Renal tubular acidosis type 1 causing hypokalaemic periodic paralysis

Introduction

This article reports an unusual case of distal renal tubular acidosis in a 34-year-old apparently healthy woman who presented with sudden onset progressive quadriparesis. She had had two episodes of transient paraparesis in the last month and both subsided spontaneously. She was ultimately diagnosed as having distal renal tubular acidosis secondary to autoimmune hypothyroidism (Hashimoto's thyroiditis). Thyroid supplementation partially reversed the renal tubular acidosis and the paraparesis also improved.

Type 1 renal tubular acidosis leading to hypokalaemic periodic paralysis can be a very uncommon presentation of autoimmune hypothyroidism in younger patients. Persistence renal tubular acidosis despite treatment with alkali solutions should prompt a search for an underlying secondary cause like hypothyroidism.

Discussion

This patient had persistent acidosis despite regular treatment with the maximum tolerated dosage of Shohl's solution and potassium alkali salt. The improvement of the urinary acidification after treatment with levothyroxine suggested thyroid deficiency as the underlying cause of renal tubular acidosis. Treatment of the hypothyroidism not only prevented recurrence of hypokalaemia and paralysis but also partially reversed the distal renal tubular acidosis.

The coexistence of distal renal tubular acidosis and autoimmune and non-autoimmune hypothyroidism has been rarely reported (Finn et al, 2008; Koul and Wahid, 2011; Punekar et al, 2012). Most non-hereditary cases of distal renal tubular acidosis have been reported to be secondary to systemic disorders such as Sjögren's syndrome, hyperglobulinaemia, chronic active hepatitis or lupus. A case of immune-mediated hypothyroidism leading to distal renal tubular acidosis and hypokalaemic periodic paralysis was also described (Koul and Wahid, 2011). One case of distal renal tubular acidosis caused by combined Sjögren's syndrome and autoimmune hypothyroidism has been published (Punekar et al, 2012). Secondary distal renal tubular acidosis is most commonly associated with Sjögren's syndrome (Koul and Wahid, 2011; Punekar et al, 2012).

Renal acidification defect had previously been described in non-autoimmune hypothyroidism (Mason and Golding, 1970). The presence of thyroid peroxidase antibody clearly pointed towards an underlying autoimmune mechanism of hypothyroidism in the current patient. Mason and Golding (1970) also demonstrated concurrent autoimmune hypothyroidism and renal tubular acidosis with a possible immunological mechanism behind the renal tubular acidosis. An association between renal tubular acidosis and non-immune hypothyroidism has been

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Case Report

A 34-year-old woman presented with sudden onset progressive quadriparesis for the last 2 days. She had no preceding history of an unaccustomed carbohydrate rich meal, heavy exercise, trauma, fever, breathlessness or diarrhoea.

She had two episodes of transient paraparesis in the last month but had no residual paralysis. Neurologically power in all four limbs was MRC grade 2/5, she had depressed deep tendon jerks in all limbs and bilateral flexor plantar responses. Her other systemic examinations were within normal limits except mild facial puffiness.

Serum potassium was low (2.9 mmol/litre) with mildly elevated serum chloride, normal sodium, calcium, creatinine and creatine kinase levels. Urinary potassium excretion and creatinine/potassium ratio were normal. Her blood gas analysis showed a pH of 7.25 with serum bicarbonate of 12 mmol/litre but normal pCO_2. Her urine pH was 5.9 with a positive urinary anion gap. Ultrasound of the lower abdomen showed nephrocalcinosis. She was diagnosed as a case of type 1 (distal) renal tubular acidosis leading to hypokalaemia and recurrent hypokalaemic periodic paralysis.

Besides regular potassium chloride she was started on Shohl's solution (citric acid and crystalline sodium citrate in distilled water) 1 mmol/kg and oral propranolol 120 mg/day. Despite gradual escalation of the alkali supplementation and propranolol to the maximum tolerable dose, after 4 months her serum potassium remained around 3 mmol/litre with one more episode of transient paraparesis which did not require hospitalization. Then the serum pH was 7.33, serum bicarbonate was 17.4 mmol/litre and urine pH was 5.8.

Her serum antinuclear antibodies, rheumatoid factor, anti Ro and La antibodies, lupus antibody, anti-neutrophil cytoplasmic antibodies (ANCA), anti-mitochondrial antibody, anti Scl-70 antibody serum immunoglobulin levels including serum and urinary protein electrophoresis revealed no abnormality. Serum thyroid-stimulating hormone was high with reduced levels of unbound thyroxine. Her thyroid peroxidase antibody level was 92 U/litre (normal up to 30 IU/litre) but her thyroglobulin level was normal, so the diagnosis was hypothyroidism secondary to autoimmune probably Hashimoto's thyroiditis.

She was started on levothyroxine supplementation, initially 50 μg and then 100 μg. After 6 months her thyroid profile normalized and thyroid peroxidase antibody titre dropped to 38 IU/litre. Her serum acidosis also partially subsided, urinary pH became <5.5 although ammonium chloride loading test made the acidosis overt. Her daily requirement of Shohl's solution and potassium alkali supplementation dropped considerably. She has had no further episodes of persistent or transient paralysis 2 years later.

described (Oster et al, 1976; Fang and Huang, 1996). They proposed three possible mechanisms for hypothyroidism-induced renal tubular acidosis:

1. Alteration of the cortical and/or medullary collecting tubules
2. Reduction in cortical sodium reabsorption leading to diminution of the degree of luminal negativity and producing a voltage-dependent defect which would lead to a concurrent impairment in potassium secretion and result in hyperkalaemia
3. An increase in membrane permeability, which allowed back-diffusion of hydrogen ions or possibly bicarbonate.

Deficiency of thyroid hormone might inhibit adenylate cyclase enzyme, thus resulting in a reduction in cortical sodium re-absorption producing a voltage-dependent defect of renal tubular acidosis. Interestingly in a study on rats with induced hypothyroidism, thyroid hormone was found to be responsible for altered expression of several renal acid base transporters (Mohebbi et al, 2007).

Conclusions

This case report highlighted the reversibility of renal tubular acidosis after treatment of the underlying autoimmune hypothyroidism and subsequent prevention of recurrence of hypokalaemic periodic paralysis in this patient. BJHM

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LEARNING POINTS

- Type 1 renal tubular acidosis leading to hypokalaemic periodic paralysis can be a very uncommon presentation of autoimmune hypothyroidism in young people.
- Persistence renal tubular acidosis despite treatment should prompt a search for a secondary cause such as hypothyroidism.
- Treatment of hypothyroidism can prevent the recurrence of renal tubular acidosis.
- The commonest association of secondary distal renal tubular acidosis is with Sjögren's syndrome.
- A defect in the hydrogen adenosine triphosphatase pump, reduced K+ absorption and membrane permeability are proposed mechanisms for hypothyroidism-induced renal tubular acidosis.

Stomal metastasis of colorectal cancer

A 74-year-old woman attended the accident and emergency department with clinical features of sub-acute large bowel obstruction. She had undergone Hartmann's procedure for obstructing sigmoid cancer 2 years previously.

There was stomal stenosis with an impassable stricture (*Figure 1*). Trucut biopsy of the lesion revealed adenocarcinoma of colonic origin. A staging computed tomography scan demonstrated metastatic disease at the stoma and in the liver and lungs (*Figure 2*).

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Metachronous tumours arising from the colonic mucosa often present as stomal recurrence and at least 10 cases have been described (Shibuya et al, 2002; Chintamani et al, 2007). This case is unique because of the location of the metastatic lesion and the time after resection of the primary (2 years).

There are no clear guidelines for the optimum curative therapy for stomal recurrence of colorectal cancer. The patient was offered stomal re-fashioning and palliative chemotherapy with radiation. BJHM

Figure 1. Macroscopic picture of stenosing stomal lesion.

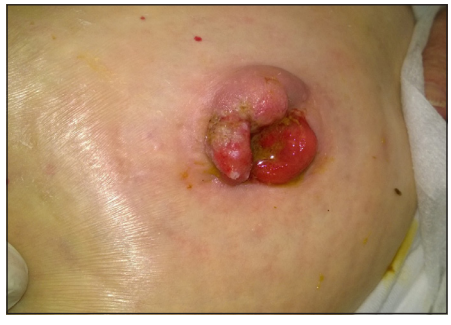
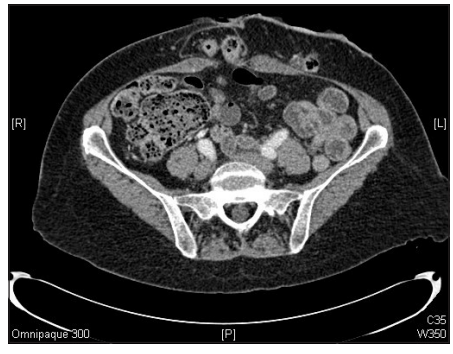


Figure 2. Computed tomography scan showing stoma stenosis.



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