Thyrotoxic Hypokalemic Periodic Paralysis (THPP): a challenge for the Emergency Medicine physician in Western countries. A case report

F. Stella, MD, L. Gottardo, MD, M.T. Busetto, MD, S. Pianetti, MD, and A. Semplicini, MD

Internal Medicine 1, Department of Internal Medicine, SS. Giovanni e Paolo Hospital, ULSS 12 Veneziana, Venice, Italy

Introduction

Thyrotoxic hypokalemic periodic paralysis (THPP) is an endocrine emergency with sudden onset of acute muscle hypo-asthenia associated with severe hypokalemia and normal acid-base balance, due to thyrotoxicosis. It may develop in patients of Asian and Native American descent, but it is very rare and undiagnosed in Western countries. Standard treatment includes β-blockers and thyrostatic drugs, but hypokalemia should not be treated with high potassium doses due to the risk of hyperkalemic rebound. Since early diagnosis and correct treatment can prevent life-threatening cardio-pulmonary complications, the emergency physician should keep in mind this rare possibility. We report a case of a 43 year old Caucasian man presenting at ED with tetraparesis as the first symptom of thyrotoxicosis with no other remarkable symptoms or signs.

Case Report

A 43 year old Caucasian man was admitted to ED for sudden onset of severe muscular weakness, affecting mainly the lower limbs. He was unable to sit up on the bed while waking up in the early morning. The day before he had walked for a long time. Neither drugs nor illicit substances, nor heavy carbohydrate intake were reported.
The vital signs were the following: HR = 96 bpm rhythmic, BP = 160/105 mmHg, RR = 14/min, body temperature = 36.2°C, random glucose test = 94 mg/dl. EKG, acid-base and gas balance were normal at first laboratory tests. Serum chemistry was unremarkable except for serum potassium level of 1.9 mEq/L.
Cardiopulmonary physical exam was normal. The neurological examination revealed tetraparesis with greater involvement of the lower limbs. Proximal muscles were mainly involved in the legs, and, on the contrary, distal muscles were involved in the arms; the left side more involved than the right side; mild pain was reported at rest and excruciating evocable pain while passive and active movements were performed; mild osteo-tendon hyporeflexia. The thyroid gland was normal. Particular attention was paid in searching signs of thyrotoxicosis, but neither tachycardia, nor ophthalmopathy nor weight loss nor tremors were found.
After stabilization of serum potassium level with low doses of intravenous KCl administration in the cardiologic ICU, the patient was reassigned to the Internal Medicine Department.
A complete laboratory work-up showed TSH = 0.07 mUI/L, fT3 = 8.4 ng/L, fT4 = 37.6 ng/L, Ab anti-TPO = 165 U/mL, Ab anti-TSHrec = 10.7 U/L.
Imaging showed enlarged thyroid lobes with homogenously increased iodine captation. We, therefore, started -blockers and thyrostatic therapy as soon as possible, with fast recovery of all the neurological symptoms. Upon discharge, the patient had completely recovered his neuromuscular functions and he had stable normalization of laboratory data.

Discussion

THPP is a rare complication of thyrotoxicosis in Western countries, presenting with acute muscle hypo-asthenia (paresis rather than paralysis) associated with muscular pain and stiffness, hypokalemia and normal arterial acid-base balance due to potassium intracellular shift.
THPP is a well-known complication of hyperthyroidism in Asian countries: it is reported in approximately 2% of Asian patients with thyrotoxicosis. In non-Asian people hypokalemic paralysis due to hyperthyroidism is unusual (0,1-0,2%), and it is mainly reported among Native American, Black and Hispanic peoples. THPP is very rare in Caucasian, as reported in Pompeo and Kung works. Despite a higher incidence of thyrotoxicosis in women, THPP occurs predominantly in men (male/female ratio = 20:1). The different distribution of HLA antigen subtypes may make certain populations more susceptible to THPP than others (such as HLA-DRw8 in Japanese, HLA-A2, Bw22, Aw19, and B17 in Singapore Chinese, and B5 and Bw46 in Hong Kong Chinese). Mutations in genes controlling Na+/K+ATPase pump activity and the exchange of intracellular potassium with extracellular sodium within the same HLA antigen subtype, may explain ethnic differences. The male predominance may reflect the action of androgen on Na+/K+ATPase activity. Furthermore, polymorphism of the CACNA1S gene (coding for a calcium channel) has been demonstrated in Asiatic THPP patients. The genetic pattern in non-Asiatic patients has not been studied.

When facing a sudden hypokaliemic paralysis, emergency physicians in Western countries look for more frequent clinical conditions, such as myasthenia gravis, Guillain-Barré syndrome, polyneuritis, FHPP or hysteria. However, the prompt recognition of the disease is crucial for the best acute management and to prevent recurrent episodes that may lead to life-threatening cardiopulmonary complications such as respiratory insufficiency and cardiac arrhythmias. THPP will recur if hyperthyroidism is not treated, but thyrotoxicosis is often subclinical at paralysis onset, in particular, in Western countries: only a few patients (approximately 10%) showed symptomatic hyperthyroidism at presentation of THPP. Muscular hypotonia may be the only symptom at first appearance of hyperthyroidism, and the correct diagnosis is only made possible by measuring the thyroid hormone levels.
The relevant characteristics of the onset of THPP are (Lin, 2005): presentation in an adult male with no family history of periodic paralysis; presence of systolic hypertension; tachycardia; high QRS voltage; first-degree atrioventricular block on ECG; normal blood acid-base state; hypokalemia; hypophosphatemia and hypercalciuria.
The present clinical report, describing THPP in a patient of non Asian or native American descent, suggests that emergency physician should raise his index of suspicion also in Western countries. THPP is an endocrine emergency, and its early recognition is critical to guide the correct therapeutic decision, that should not include large potassium supplementation, in view of the risk of rebound hyperkalemia.

References

Pompeo A, Nepa A, Maddestra M, Feliziani V, Genovesi N. *Thyrotoxic hypokalemic periodic paralysis: An overlooked pathology in western countries*. Eur J Emerg Medicine 2007; 18: 380-90.
Lin S.H. *Thyrotoxic periodic paralysis*. Mayo Clin Proc 2005; 80: 99-105.
Kung A.W. *Clinical review: Thyrotoxic periodic paralysis: a diagnostic challenge*. J Clin Endocronol Metab. 2006; 91, 7: 2490-5.