurol Psychopathol 1928 s1-9: 30-35
doi: 10.1136/jnnp.s1-9.33.30

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