Short report

The rigid spine syndrome in two sisters

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SUMMARY Two half-sisters aged 14 and 18 years are described with a rigid spine syndrome as the cardinal clinical feature of an autosomal dominant neuromuscular disorder. Ten years previously, a diagnosis of multicore disease had been made from the clinical signs and muscle biopsy findings. Long term follow-up revealed a non-specific muscular dystrophy with axial predominance and a rigid spine in the younger girl; the older sister presented at the age of 18 with a rigid spine as the only myopathic sign. Computed tomography of the muscles showed severe involvement of the paraspinal musculature, in contrast with either less or no involvement of the other muscles.

The rigid spine syndrome is characterised clinically by pronounced limitation of flexion of the whole spine, due to replacement of the paraspinal musculature by connective tissue.¹⁻³ It occurs as the cardinal myopathic feature in children, in whom a predisposing heterogenous group of neuromuscular disorders may be present,⁴⁻²⁴ and is almost always sporadic. Muscle biopsy findings are variable and depend on the site of biopsy: the paraspinal musculature frequently reveals severe dystrophic myofibrosis,^{3 4 14 15 23} whereas muscle biopsy findings in the extremities may vary, ranging from normal to aspecific changes such as fibre type predominance or muscle dystrophy.^{9 13 17 21 22 24}

We describe two half-sisters who were thought initially to have a non-progressive autosomal dominant multicore myopathy. After a 9 year follow up, both girls eventually displayed the clinical features of the rigid spine syndrome, and the younger sister also showed evidence of aspecific muscular dystrophy. The diagnostic contribution of CT scanning of the muscles is stressed, as this appears not to have been mentioned in previous reports of this syndrome.

Case reports

The histories of the two sisters and their mother until 1981 have been previously described²⁵; they are here briefly summarised and completed.

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Case 1 was born at term in 1972; there were no feeding problems and motor development was normal without apparent floppiness. First examination was in 1977 for excessive muscle fatigue. The girl was very small, with general slight muscle hypotrophy and weakness, MRC grade 4+, except for the foot extensors which displayed a more pronounced paresis, MRC grade 3. Winged scapula and ankle contracture were present bilaterally. All myotatic reflexes were either hypoactive or absent. There was no sensory disturbance. The serum creatine kinase activity (CK) was slightly increased at three times the normal value and the previously described biopsy findings of the quadriceps muscle²⁵ were consistent with multicore disease.

Further clinical progression unexpectedly occurred in the summer of 1982: she then presented with diffuse and substantial muscle atrophy; the musculature of the trunk and the extremities was diffusely paretic (MRC grade 4), and even more severe weakness (MRC grade 3) was noted in the neck flexors and the foot extensors. There was increased dorsal kyphosis and lumbar lordosis; flexion of the thoracolumbar spine was markedly limited and an obvious contracture of the neck extensors was now present; there was no increase of the ankle contracture. A repeated biopsy of the right quadriceps muscle showed randomly distributed and irregular cores with absence of mitochondria and Z-band smearing or disruption. However, additional abnormalities consisted of muscle dystrophic signs including fibre splitting, some necrotic and a few basophilic fibres, many internal nuclei and increased endomysial fibrosis. There was a fibre 1 predominance of 60% (fig 1a).

Six months later, CT of the muscles revealed areas of very low attenuation in the erectors spinae, consistent with replacement of muscle by lipofibrotic tissue. It was striking that the paravertebral musculature was much more involved than the muscles of the extremities; the proximal flexors of the legs were only moderately dystrophic whereas the quadriceps muscles appeared quite normal.

Progression of hyperextension of the neck eventually

Fig 1 (a) Second quadriceps muscle biopsy in case 1 (aged 10 yr): stain with H&E showing variable fibre size, atrophic fibres and fibre splitting, randomly distributed cores, internal nuclei and some endomysial fibrosis. ($\times 150$) (b) m. erector spinae biopsy in case 1 (aged 13) displaying extensive proliferation of endomysial connective tissue and marked variation in fibre size; only occasional fibre necrosis is seen. ($\times 60$)

Fig 2 Case 2, aged 18 yr. No apparent myopathic features but rigidity of the spine is obvious at maximal flexion of the neck and the lumbar region.

necessitated a surgical correction in December 1985, during which biopsy material was obtained from the cervical and lumbar musculature. This confirmed the CT findings in that nearly all muscular tissue was replaced by connective tissue proliferation (fig 1b). Radiography showed a normal heart configuration, and electrocardiograms (ECG) in 1981 and 1986 were normal; 24-hour continuous electrocardiographic monitoring was not performed. Echocardiography revealed a holosystolic prolapse of the mitral valve. Vital capacity was reduced at 70% of the normal value. A CT brain scan in 1986 was normal.

Case 2 The older half-sister of patient 1 was born in 1968 and was asymptomatic when a muscle biopsy was carried out in 1981; at that time the serum CK was slightly elevated at 2.5 times the normal value. A biopsy of the quadriceps muscle revealed small cores of decreased oxidative enzyme activity; the cores consisted of Z-band dissolution and absence of mitochondria. She was lost to follow-up until April 1986 and then reappeared as a short (160 cm) 18 year old girl without signs of myopathy (fig 2).

Examination demonstrated an obvious limitation of flexion of the spine (especially the neck) and paresis MRC grade 4 of the neck flexors; the serum CK was elevated at $3 \times$ the normal value; a second muscle biopsy was not performed, but CT of the muscles suggested severe lipofibrosis of the paraspinal musculature, in contrast with normal findings in the extremities (fig 3a, b). Both ECG and echocardiography were normal, as was the CT brain scan.

Case 3 The mother of the two girls is asymptomatic and both repeated serum CK determinations and CT of the paraspinal and the girdle muscles in 1986 were within normal limits; however, a biopsy of her quadriceps in 1981 showed a few cores with Z-band streaming.

Discussion

The rigid spine syndrome was initially described as a distinct clinical entity^{1,2} but there is now increasing evidence that it is merely a cardinal feature of various neuromuscular disorders.⁴⁻²⁴ Muscle weakness in the extremities may be absent or, when present, is usually slight to moderate. Concomitant flexion contractures of the extremities are frequently seen, usually at the elbows, the knees or the ankles. In our two patients, only the youngest had moderate contractures of the ankles.

In the present family, it was striking that the younger girl (case 1) initially presented both clinically and pathologically as a patient with multicore disease. This was thought to be confirmed by the presence of identical cores in the muscles of her asymptomatic older sister and her mother. Her apparently quiescent muscular deficit deteriorated into a dystrophic picture when she was 10 years old and she eventually corresponded to the criteria of congenital muscular dystrophy.²⁶ Hypotrophy and weakness increased slowly, but the most disabling symptom consisted of an increasing hyperextension of the neck due to paraspinal myofibrosis. Re-examination of her older sister at the age of 18 (1986) revealed no other signs of myopathy than limitation of flexion of the cervical and the dorsolumbar spine, due to paraspinal lipofibrosis.

Fig 3 (a) CT of the lumbar region in case 2: areas of very low attenuation in the paraspinal musculature (arrows), consistent with extensive lipofibrotic degeneration. (b) CT of the proximal leg in the same patient shows normal muscle configuration.

The CT patterns of the muscles in our two patients were notable. In both cases, the abnormalities in the paraspinal musculature were much more pronounced than in the extremities; more particularly, the quadriceps muscles appeared normal and this was mirrored by the relatively mild changes in the biopsy specimens of this muscle. If a CT had been performed earlier than in 1983, it is probable that a biopsy from another more involved area would have led to the diagnosis of a non-specific muscular dystrophy with axial predominance.

The presence of multicores in the quadriceps biopsies of the two girls and their asymptomatic mother remains unexplained, but it is striking that similar findings have been previously described in limb muscle biopsies from other patients with a rigid spine syndrome.^{11 13 15 18} In one of them¹⁸ a typical picture of multicore disease was found in a limb muscle biopsy from a boy, presenting with the clinical features of a rigid spine syndrome: pathological examination revealed extensive fibrosis of the paraspinal musculature. However, in this patient there was also evidence of neuro-axonal dystrophy, which was not present in our cases. The cores with Z-band streaming in our patients possibly represented only non-specific changes, as they may be seen in many conditions, including healthy people, asymptomatic myopathies and any type of muscle dystrophies.^{18 27 28}

Almost all patients with rigid spine syndrome have been reported as sporadic cases but the familial occurrence of the disorder has been documented by Echenne (brother and sister of the same parents).¹⁴ The fact that the present two sisters had different fathers suggests an autosomal dominant mode of inheritance with variable expressivity. This and the absence of cardiomyopathy differentiate the disorder from an X-linked recessive Emery-Dreifuss muscular dystrophy²⁹ or other inherited muscular dystrophies with cardiac involvement.^{30 31}

Our two patients are in keeping with the clinical diagnosis of a rigid spine syndrome. Long-term follow-up and additional investigations led us to modify the initial diagnosis of multicore disease: both patients probably suffer from an autosomal dominant nonspecific muscular dystrophy with axial predominance and different degrees of severity. The presence of multicores in the less involved quadriceps muscles and pronounced connective tissue proliferation in the paraspinal musculature of the two girls may indicate a common underlying defect, with variable clinical and pathological expression. The nature of this defect remains unknown.

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Addendum

After the acceptance of our article, an additional report on dominant minicore myopathy came to our attention. It concerned a 39 year old mother and her 13 year old son. A rigid spine was not present and impairment of the paravertebral musculature was limited to a slight muscle atrophy and weakness of the neck in the boy; CT of the muscles was not performed. This family adds further support for the heterogeneity of multicore myopathy.

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