MYOTONIA CONGENITA (THOMSEN'S DISEASE) IN A CHINESE FAMILY

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Charles Bell in 1833 was probably the first to describe myotonia congenita, a name suggested by Strumpell in 1881. Nowadays it is aptly better known as Thomsen's Disease for it was brought to the attention of the medical profession in 1876, by Asmus Julius Thomsen (1815-1896), a Danish physician who not only suffered from the disease but shared it with 20 members of his family over 4 generations. Nissen (1923), Thomsen's great grand nephew, completed the family record of 7 generations with 35 cases. Thomasen (1947) brought the famous pedigree up to date giving details of 106 descendents. Another famous physician who suffered from the disease and gave a detailed account of it was Brit (1908).

Most of the descriptions of myotonia congenita are to be found in the European literature. There are very few reports of the condition in Asians. Thus in a review of the Indian literature V.K. Gupta (1965) could find only 2 reported cases, to which he added another 2. We describe below 3 cases occurring in a Chinese family. A photomotographic technique for the quantitative demonstration of myotonia in the calf muscles is also described.

CASE REPORTS

Case 1

G.K.L., a 19 year old Chinese egg seller complained of inability to relax his grasp promptly; tended to fall with the slightest push; felt difficulty in suddenly standing from a sitting position or in starting to walk, and inability to run suddenly in case of emergency (e.g. to catch a bus) but had to walk a few steps slowly initially and then

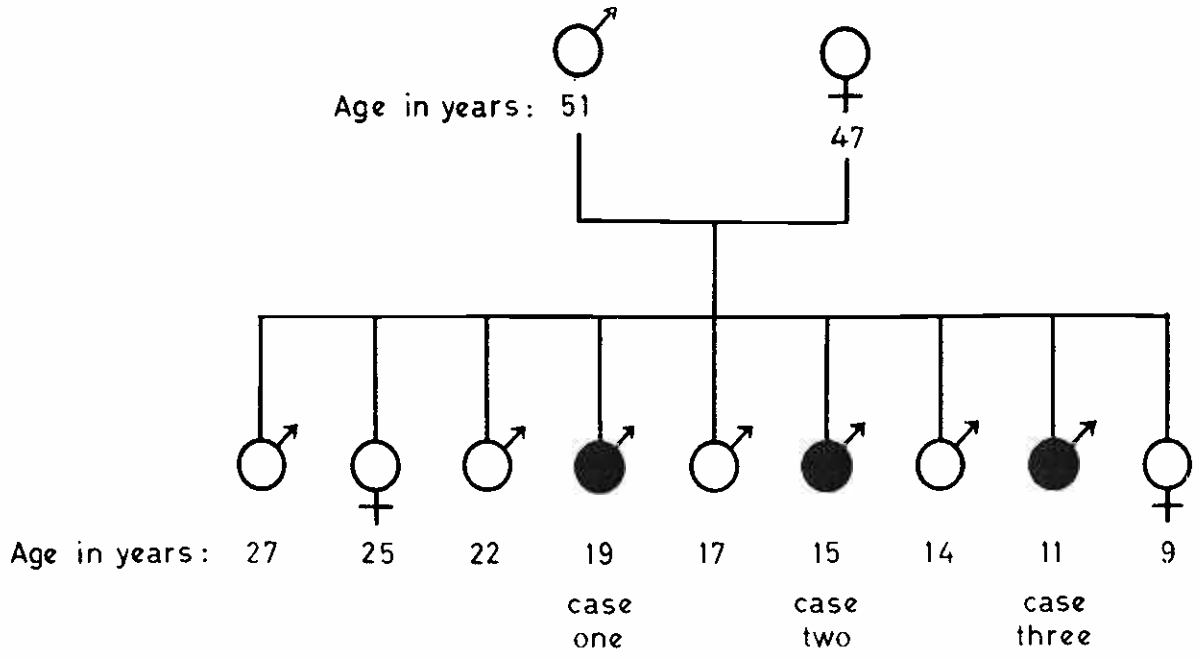

Fig. 1. Showing family tree of the 3 cases.

gained motion. These symptoms started when he was 5 years old and have progressively become worse. Excitement, alarm, cold, fatigue, abruptness and force of the willed movements and execution after long periods of rest all aggravate the symptoms.

He is the fourth child in a family of 7 boys and 2 girls (Fig. 1). His father and mother are first cousins (i.e. mothers of the father and mother are sisters). There is no history of a similar illness in the paternal and maternal family trees. (Father is the only child in the family while mother is the sixth in a family of 7 girls).

Physical examination revealed a fine physique with apparently very well developed muscles (Fig. 2).

His height was 5½ feet and he weighed 140 lbs. The muscles felt firm and their power in the limbs were grade 4-5. The tendon reflexes were sluggish. The clenched fists took about 15 seconds to relax. Percussion myotonia were demonstratable in the tongue, deltoid, rhomboid, triceps, biceps, quadriceps, glutei and calf muscles. The Achilles tendon reflex time was measured with a photomotograph. The photomotograph measured the free Achilles tendon reflex as the foot interrupted a beam of light activating a photoelectric cell, while a standard electrocardiographic machine recorded this simultaneously (Gilson, 1959). Prolonged relaxation (myotonia) was well shown in patient's photomotograph, compared to that of an unaffected brother (Fig. 3); the tap to half-relaxation time was 1540 milliseconds, while that of the unaffected brother was 260 milliseconds (normal range: 230-300 milliseconds. Cheah, J.S. 1968).

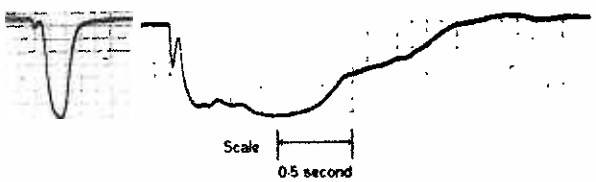

Fig. 3. Photomotogram of the Achilles tendon reflex of Case 1 (right) compared with that of an unaffected brother (left). For legend, see text.

There was no frontal balding, cataract, wasting of the sterno-mastoid muscles, gynaecomastia or testicular atrophy. The heart was normal. The blood pressure was 120/80.

The electrocardiograph was normal. Muscle biopsy from the right deltoid muscle showed hypertrophy of the muscle cells (they measured 40-100μ in diameter; normal should be less than 40μ). There was an absence of necrosis, regeneration, fat, atrophic fibres and sarcolemmal nuclear chains. A few central nuclei were present (Fig. 4).

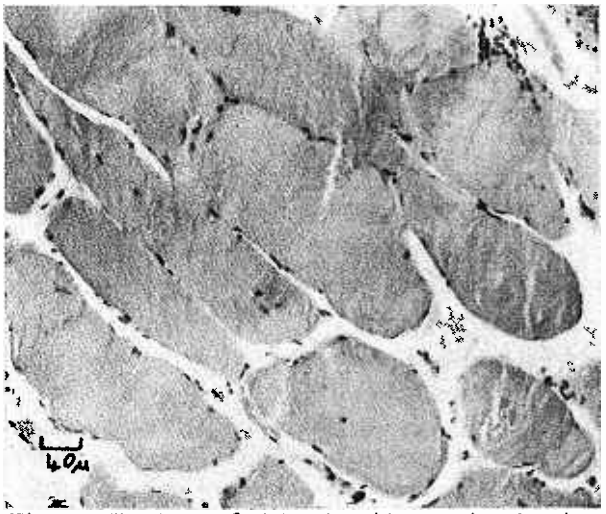

Fig. 4. Histology of right deltoid muscle showing muscle hypertrophy. H. & E. × 500.

Electromyography showed prolonged trains of potentials occurring in great profusion in response to electrode movements; they first increased rapidly in frequency and amplitude and then less rapidly diminished—the sound produced resembled that of a dive bomber.

The serum aldolase and creatine phosphokinase were elevated (Table I). These were determined by the methods of Sibley and Lehninger (1949) and Hughes (1962) respectively. The serum potassium, sodium, chloride, calcium, phosphate and magnesium were normal. Urinary creatine excretion was increased—284 mg/day (normally absent).

Case 2

G.P.S. 15 years old, is a younger brother of case 1. (Fig. 1). He began to experience inability to relax his grasp promptly and standing up rapidly after prolonged sitting at the age of 7 years.

Examination revealed generalised pseudohypertrophy of skeletal muscles (Fig. 5). The tone and power of the muscles were normal. Tendon reflexes were sluggish. The clenched fist took about 2 seconds to relax. Percussion myotonia were present, though less marked than in case 1, in the biceps, triceps, deltoid, rhomboid, and quadriceps muscles. It was absent in the tongue and calf muscles. The photomotogram of the Achilles tendon reflex was normal (tap to half-relaxation time: 260 milliseconds). The blood pressure was 120/80; the heart was normal. There were no baldness, cataract, atrophy of sternomastoid muscles, gynaecomastia or testicular atrophy.

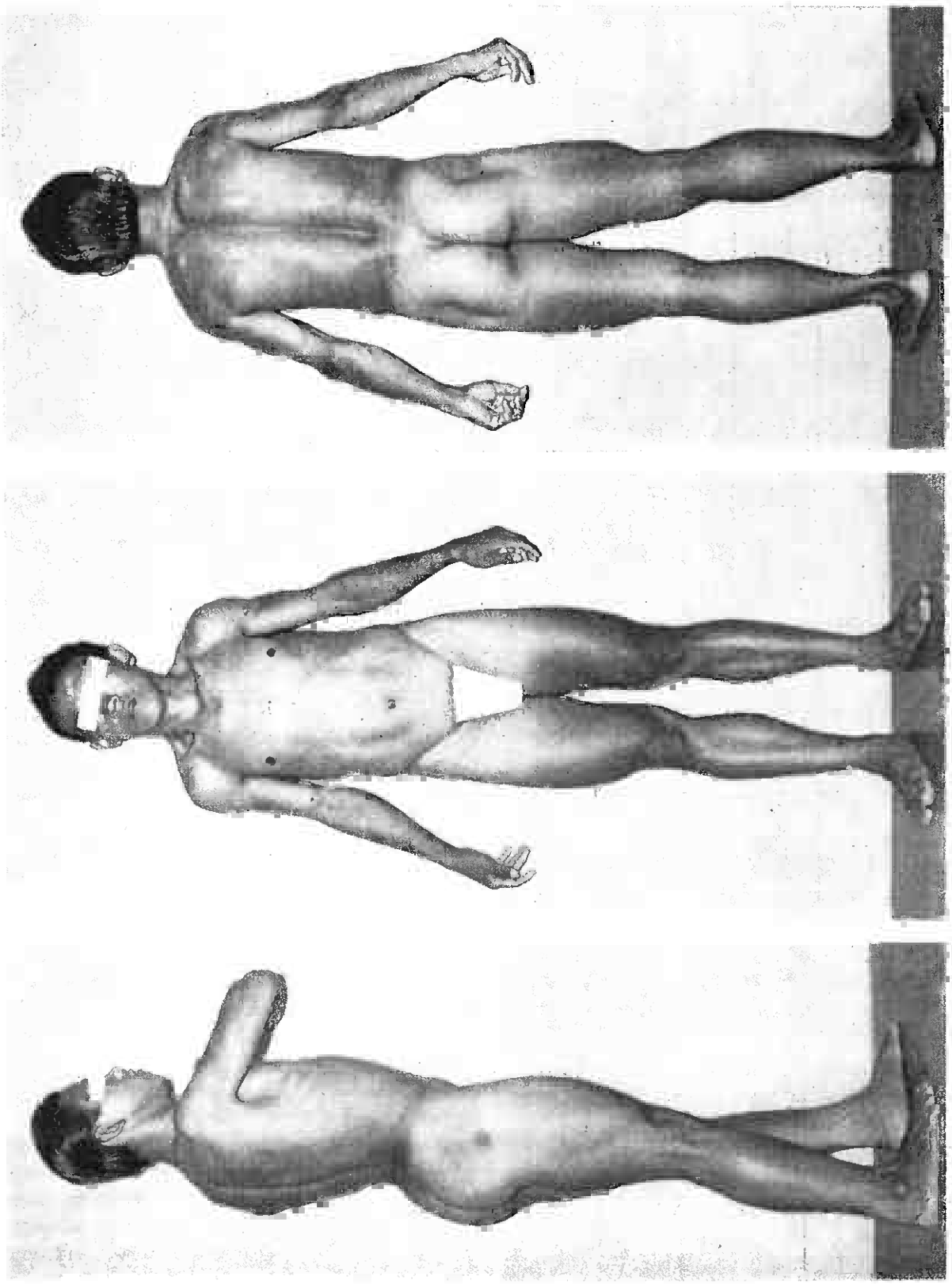

Fig. 2. Case 1. Showing generalised pseudohypertrophy of skeletal muscles.

TABLE I

SERUM ALDOLASE AND CREATINE PHOSPHOKINASE LEVELS IN THE 3 CASES AND IN SOME OF THE UNAFFECTED SIBLINGS.

	Serum Aldolase in units/ml. (Normal value: 3–8 units/ml.)	Serum creatine phospho kinase in units/ml. (Normal value: male – 0·3–4·5 units/ml.; female – 0·9–2·4 units/ml.)
Father	–	<1
Mother	–	2·1
Case one	20	10·0
Case two	9	1·7
Case three	3	<1
Brother (17 years)	4·4	11·7
Brother (14 years)	3·1	4·2
Brother (9 years)	6·2	6·3

Muscle biopsy revealed similar histology to that of case 1. The electromyogram was also similar to that of case 1. The electrocardiogram was normal. The serum aldolase was elevated while the serum creatine phosphokinase was normal (Table I). Creatinuria was present (155mg/day).

Case 3

G.P.C., 11 years old, is a younger brother of Case 1 and 2 (Fig. 1). His symptoms resembled those of his brothers and started since the age of 6 years.

The skeletal muscles were pseudohypertrophied, like those of his brothers (Fig. 5). The tone and power of the muscles were normal; and the tendon reflexes were sluggish. He required about 2 seconds to relax his grip. Percussion myotonia were demonstrable in all the major muscles. The Achilles tendon reflex time was normal (tap to half-relaxation time: 260 milliseconds). The cardiovascular system was normal; the blood pressure was 100/60. Like his 2 affected brothers, there was an absence of frontal baldness, cataract, atrophy of the sternomastoid muscles, gynaecomastia and testicular atrophy.

The serum aldolase and creatine phosphokinase levels were normal (Table I). Muscle biopsy revealed similar histology to that of Case 1 (Fig. 4). The electromyogram was similarly identical. Urinary creatine extraction was less marked than that in Case 1 and 2 (55mg/day).

DISCUSSION

Though myotonia congenita was the earliest form of myotonia to be described, other forms of myotonia are now recognised. Thus de Jong (1965) recognises 8 types on clinical and genetic evidences: Type 1 (myotonia congenita—autosomal dominant), Type 2 (myotonia congenita-autosomal recessive), Type 3 (dystrophia myotonica—autosomal dominant), Type 4 (myokymia, myotonia, muscular wasting and increased perspiration—sporadic cases) Type 5 (paramyotonia congenita—autosomal dominant) Type 6, (periodic paramyotonic paralysis—autosomal dominant) Type 7, (adynamia episodica myotonia-dominant) and Type 8 (myotonia levior—autosomal dominant).

The presence of consanguinity in the parents and the fact that 3 out of the 9 siblings in the

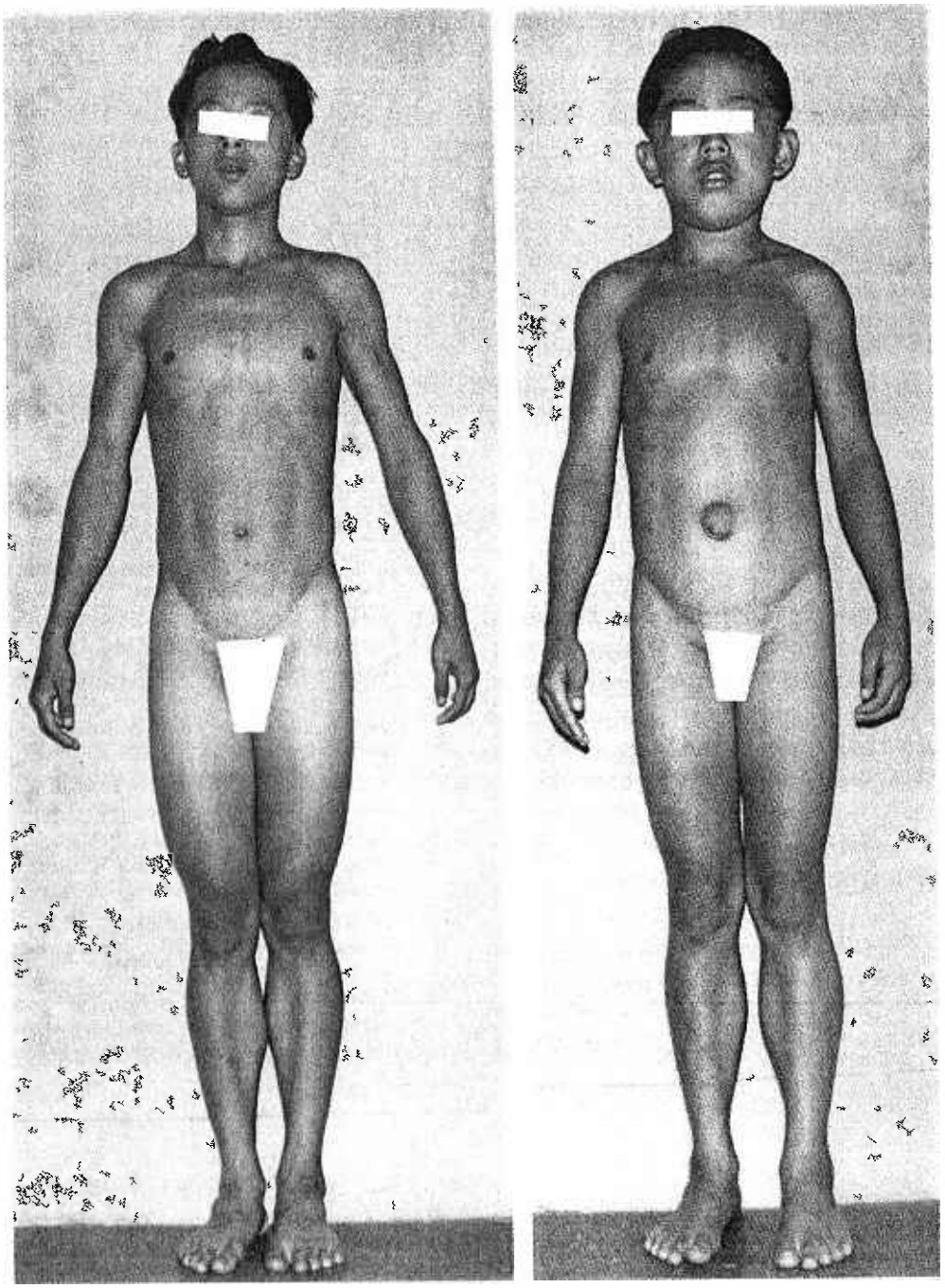

Fig. 5. Showing generalised pseudohypertrophy of skeletal muscles in Case 2 (left) and Case 3 (right).

family described above are affected would suggest an autosomal recessive transmission. A dominant gene with high penetrance is the typical pattern of inheritance for myotonia congenita (Brit, 1908; Bell, 1947; Thomasen, 1948): though Becker (1961) in a series of 80 cases, found consanquinity in 10% of the parents of 30 cases, which he considered to be transmitted by an autosomal recessive gene. Two of the four families described by Thomasen (1948) fit the pattern of autosomal recessive inheritance.

In 1949 Sibley and Lehninger reported high levels of serum aldolase in 2 cases of progressive muscular dystrophy. Since then it has been established that high levels of serum aldolase occur in the earlier stages of the disease and declines as the disease progresses (Thomson et al., 1960). In myotonia congenita it seems that an elevation will occur if the disease is severe (Pennington, 1964). This appears to be the case in the cases we described; in Cases 1 and 2, where the disease is more advanced, the serum aldolase is elevated while in Case 3 it is normal. In 3 unaffected brothers, they are normal (Table 1). Serum creatine phosphokinase has also been shown to be elevated in muscular dystrophy and also in the majority of the female carriers of the Duchenne type dystrophy. Reports of this enzyme in myotonia

congenita are scanty. In the family we describe it is elevated in Case 1 and normal in Cases 2 and 3. Thus it appears that it is elevated when the disease is more advanced. Two of the unaffected brothers have also elevated values (Table I). It is tempting to speculate that they might be carriers.

The traditional treatment of myotonia is quinine hydrochloride, prednisolone and procainamide (Brain, 1962). More recently Munsat (1967) found that diphenylhydantoin was just as effective as procainamide and better tolerated. Case 1 has been given diphenylhydantoin 100 mg. thrice daily and has benefited from it.

SUMMARY

Three cases in a Chinese family with myotonia congenita (Thomsen's Disease) are described. The inheritance appears to be autosomal recessive. Two of the unaffected brothers have elevated serum creatine phosphokinase: it is speculated that they may be carriers of the disease. Myotonia of the calf muscles is shown quantitatively using a photomotograph.

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