Thyrotoxic periodic paralysis in a Caucasian male

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INTRODUCTION

Sudden muscular weakness is rare and dramatic, both for the patient and the physician. Although thyrotoxic periodic paralysis is a rare disorder in the west, it should be considered in the differential diagnosis of sudden weakness. Often the cause of the weakness or paralysis is undetected because of the absence of clinical symptoms of the underlying hyperthyroidism and because clinicians are unfamiliar with the disorder (Darrow et al, 1995).

This article presents a rare case of a Caucasian patient with previously undiagnosed hyperthyroidism who had symptoms of intermittent weakness of upper and lower limbs for 6 months. The weakness abated after commencement of antithyroid medications. The incidence of thyrotoxic periodic paralysis in the west is uncertain (Ko et al, 1996).

DISCUSSION

Causes of wobbly legs

Intermittent wobbly legs are an uncommon symptom. They may occur as part of syncope but usually there are other features such as light-headedness. If the weakness comes on with exertion, it may be a manifestation of myasthenia gravis, CNS demyelination or a vascular malformation of the cord. Muscle pain and weakness on exertion are commonest in older patients with peripheral vascular disease or lumbar canal stenosis. In younger patients these symptoms may point to a myositis or a metabolic defect of glucose or fatty acid metabolism affecting muscles. This man's recurrent painless weakness suggested one of the periodic paralyses.

Hyperkalaemic periodic paralysis

Hyperkalaemic periodic paralysis is caused by a defect in the sodium channel gene and the periods of paralyses are associated with hyperkalaemia (Shishiba, 1997). It is characterized by bouts of weakness that start early in childhood. The attacks last for 15 minutes to 1 hour and are precipitated by rest after exertion, potassium load or emotional stress. Patients have often suffered clinical myotonia in infancy and myotonia is often present on electromyography.

CASE REPORT

A 35-year-old Caucasian system analyst presented to his GP with a 6-month history of intermittent weakness of both upper and lower limbs lasting 30–40 minutes and resolving spontaneously. He gave no history of any precipitating factors. There was no history of headaches, dizziness, loss of consciousness or sphincter disturbances. His vision, speech and swallowing were not affected during the episodes of limb weakness.

All of the episodes occurred on getting out of bed, most on waking in the morning, except for one which occurred on waking in the middle of the night when he got out of bed to go to the toilet. His legs gave way but he did not lose consciousness. There were no symptoms and signs of thyrotoxicosis. He was referred for further assessment. Neurological and systemic examination did not reveal any abnormal findings.

Investigations including magnetic resonance imaging scan of the spine, vitamin B_{12}, red cell folate, urea and electrolytes, full blood count and erythrocyte sedimentation rate were within normal limits.

However, his thyroid function revealed free thyroxine >50 μmol/litre and thyroid-stimulating hormone <0.02 pmol/litre suggesting thyrotoxicosis. He was positive for anti-microsomal thyroid antibodies. A technetium scan showed symmetric enlargement of both lobes of the thyroid gland with an avid uptake.

On treatment with carbimazole the attacks became less frequent and over a period of 3 months regressed completely. He remains asymptomatic after treatment with carbimazole.

Hypokalaemic periodic paralysis

Hypokalaemic periodic paralysis is caused by a defect in the calcium channel gene (Greenberg, 1997). The condition presents before the age of 30 years with attacks affecting the limbs, usually terminating in 3–4 hours. Patient may awake with weakness and attacks may be triggered by conditions tending to lower serum potassium levels such as high sodium or high carbohydrate meals.

Thyrotoxic periodic paralysis

This patient suffered attacks typical of hypokalaemic periodic paralysis but his age made this diagnosis very unlikely. The investigations confirmed the diagnosis of thyrotoxic periodic paralysis, in which the attacks may be clinically identical to those of hypokalaemic periodic paralysis, but are more frequently associated with autonomic disturbances such as arrhythmia.

The condition is much commoner in men, who represent about 95% of the cases. Equally striking is the racial variation. About 10% of men in south-east Asia with thyrotoxicosis present with thyrotoxic periodic paralysis and the condition is also relatively common in Hispanics. In those of north European or Afro-Caribbean descent it is exceptionally uncommon.

As in this patient, those who present with thyrotoxic periodic paralysis often have none of the classical signs of thyrotoxicosis (Kelly et al, 1989). His case

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is important because in the UK this is a very rare presentation of a common treatable condition.

During attacks of thyrotoxic periodic paralysis the serum potassium is usually low, but normokalaemic and hyperkalaemic cases have been described. As in this patient, attacks commonly occur in the early hours, especially if the patient has exercised the previous day (Charnes and Johns, 1978).

Pathophysiology

The clinical similarities with hypokalaemic periodic paralysis make it tempting to try to explain the mechanism of the abnormality along similar lines.

In thyrotoxic patients sodium/potassium pump activity is roughly double that of controls. The activity in patients with thyrotoxic periodic paralysis is 80% higher than in patients without thyrotoxic periodic paralysis, increasing the shift of potassium ions into the cells in exchange for sodium moving out of the cells. This may account for a tendency to hypokalaemia that would be exacerbated by large meals that cause hyperinsulinaemia and stimulate Na+/K+ ATPase activity (Chan et al, 1994). The additional insult might lead to a sudden intracellular shift of potassium into muscle and predispose to hypokalaemic weakness. However, some features remain unexplained.

Despite thyrotoxicosis itself being much commoner in women, the massive male preponderance implies a hormonal influence. The racial preponderance which does not reflect other forms of periodic paralysis implies a genetic influence and occasional cases with normal and elevated blood potassium levels clearly do not fit into this model (Penisson-Besnier et al, 1998).

Moreover thyrotoxic periodic paralysis is treated with propranolol and restoration of the euthyroid state (Young and Tse, 1974). This differs from hypokalaemic periodic paralysis which is unaffected by beta-blockade, but is very sensitive to the carbonic anhydrase inhibitor, acetazolamide (Shishiba, 1997). This suggests significant differences in the mechanism of thyrotoxic periodic paralysis from the other periodic paralyses. **HM**

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