Child Neurology: Maternal Transmission of Congenital Myotonic Dystrophy Type 2: Case Report

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Introduction

Myotonic Dystrophy type 2 (DM2) is a dominantly inherited multisystem disease caused by a CCTG repeat expansion in intron 1 of the CNBP gene on chromosome 3q21.3. The disease is characterized by progressive proximal muscle weakness, myotonia, early-onset cataracts, and multiorgan involvement. In contrast to Myotonic Dystrophy type 1 (DM1), congenital or childhood forms are very rare. Recently two cases of presumed congenital DM2 have been reported.

We report a family with four genetically confirmed DM2 patients, including an 8-year-old girl with DM2 and congenital pes planovalgus and equinus. We highlight the association of DM2 and congenital foot deformities, and the possible anticipation with maternal transmission.

Case Summary

Family

The girl’s mother and grandmother were diagnosed with DM2 at age 32 and 62 respectively, prior to the index case. They both had typical DM2 manifestations: proximal weakness, pain and myotonia. The family history was negative for foot deformities, and the mother did neither smoke nor use selective serotonin reuptake inhibitors. The grandmother has had cataract surgery and cholecystectomy.
**Index patient**

The girl was 8 years old at the time of last follow-up. Prenatal genetic testing (chorionic villi sampling) had confirmed DM2. Pregnancy and a term delivery were normal (1-minute Apgar score 9, birth weight 3,295 grams). Two weeks after birth, the mother and baby girl visited the general practitioner because of the child’s crying when her right leg was pulled during diaper changes. The symptoms were treated conservatively and she started walking at 14 months. One month later, she was referred to an orthopedic surgeon because of persistent pain in the right foot and difference in foot size. Examination showed right pes planovalgus and equinus. The right foot was larger and wider and dorsiflexion was limited (Figure 1). A foot X-ray showed no osseous abnormalities. At the age of 24 months, quantitative muscle ultrasound showed normal echo intensity and muscle diameter, and electromyography showed no abnormalities. Conservative treatment by semi-orthopedic shoes with arch support was prescribed and physical therapy was started. Six years after presentation, the girl shows normal motor development, except for difficulty with sports because of pain in the foot.

The CCTG repeat in intron 1 of the *CNBP* gene was analyzed by fragment length analysis of repeat-primed PCR and of long-range PCR with Southern blotting. The index patient, her mother, maternal uncle and grandmother had a pathogenic CCTG expansion varying from 250 to over 2,000 repeats in each patient (Figure 2).
Discussion

We reported a girl with DM2 and unilateral congenital pes planovalgus and equinus. DM2 was confirmed by the detection of a CCTG expansion varying from 250 to over 2,000 repeats and inherited maternally.

Our observation is in line with two previously reported DM2 cases. Kruse et al. reported a 2-year-old boy with unilateral congenital pes equinus, neonatal generalized hypotonia and delayed motor and cognitive development. Molecular analysis revealed a CCTG repeat size of 2,500 repeats for the boy and the mother. Renard et al. described a 2.5-year-old girl with DM2 and congenital bilateral talipes equinovarus (clubfoot), which were already detected by prenatal ultrasound. Corrective foot surgery was performed. Molecular analysis revealed a CCTG repeat size of 85 and 88 for the girl and the mother respectively. A recent retrospective study on pregnancy in DM1/2 included one newborn with talipes equinovarus out of the first pregnancies in women with DM2 (n=22). This newborn was not genetically tested for DM2.

These previous reports together with our case suggest a higher prevalence than expected based on the rarity of these foot deformities. Among Caucasians the incidence of talipes equinovarus is approximately 1 per 1,000 live births. In the, to date, worldwide number of 1,500 patients with DM2 the extrapolated incidence of talipes equinovarus would be 1.5. The incidence of congenital pes equinus is, to our knowledge, unknown in literature. Based on the above cases, a causal relation between congenital foot deformities and DM2 seems likely and would need a larger study. The phenotypic differences among the family members might also be explained by variable expressivity.

Foot deformities are also observed in DM1. In a retrospective study 17 congenital and 4 adult-onset DM1 patients with orthopedic disorders were
reported (n=21). In 20 patients foot deformities were reported; the equines deformity was most common.

Clinical anticipation in DM2 was firstly mentioned by Schneider et al.; congenital manifestations were not observed yet. In contrast to other repeat-diseases, e.g. DM1 and Huntington’s disease, clinical anticipation was not associated with an increase of the repeat expansion in the DM2 cases described so far. Remarkably, transmission in all cases of congenital foot deformities was maternal.

We here suggest the existence of congenital DM2 as a result of anticipation upon maternal transmission. The occurrence of a congenital form of DM2 would widen the spectrum of DM2 and have implications for clinical practice. Exclusive maternal origin in the transmission of DM2 to the congenital form needs further examination in a large number of families.
Figures

Figure 1. Foot deformities in the 2-year-old girl.

1A. Pes planovalgus right.

1B and 1C. Pes equinus right; a 15 degree reduction in dorsiflexion right compared with the left (healthy) side. Literature suggests that the normal range of motion (ROM) for ankle joint dorsiflexion is 0 to 16.5 degrees by standard non-weight-bearing method\textsuperscript{10}. We used, however, the ROM of the opposite, healthy side as an indicator of normal ROM for ankle joint dorsiflexion, as also has been reported in literature\textsuperscript{11}.

Figure 2. Pedigree. Individuals with DM2 are depicted by the black symbols.
Literature

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