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Progressive Muscular Dystrophy (Duchenne Type) (Case Report)

by

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Abstract

Clinical findings of two brothers suffering from progressive muscular dystrophy pseudohypertrophic type according to Duchenne are reported. Literatures dealing with its clinical classification, biochemical disturbances, hypotheses of the pathogenesis, management of treatment, mode of action of A.T.P. and the pedigree have been briefly reported.

Progressive Muscular Dystrophy is a progressive disease affecting voluntary muscles. It is characterized by a decreased strength in the affected muscles with rapid or slow gradual progression. About 45% of the patients gave a history that at least another member of the family is affected by the disease. Pseudohypertrophic form (Duchenne type) is usually inherited as a recessive factor, often sexlinked.

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Case report

On January 10, 1972, two brothers, S., 10 years old, and A., 8 years old, were admitted to the Dr. Kariadi General Hospital Semarang with clinically progressive muscular dystrophy, pseudohypertrophic type. Both were the only 2 boys out of 7 children. The history of the disease of both children was about the same. Physical developments was normal until the age of 3-4 years. Since then their parents noticed enlargements of the calf muscle in both their left and right legs (Fig. 1). They had increasing difficulty in getting up from a sitting position on the floor. Both showed a typical "waddling gait". The pedigree is shown in Fig. 4 revealing the affected males and the carrier state of the females in the family. Muscular examination revealed muscular weakness of scapula, shoulder, elbow, forearms, lower extremity, and hip.

Due to a lack of facilities, electromyography could not be done. Biopsy of the left gastrocnemius muscle of both patients showed the same pathological changes, namely fibrosis and infiltration of lipoid cells, and proliferation of nucleus on sarcolemnal sheath (Fig. 2, 3). Laboratory examination revealed the following data :

S. (10 years): S.G.O.T. = 67 U (Normal values: 5 - 40 U), S.G.P.T. = 59 U. (Normal values: 5 - 35 U) Creatine in urine : 300 mg./24 hours specimen (normal values 0 - 100 mg).

A. (8 years): S.G.O.T. = 65 U, S.G.P.T. = 59 U. Creatine in urine: 350 mg./24 hours specimen.

In the Dr. Kariadi Hospital, besides physiotherapy, A.T.P. was given daily; 10 mg. intravenously in a solution of 20% glucose, combined with Vit. E. Examination after 90 days of treatment showed a moderate improvement of the muscular test.

Discussion

Our cases belong to the Duchenne type according to the classification by Tyler and Wintrobe (1950):

1. this type begins in early childhood which nearly affects males;
2. frequently inherited as a sex-linked recessive Mendelian trait;
3. involves pelvic musculature initially;
4. almost completely spares the facial muscles;
5. often accompanied by muscular enlargement (pseudohypertrophy);
6. usually progressively rapid and upward; and,
7. seldom compatible with survival to adult life.

Highly elevated levels of some serum enzymes occurs in the early stages of the disease.

The other clinical form is the facioscapulo-humeral type which appears in late childhood or in adolescence characteristically inherited as an auto-somal dominant, thus affecting both sexes in approximately equal numbers, involving facial and pectoral girdle muscles initially and only rarely accompanied by muscular enlargements. The downward progression of condition is slow. The serum enzymes level is slightly increased or even normal. Walton and Nattras (1954) identified a second kind of childhood dystrophy termed as the limb-girdle type which affected both sexes equally, with an onset within the first 3 decades and had a slow course characterized by weakening of the pelvic and shoulder girdle muscles with pseudohypertrophy uncommon. The serum enzym was normal or slightly increased.

* Biochemical disturbances — Besides serum enzymes which have been found to be of value in investigation and diagnosis, another biochemical hallmark of progressive muscular dystrophy is a reduction in the daily excretion of creatinine and excessive urine loss of creatine. The serum creatine rises but the creatinine is normal or low. It is the urine which gives evidence of loss of muscle mass.

* Pathology — The earliest change of muscle fibres is swelling, which may persist for months before atrophy sets in. The affected fibres tend to be homogenous and hyalinized and splitting of the fibre is a common feature. Gradually, fragmentation of the fibres becomes apparent. Absence of regenerative power may be regarded as the hallmark of the lesions. Disappearance of the muscle fibres is accompanied by replacement with fat and fibrous tissue. It is the excessive deposit of fat which is so characteristic a feature of the common pseudohypertrophic variety of the disease.

* Pathogenesis — Besides genetic of origin, the real pathogenesis of the disease remains unknown. One hypothesis is the microcirculatory disorders which might play a role in the genesis of the disease. According to Demos (1961), the condition is not due to a primary abnormality of the muscle fibre; on the contrary the voluntary muscle lesion is secondary to microcirculatory disorders which bring about hypoxia, with subsequent disturbances of cellular permeability and outward passage of enzymes into the bloodstream. With this pathogenetic hypothesis of microcirculatory disfunction we not only can explain the disorders of the muscle, but also the bones with delayed body development; hence smaller than the average normal subject of the same age, as well as the involvement of the brain tissues with mental subnormality.

* Prognosis — The disease is progressive in the pseudohypertrophic type; death usually occurs within 5 to 10 years after the onset. But in the last decade much progress has been made in the investigation of the pathogenesis of human muscle disease. If the basic biochemical abnormality is identified in Duchenne dystrophy, it is reasonable to hope that the restoration of muscle fibres architecture will occur by regeneration if a chemical substitute or some other treatment is

developed to compensate for the biochemical lesion. Because human as well as animal skeletal muscle has great power of regeneration, attempts at regeneration are observed even in the late stages of progressive muscular dystrophy (Kakulas, 1969).

- Treatment — Demos (1961) emphasized the importance of early treatment. For this purpose he recommended routine analysis of serum enzyme levels in the umbilical cord of all newborns whose mothers have already given birth to or are sisters of dystrophic children, so that treatment can be undertaken on the basis of early detection.

The management of treatment consists mainly of :

1. Hot baths (from 37° C to 40° C) lasting at least 30 minutes, during which extension movements are performed to combat muscular contractures.
2. Administration of peripheral vasodilator agents, Adenosine Triphosphate (ATP), into the bloodstream will cause dilatation of blood vessels proportionate to ATP concentration.

Nakahara (1965) took notes after an ATP injection :

1. Excretion of creatine of muscular dystrophy patients was decreased and excretion of 17-ketosteroid was increased.
2. ATP-ase activity of water soluble protein was increased in gastrocnemius muscle progressive muscular dystrophy.
3. Myoglobin content of gastrocnemius muscle of progressive dystrophy was increased.
4. Adenosine nucleotide content turned to normal in decreased gastrocnemius muscle.
5. Water soluble protein of muscle was hardly disassociated.
6. Lactate content of ATP injected muscle noteworthily decreased.

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