Unusual association of diseases/symptoms

Unusual case of weakness in the UK

W S Ngu, D J Tymms

Department of Endocrinology, Wroughtington, Wigan and Leigh NHS Trust, Wigan, UK

Correspondence to W S Ngu, Ingu@doctors.org.uk

Summary

A healthy 35-year-old Vietnamese man presented with acute tetraparesis. He was watching television when suddenly he could not mobilise. As the weakness progressed overnight he attended the accident and emergency department. Observations were normal. He denied any pain, headache, vomiting, diarrhoea or use of laxatives or illicit drugs. Neurological examination revealed global weakness in all four limbs ranging from 0 to 3/5. Reflexes were suppressed. Examination of cranial nerves and of other systems was unremarkable. However, laboratory results showed a hypokalaemia of 2.3 (3.5–5.5 mmol/l) on admission. ECG first showed U waves and Mobitz type 1 but this resolved to sinus rhythm. On further questioning, he revealed a recent weight loss of 9 kg despite an increase in appetite. Thyroid function tests revealed free T4 57 (12–22 pmol/l) with thyroid-stimulating hormone undetectable. He was treated with potassium replacement and carbimazole and his symptoms resolved completely 8 days post-admission. The patient was diagnosed with hypokalaemic thyrotoxic periodic paralysis.

BACKGROUND

Hypokalaemic thyrotoxic periodic paralysis (HTPP) is a condition that needs to be kept in mind when doctors in the UK are faced with patients with hypokalaemia and paralysis. Although it is traditionally more common in Asia, due to the effects of migration it has been described in the Asian population in Australia, New Zealand and the USA. In addition, there are an increasing number of cases of HTPP reported in Europe.^{1–5}

CASE PRESENTATION

We describe the case of a previously fit and well 35-year-old Vietnamese man who presented to accident and emergency (A&E) with acute tetraparesis. He was watching television the evening before and realised he could not stand or raise his arms on trying to get up from the sofa. He managed to drag himself upstairs into bed but the weakness progressed overnight and he attended the A&E department.

His observations on arrival were all within normal limits. He denied any pain, headache, rash, vomiting, diarrhoea or use of laxatives. He was a smoker but denied any use of illicit drugs. Cardiovascular, chest and abdominal examinations were unremarkable. Neurological examination revealed global weakness in all four limbs ranging from 0–3/5. Reflexes were suppressed but present. Cranial nerves were intact and pupils were reacting normally.

However, laboratory results yielded more information as potassium was 2.3 (3.5–5.5 mmol/l) on admission. ECG first showed U waves and Mobitz Type 1 but this soon resolved to sinus rhythm. Apart from that, alanine transaminase was 172 (3–35 IU/l) and random cortisol was 346 (<280 nmol/24 h).

On further questioning, he revealed a recent weight loss of 9 kg despite an increase in appetite. Thyroid function tests revealed free T4 57 pmol/l (12–22 pmol/l) with thyroid-stimulating hormone undetectable.

The patient was treated for hypokalaemia and also for his hyperthyroidism with carbimazole and his symptoms resolved completely 8 days post-admission. He was diag-

nosed with HTPP. Examination revealed a small non-tender symmetrical goitre. His thyroid peroxidase antibody test was 286 kU/l (0–34 kU/l) and it was thought likely that he had Graves' disease.

DIFFERENTIAL DIAGNOSIS

With a patient who attends A&E with an acute tetraparesis, a few differential diagnoses should be considered by the physician, including paraplegia caused by trauma, ischaemia, inflammation or tumour, Guillain-Barré syndrome, periodic paralysis, myasthenia gravis and dissociative paralysis.

With this patient, blood tests revealed a low potassium level. However, HTPP can be seen with relatively mild hypokalaemia particularly if the patient is in the recovery phase. The common causes of hypokalaemia can be divided into three categories: decreased intake, increased excretion and situations that might result in a shift of potassium from the extracellular to the intracellular space. For example, patients that are on total parental nutrition, elderly patients and patients with eating disorders might have a decreased intake of potassium rich foods leading to their hypokalaemia. With regards to the increased excretion category, this can be divided into patients with:

1. Gastrointestinal losses: diarrhoea or vomiting.
2. Medication: diuretics, mannitol or antibiotics (gentamicin/cisplatin/amphotericin B).
3. Endogenous mineralocorticoid excess: Cushing's disease, primary or secondary hyperaldosteronism.
4. Exogenous mineralocorticoid excess: – steroid treatment, liquorice abuse.
5. Increased urine outflow: hyperglycaemia.

Last, but not least, one has to take into account conditions such as insulin treatment for diabetic patients, refeeding syndrome or chronic obstructive pulmonary disease patients on high doses of agonist treatment that might result in a shift of potassium from the extracellular space into the intracellular space resulting in hypokalaemia.⁶

OUTCOME AND FOLLOW-UP

The patient's symptoms improved completely 8 days after treatment with carbimazole and potassium replacement.

DISCUSSION

Hypokalaemic periodic paralysis is a rare life-threatening syndrome but is potentially reversible when detected at an early stage. It can be divided into familial hypokalaemic periodic paralysis (FHPP) and HTPP. FHPP is more common in western countries and in paediatric patients.⁷

However, HTPP is an acquired form of hypokalaemic periodic paralysis and is most common in Asian men in their thirties.⁸

It is rarer in Caucasians or African-Americans and, therefore, can be difficult to recognise in such populations. Patients with HTPP exhibit acute recurrent episodes of flaccid paralysis, affecting the proximal muscles of the lower limbs, either following strenuous physical activity or a carbohydrate-rich meal.⁹

However, it has also been described to affect respiratory muscles resulting in respiratory distress.¹⁰

Also, studies have found that attacks of HTPP happen more frequently at night.^{11 12}

There are a few theories behind the pathophysiology of HTPP but it is thought that in hyperthyroid patients there is an increase in the number and activity of Na/K ATPases of cell membranes, which is responsible for the refractory state of the sarcolemma and the transmembrane potassium shifts.⁸ It is inherited in an autosomal dominant pattern.⁷

Lab findings in HTPP include hypomagnesaemia and hypophosphataemia, which helps distinguish it from FHPP.

Correction of hypokalaemia is the treatment priority when it is severe. Control of the thyrotoxicosis with anti-thyroid drugs is essential. Blocker treatment may be helpful and can be used to prevent recurrent attacks of HTPP.¹³ In the acute management of hypokalaemia, intravenous potassium infusions might be insufficient to resolve acute attacks and intravenous propranolol has been reported to reverse attacks of weakness in patients unresponsive to potassium replacement.¹⁴ Potassium levels should always be monitored regularly as rebound hyperkalaemia can occur. Restoration of euthyroidism eliminates thyrotoxic attacks but HTPP can recur if thyrotoxicosis returns.

Hypokalaemic periodic paralysis is a rare disorder with recurrent periods of hypokalaemic paralysis between periods of normal serum potassium levels. In most cases, it is due to an abnormality in the 1 subunit of the dihydropyridine-sensitive calcium channel in the skeletal muscle. How a defect in a calcium channel produces hypokalaemic paralysis is not well understood.⁶

Although rare, there have been increasing cases of HTPP reported in European populations^{1–5} as well as some cases reported in children.⁷

With the effects of migration, there is an increasing need for doctors in the UK to be aware of HTPP and to include this in their differential diagnosis when faced with patients

with hypokalaemia. For example, HTPP has been reported in Asian patients in Australia.¹⁵

Learning points

- Hypokalaemic thyrotoxic periodic paralysis (HTPP) should be in the list of differential diagnoses for the acute care physician who is presented with acute tetraparesis in a patient with preserved consciousness.
- The treatment priority for HTPP is to correct the potassium deficit first in cases of severe hypokalaemia. In less severe cases, blocker treatment can be used during early treatment with antithyroid drugs until the patient is euthyroid.

Competing interests None.

Patient consent Obtained.

REFERENCES

1. Gaul C, Leonhardt G, Spens A, et al. [Hypokalaemic thyrotoxic periodic paralysis (HTPP). Rare differential diagnosis in case of acute tetraparesis in Europe]. *Med Klin (Munich)* 2005;**100**:583–6.
2. Vanderghyest F, Vanderghyest A, Leleux A, et al. [Hypokalaemic thyrotoxic periodic paralysis: a case report]. *Acta Clin Belg* 2002;**57**:19–22.
3. Atallah P, Dib ER, Khoury M. Thyrotoxic periodic paralysis. A case report. *J Med Liban* 2007;**55**:167–9.
4. Vendrame F, Verrienti A, Parlapiano C, et al. Thyrotoxic periodic paralysis in an Italian man: clinical manifestation and genetic analysis. *Ann Clin Biochem* 2008;**45**:218–20.
5. Vogel D, Schwegler B, Schmidt J, et al. [Hypokalaemic thyrotoxic periodic paralysis following rice consumption]. *Dtsch Med Wochenschr* 2007;**132**:1510–12.
6. EMedicine (homepage on the Internet). Sripathi Naganand. Periodic paralyses. <http://emedicine.medscape.com/article/1171678-overview> (Accessed 24 July 2007).
7. Schalin-Jantti C, Laine T, Valli-Jaakola K, et al. Manifestation, management and molecular analysis of candidate genes in two rare cases of thyrotoxic hypokalaemic periodic paralysis. *Horm Res* 2005;**63**:139–44.
8. Hsieh MJ, Lyu RK, Chang WN, et al. Hypokalaemic thyrotoxic periodic paralysis: clinical characteristics and predictors of recurrent paralytic attacks. *Eur J Neurol* 2008;**15**:559–64.
9. Antonello IC, Antonello VS, de Los Santos CA, et al. Thyrotoxic hypokalaemic periodic paralysis: a life-threatening syndrome. *Eur J Emerg Med* 2009;**16**:43–4.
10. Wu CZ, Wu YK, Lin JD, et al. Thyrotoxic periodic paralysis complicated by acute hypercapnic respiratory failure and ventricular tachycardia. *Thyroid* 2008;**18**:1321–4.
11. Paiboonpol S. Hypokalaemic periodic paralysis as a manifestation of thyrotoxicosis. *J Med Assoc Thai* 2008;**91**:1331–5.
12. Silva MR, Chiamolera MI, Kasamatsu TS, et al. [Thyrotoxic hypokalaemic periodic paralysis, an endocrine emergency: clinical and genetic features in 25 patients]. *Arg Bras Endocrinol Metabol* 2004;**48**:196–215.
13. Lin SH, Lin YF. Propranolol rapidly reverses paralysis, hypokalemia, and hypophosphatemia in thyrotoxic periodic paralysis. *Am J Kidney Dis* 2001;**37**:620–3.
14. Birkhahn RH, Gaeta TJ, Melniker L. Thyrotoxic periodic paralysis and intravenous propranolol in the emergency setting. *J Emerg Med* 2000;**18**:199–202.
15. Gillett MJ. Thyrotoxic, hypokalaemic periodic paralysis. *Emerg Med Australas* 2005;**17**:397–400 and the US (Gandhi M. An unusual case of muscle weakness: a case report. *Am J Med Sci* 2006;**332**:134–6).

This pdf has been created automatically from the final edited text and images.

Copyright 2010 BMJ Publishing Group. All rights reserved. For permission to reuse any of this content visit <http://group.bmj.com/group/rights-licensing/permissions>.

BMJ Case Report Fellows may re-use this article for personal use and teaching without any further permission.

Please cite this article as follows (you will need to access the article online to obtain the date of publication).

Ngu WS, Tymms DJ. Unusual case of weakness in the UK. *BMJ Case Reports* 2010;10.1136/bcr.03.2010.2785, date of publication

Become a Fellow of BMJ Case Reports today and you can:

- ▶ Submit as many cases as you like
- ▶ Enjoy fast sympathetic peer review and rapid publication of accepted articles
- ▶ Access all the published articles
- ▶ Re-use any of the published material for personal use and teaching without further permission

For information on Institutional Fellowships contact consortiasales@bmjgroup.com

Visit casereports.bmj.com for more articles like this and to become a Fellow