Thyrotoxic periodic paralysis: Report of two cases and a short review of the literature

Tirotoksik Periyodik Paralizi: İki Olgu Sunumu ve Literatürün Kısa Derlemesi

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Abstract

Thyrotoxic periodic paralysis (TPP) is a fatal complication of hyperthyroidism which is characterized by muscle weakness and hypokalemia. In the literature, Asian populations are reported to have a vulnerability to TPP. Considering the life-threatening aspect of the disorder, we decided to report two cases with TPP who have been successfully diagnosed and treated. The first case was a 26-year-old man with the diagnosis of Graves' disease. He had the complaint of sudden leg muscle weakness. At laboratory examination, hypokalemia was detected. The diagnosis of thyrotoxic periodic paralysis was made and intravenous potassium replacement was applied. The second case was a 29-year-old man, complaining of generalized muscle weakness. He was pareparesic on admission. Laboratory examination revealed hypokalemia. Following intravenous potassium replacement, his neurologic status completely improved. His further investigation was compatible with Graves' hyperthyroidism. Thyrotoxic periodic paralysis is a rare, but life-threatining clinical entity. It should be kept in mind in the management of hypokalemic cases with muscular and neurologic manifestations. *Turk Jem 2007; 11: 62-3*

Key words: Thyrotoxic periodic paralysis, thyrotoxicosis, antithyroid agents, hypokalemia

Özet

Tirotoksik periyodik paralizi, hipertiroidinin kas güçsüzlüğü ve hipokalemiyle karakterize ölümcül olabilen bir komplikasyonudur. Literatürde; Asya populasyonunda tirotoksik periyodik paralizi komplikasyonuna bir yatkınlık olduğu tespit edilmiştir. Hastalığın hayatı tehdit eden boyutunu göz önüne alarak, uygun şekilde tanı almış ve tedavisi yapılmış iki tirotoksik periyodik paralizi olgumuzun bildirilmesine karar verdik. İlk olgumuz , Graves tanısıyla izlenmekte olan 26 yaşında erkek hasta bacaklarda ani gelişen kas güçsüzlüğü ile hastanemize başvurdu. Hastanın laboratuar incelemesinde hipokalemi tespit edildi. Tirotoksik periyodik paralizi tanısı konarak hastaya intravenöz potasyum replasmanı yapıldı. İkinci olgumuz; 29 yaşında erkek hasta yaygın kas güçsüzlüğünden yakınmakta idi. Başvurusunda paraparezi saptandı.Laboratuar incelemesinde hipokalemi tespit edildi. İntravenöz potasyum replasmanını takiben nörolojik durumu tamamen düzeldi. İleri tanısal incelemelerde hastada Graves hastalığı olduğu saptandı. Tirotoksik periyodik paralizi nadir ancak hayatı tehdit edebilen bir klinik durumdur.Bu nedenle nörolojik kas bulgularıyla başvuran hipokalemi vakalarında akılda tutulmalıdır. *Turk Jem 2007; 11: 62-3*

Anahtar kelimeler: Tirotoksik periyodik paralizi, tirotoksikozis, antitiroid ajanlar, hipokalemi

Introduction

Thyrotoxic periodic paralysis (TPP) is a fatal complication of hyperthyroidism which is characterized by muscle weakness and hypokalemia. In literature, Asian populations are reported to have a vulnerability to TPP and its overall incidence among Chinese and Japanese thyrotoxic patients is about 1.8% and 1.9 %, respectively (1,2). Although thyrotoxicosis commonly affects females, TPP has a strong male predominance. Male to female ratio ranges from 17:1 to 70:1 (1-4). Patients are usually young adult males at their 30s or 40s (5-7). Male dominance of the disorder is attributed to the ATPase activity which is increased by androgens and inhibited by estrogens (8).
Considering the life-threatening aspect of the disorder, we decided to report two thyrotoxic cases with TPP who had been successfully diagnosed and treated. We aimed to contribute to ongoing medical education of the physicians and focus them on this rare clinical entity.

Case 1

A 26-year-old man, with the diagnosis of Graves' disease, was admitted to the emergency unit with the complaint of sudden muscle weakness at his legs. He had been treated with methimazol for 6 months. His thyroid function tests kept being above the normal limits, despite of maximal methimazol dosage, so a surgical procedure was chosen as the final therapeutic option. Glucocorticoids and colestran-binding resins were added to therapy prior to surgery.

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On admission, he was unable to walk without assistance. His vital signs were normal and the pathological findings at physical examination were bilateral exophtalmus, diffuse palpable thyroid gland and depressed deep tendon reflexes.
Laboratory analyses revealed hypokalemia with normal renal and hepatic functions. His electrocardiography (ECG) exhibited sinus tachycardia with T wave depression. Further analyses detected depressed serum thyroid stimulating hormone (TSH) with high free-tri-iodothyronine (fT3) and free-thyroxine (fT4) levels (Details are shown in Table 1). The diagnosis was TPP and treatment with intravenous potassium chloride was immediately applied. Serum potassium levels normalized with simultaneous resolution of weakness at his legs.

Case 2

A 29-year-old man presented to the emergency unit, complaining of sudden generalized weakness. On the day of admittance, he had the story of working hard physically at his farm. His body temperature was 37 0C, blood pressure was 160/120 mmHg, and pulse rate was 120/min. At physical examination, he was found to be paraparesic. His neurologic status deteoriated during the following 30 minutes and he was quadriparesic then. Lower limbs were more affected. Deep tendon reflexes were lost with normal sensation.
His ECG showed right bundle branch block. Laboratory investigation demonstrated low serum potassium with high creatine phosphokinase (CPK); 579 IU/L (reference range 22-200). His hepatic and renal functions were found to be normal. Serum potassium levels improved with intravenous potassium replacement and reached up to physiological limits. Further laboratory data showed supressed TSH and elevated fT3 and fT4 levels (Table 1).Electroneuromyography (ENMG) detected no abnormality. A diagnosis of TPP was made. Endocrinological evaluation including; thyroid ultrasonography and scintigraphy were compatible with Graves' disease. The radioiodine uptake at 24th hour was 48%. Thionamide and β-blocker therapy was started immediately.
The details of laboratory analyses of the cases are shown in Table 1.

Discussion

The pathophysiology of TPP focuses on Na-K ATPase pump. It has been demonstrated that thyrotoxic patients with TPP have significantly higher pump activity than the ones without the disorder (9-11). Excess thyroid hormones can cause hyperstimulation of the Na-K ATPase pump which may result in influx of potassium into intrasellular space (9,12). In addition to direct stimulation, thyroid hormones can increase the number and sensitivity of β-receptors which may cause catecholamine-mediated potassium uptake. Apart from these, patients with TPP exhibit an exaggerated insulin response during oral glucose challenge compared with the ones without TPP (13,14). This may be a rationale explanation for the presentation of the cases following a heavy physical exertion or consumption of a diet with high calories.

Table 1. Biochemical analyses of the cases on admission

	Case 1	Case 2
Potassium (mEq/L) (3.5-5.30)	2.56	2.21
TSH (μIU/mL) (0.3-4.94)	0.0	0.0
fT_3 (pmol/L) (2.22-5.34)	10.7	24.87
fT_4 (pmol/L) (9-25)	42.11	51.63

In our cases, hypokalemic state was controlled by intravenous potassium replacement therapy. In addition to anti-thyroid drugs, β-blocker therapy was started in both. The latter drug is the choice of treatment and prevents attacks of TPP by inhibiting β-adrenergic stimulation. Relying on this pathophysiological mechanism, β-blocker treatment can strongly be recommended. However, our first case was consuming a β-blocker besides the drugs mentioned above when he was admitted with full blown symptoms. Glucocorticoids can reduce serum potassium levels with their mineralocorticoid activity and via this effect, patients may have a tendency toward hypokalemia (15). The hypokalemic episode of this patient may be explained by glucocorticoid consumption.
Hypokalemic cases who present following a heavy exercise should remind us of the possibility of thyrotoxicosis, as detected in our second case.
In literature, the presence of only one case with TPP from Turkey makes these subjects worth reporting (16). Physicians, especially working at emergency units, should be aware of the fact that thyrotoxicosis may present with hypokalemia. Following immediate intravenous potassium replacement, it is mandatory to maintain euthyroidism in order to prevent recurrent attacks of paralysis. Considering the underlying thyroid pathology, options of long-term antithyroid therapy, radioiodine treatment or surgery may be chosen.

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