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# Peroneal muscular atrophy (of Charcot–Marie–Tooth) in two African brothers*

J. R. BILLINGHURST

*Department of Medicine, Makerere Medical School and Mulago Hospital, Kampala, Uganda*

**Summary**

The case of two elderly Africans, sons of the same father and mother, with muscle wasting typical of peroneal muscular atrophy (of Charcot–Marie–Tooth) is reported. They also showed clinical features of peripheral neuropathy, the presence of which was confirmed by motor nerve conduction studies. They alleged that insidious onset occurred at the late age of about 40 years. It is possible that this very uncommon disease has not previously been reported in Africans.

**Résumé**

Deux africains vieux, frères véritables, se presentèrent avec les signes typiques de l'atrophie musculaire progressive type Charcot-Marie. Il y avait aussi les signes d'une névropathie périphérique, qu'on a confirmé par mésurer la velocité de quelques nerfs motoriques. La maladie avait commencé tardivement à l'âge d'environ 40 ans. C'est possible que c'est pour la première fois il y a un compte rendu dans les journaux medicaux de telle maladie chez africain.

In a specialty noted for rare disorders with quaint names and lurid prognoses, it is refreshing to find an untreatable neurological disease whose rate of progress is as slow and whose disabilities are as mild as in the peroneal muscular atrophy of Charcot–Marie–Tooth, a disease doubly quaint not only on account of its name but also because of its deformity: the inverted champagne bottle or fat bottle legs. In two elderly African brothers the condition was of late onset, the distribution of the muscle atrophy was typical, the features of peripheral neuropathy were clear, and the conduction velocity in motor nerves was markedly slowed. Trowell (1960) had not discovered any reported cases in Africans to that date, and there were no cases in Osuntokun's 12 year survey, from 1957 to 1969, of almost 10,000 neurological cases at Ibadan, Nigeria (Osuntokun, 1971). No specific mention of the disease is made in other reviews of neurological disorders in Africans (Hutton, 1956; Gelfand, 1957; Reef, Lipschitz & Block, 1958; Kaushik, 1961; Cosnett, 1964; Haddock, 1965; Ojiambo, 1966; Spillane, 1969; Dada *et al.*, 1969; Billinghurst, 1970; Collomb *et al.*, 1971).

Correspondence: Dr J. R. Billinghurst, Oldchurch Hospital, Romford, Essex, RM7 0BE, England.

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## Case histories

L.M., a Muganda male aged 64 years, the eldest of his sibship, was first admitted to Mulago Hospital in 1971 with progressive wasting of limb muscles initially and erroneously ascribed to motor neurone disease. When he was about 40 years of age, he had gradually begun to notice weakness and deformity of his feet such that he could no longer wear sandals. Weakness and wasting very slowly spread up his legs until his gait became weak and clumsy and recently he needed to use a stick when standing and walking. In addition, his hands also gradually became weak, wasted and deformed. He also noticed mild numbness and tingling in the feet. There were no other symptoms of note.

On examination, he was a slim, generally healthy man with no abnormal signs except those that follow.

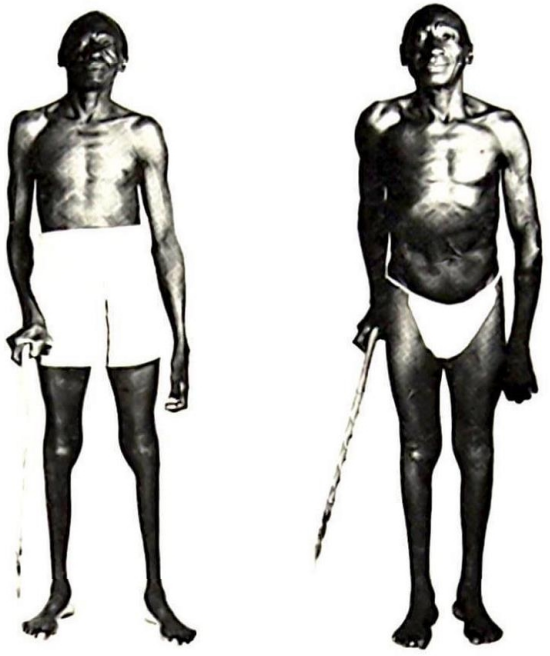

FIG. 1. The brothers L.M. (left) and A.M. (right).

There was marked wasting of all muscles in the legs below the knees and in the lower one-quarter of the thighs, with a fairly well-marked demarcation between wasted and normal muscles. There was also pronounced wasting of all the muscles of the hands and of the lower one-third of the forearms. Bilateral claw-foot and claw-hand deformities were present. There was no proximal muscle weakness or wasting. All tendon jerks were absent, as were the plantar responses. Vibration sense was lost in the legs up to the iliac crests and was absent also at the finger tips. Joint position sense was preserved and Romberg's sign was negative. Pinprick sensation was impaired in the toes and distal half of the feet but was normal elsewhere. The gait was very typically high-steppage in character and was also moderately unsteady, the latter being ascribed mainly to weakness. Nystagmus and dysarthria were absent but there was mild ataxia in the finger–nose–finger test. Some nerves, where palpable, were moderately thickened. The remainder of the nervous system was entirely normal (Fig. 1).

Early in 1972 the patient was re-admitted and it became possible to see and admit his brother for the first time.

A.M., a male Muganda aged 61 years, was the next oldest in his sibship after L.M. His disability had started gradually at the age of 35 years and his symptoms and signs were similar to those of his brother. The wasting of the leg muscles below the knees was less strikingly obvious because he had had several falls severe enough to cause scarring and thickening of subcutaneous tissue. Pes cavus was also less noticeable.

### Family history

The available pedigree is shown in Fig. 2. Because of local customs it is extremely unlikely that the parents are consanguineous. In published series the usual mode of inheritance has been autosomal dominant, but pedigrees with autosomal recessive and sex-linked recessive inheritance have been reported. In these cases, if it is assumed that the genetically determined age of onset in the family is between 30 and 40 years, a dominant mode of inheritance would best fit the available data, the gene having been present in their mother who died before its expression became obvious. Since no-one else in the family has been examined, however, the matter remains speculative.

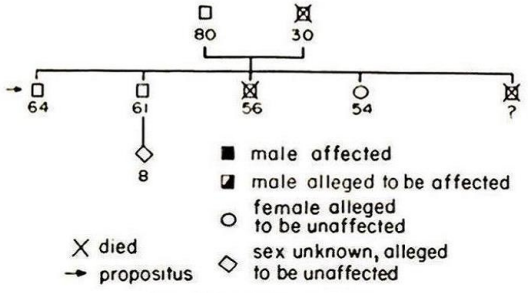


FIG. 2. Available pedigree

### Motor nerve conduction velocity

The velocities are shown in Table 1. It was impossible to record any muscle action potentials from the hands of A.M. No detectable muscle action potentials could be detected on ulnar nerve stimulation in L.M., or on peroneal nerve stimulation in either brother.

TABLE 1. Motor nerve conduction velocity

| Subject | Nerve | Result (m/sec) | Normal Mean (m/sec) | Range) (m/sec) |
|---|---|---|---|---|
| L.M. | Median | 23 | 57 | 52-67*† |
| L.M | Femoral | 47 | 74 | 56-94‡ |
| A.M. | Femoral | 21 | | |

* Thomas, P.K., Sears, T.A. & Gilliatt, R.W. (1959).
† Mayer, R.F. (1963);
‡ Chopra, J.S. & Hurwitz, L.J. (1968).

### Discussion

The two brothers described do not differ in any important respect from the classical picture. Age of onset (35–40 years) was late but not impossibly so. Slowing of nerve conduction velocity has recently been described as typical (Dyck, Lambert & Mulder, 1963). Some degree of nerve thickening is quite frequent, but these patients do not fit the picture of the hypertrophic polyneuritis of Déjerine & Sottas. Nor on the other hand do they resemble classical Friedreich's ataxia.

Maybe their claim to fame will rest on their being among the first—possibly the first—Africans to be reported as suffering from peroneal muscular atrophy of Charcot-Marie-Tooth, with inverted champagne bottle legs, high-steppage gait and clawing of feet and hands.

Although the clinical features of peroneal muscular atrophy are so clear and well-known, there is scanty and confused information about its pathology, largely due, no doubt, to its benign nature. Changes in peripheral nerves and loss of cells in the spinal cord have been reported. The essence of the problem is: is it a spinal cord disease or a peripheral nerve disease or a mixture of the two; or even are there two diseases, a myelopathic and a neuropathic one? The myelopathic type resembles Friedreich's ataxia and may lie at one pole of the clinical manifestations of that disease. The evidence for a neuropathic element in the typical disease appears now to be overwhelming; not only is nerve conduction slowed but also segmental demyelination and remyelination have been demonstrated (Gutrecht & Dyck, 1966), the very hallmarks of a Schwann cell disorder and a plausible explanation for the thickening of peripheral nerves which is sometimes noted.

No Schwannopathy, however, gives rise to inverted champagne bottle legs. Could there be a genetically determined defect of late onset—an abiotrophy—which results in an inability to maintain the axons of motor nerves whose length exceeds a certain limit? The distance from the spinal cord to the cut-off point between normal and wasted muscles is about the same in the arm as it is in the leg—0·6-0·75 m in a person of average height. The viability of an axon depends on its cell body, not on its Schwann cells, for it is by the cell body that the flow of axoplasm is initiated and maintained. The further the axoplasm has to flow the more vulnerable it may be to insults to the cell body. Put another way, if a population of

neurones is partially damaged, the effects may be seen best—or only—in those neurones with the longest axons. This is the postulated mechanism in triorthocresyl phosphate poisoning. It is tempting to suggest that in peroneal muscular atrophy there is a genetically determined defect of neuroneal function mild enough to manifest itself only in those neurones which have to pump their axoplasm beyond a certain critical distance.

The attractive features of such a hypothesis—of partial neuronal failure—are that it is in line with current ideas on neuronal function, that it attempts to explain the peculiar distribution of muscle wasting, and that it is compatible with the histological preservation of cell bodies which are defective but not necessarily dead. However, it is not a unitary hypothesis as it does not satisfactorily explain the observed slowing of conduction and the segmental demyelination which seem to demand a separate Schwann cell dysfunction.

## Acknowledgments

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