



# POSNA

## The Core Curriculum

### Duchenne muscular dystrophy

#### Objectives

1. Describe the basic genetic and protein defect of Duchenne muscular dystrophy
2. Describe the natural history of Duchenne muscular dystrophy
3. Describe symptoms of muscular dystrophy in the 3 to 6 year age range
4. Describe the philosophy of contracture control in the ambulatory patient
5. Define indications for correction, and/or prevention of spinal deformity for the patient with Duchenne muscular dystrophy

#### Discussion points

1. What are active present areas of research in the field of muscular dystrophy?
2. What is the Gower sign?

#### Discussion

Duchenne muscular dystrophy (sometimes called Meryon's disease, especially in British writings) is a relatively common form of muscular dystrophy, affecting about 1:3500 live male births. It is transmitted in a sex-linked recessive pattern. Rare forms have been noted in females, and female carriers have a high percentage of subtle weakness and enzyme abnormalities. Boys generally develop normally until about age 3-6 when they may present with toe-walking, clumsiness, flatfootedness, tripping, or difficulty running or climbing stairs. The first muscle group displaying weakness is the gluteus maximus, with more weakness in the proximal muscles (quadriceps, hip abductors) than distal. Abdominal weakness also has an early onset. The anterior tibial is most affected below the knee. Pseudohypertrophy of the calf is common. Shoulder girdle weakness follows a few years later. Gait deteriorates, initially with increased lordosis to compensate for gluteus maximus weakness, then a waddling, wide based gait to compensate for hip abductor weakness and anterior tibial weakness. The Bower sign is an example of the effects of hip extensor and quadriceps weakness, manifested by the boy's use of hands and arms to push the knees into extension, compensating for the weakness. Contractures of the iliotibial band and heelcord are most common; inversion deformities of the foot and ankle are also common due to the persistence of activity in the posterior tibial tendon longer than other ankle motors.

Diagnosis is usually suspected by elevation of the serum creatine kinase level in the early stages of the disease. Creatine kinase appears to be associated with cell membrane permeability of muscle cells. The particular gene involved in Duchenne and Becker

dystrophies was identified in 1982, and in 1987, its protein product, dystrophin, was identified. Histochemical studies of muscle can quantitate the amount of dystrophin present beneath the cell membrane; in Duchenne dystrophy there is none, in Becker dystrophy it is reduced. It is also reduced in many female carriers. Muscle biopsy is still the most used method of establishing the diagnosis, although molecular genetic techniques may be more used in the future. Dystrophin is essential for the stability of the muscle cell membrane, and its absence leads to disruption of the membrane and secondary degeneration, possibly through influx of calcium. Dystrophin is normally located on the internal surface of the cell membrane, and is also linked to F-actin.

Duchenne muscular dystrophy is associated with relentless progression of muscular weakness, with death usually resulting early in the third decade from cardiopulmonary problems. Walking usually becomes difficult, then impossible, at about age 10 with considerable variation. A program of regular stretching, heelcord lengthenings, soft tissue release, and transfer of the posterior tibial tendon, and brace support was documented to preserve ambulation on an average into the fourteenth year of life. Spinal deformity is common in teenaged boys with Duchenne dystrophy. Surgical stabilization of scoliosis is usually recommended when the curve exceeds 20 degrees, based on the logic that the curve will inevitably worsen, and pulmonary function will inevitably decrease. Surgical stabilization does not improve pulmonary function, but follow-up studies still reveal a high degree of patient satisfaction, despite a high complication rate. There is extensive recent literature on the technical details of spine stabilization for muscular dystrophy.

Other problems often associated with Duchenne muscular dystrophy are decreased cognitive dysfunction, small stature, osteopenia with increased fracture risk, and cardiac dysfunction. There is a great deal of research effort underway at present to develop better therapy for boys with muscular dystrophy, as our present treatment is largely supportive only. Much research is at the molecular biology level, and it is interesting to compare the titles of recent writings with those 10-20 years ago before the explosion of efforts at the molecular level. Prednisone is also currently being investigated as an adjunct to slowing the progressive weakness accompanying this disease. To continue to keep abreast in this field, some knowledge of molecular biology will be a necessity.

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