Thyrotoxic hypokalemic periodic paralysis as the presenting symptom of silent thyroiditis

Debmalya Sanyal, Shakya Bhattacharjee[1]

Department of Endocrinology, KPC Medical College and Hospital, 1F, Raja Subodh Chandra Mullick Road, Jadavpur, Kolkata, West Bengal, [1]Department of General Medicine, Peerless Hospital, 95/B, Indra Biswas Road, Kolkata, India

Abstract

Silent thyroiditis is a rare cause of thyrotoxic periodic paralysis. The objective was to present a case of silent thyroiditis presenting as periodic paralysis. A 23-year-old man presented with recurrent acute flaccid predominantly proximal weakness of all four limbs. He had a similar episode 3 weeks back. On examination he was found to have hypokalemia secondary to thyrotoxicosis. Clinically there were no features of thyrotoxicosis or thyroiditis. He was initially treated with intravenous and later oral potassium supplementation and propranolol. At 8 weeks of follow-up his thyroid profile became normal and his propranolol was stopped. He had no further recurrence of paralysis. He was diagnosed as a case silent thyroiditis presenting as thyrotoxic periodic paralysis. In cases of recurrent or acute flaccid muscle paralysis, it is important to suspect thyrotoxicosis, even if asymptomatic. Definitive treatment of thyrotoxicosis prevents recurrence.

Key Words

Hypokalemia, oral potassium, periodic paralysis, thyroiditis, thyrotoxicosis

For correspondence:

Dr. Shakya Bhattacharjee, Registrar in General Medicine, Peerless Hospital, 95/B, Indra Biswas Road, Kolkata- 700 037, India.
Email: shakyadoc@rediffmail.com

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Introduction

Thyrotoxic periodic paralysis (TPP) is an uncommon and potentially lethal complication of thyrotoxicosis, mostly associated with Grave's disease. Thyrotoxic hypokalemic periodic paralysis (THPP) has been reported in oriental Asian populations and rarely in other ethnic groups including Caucasians. THPP is characterized by episodic muscle paralysis and hypokalemia.[1] Thyrotoxicosis in TPP may be asymptomatic. We report a case of silent thyrotoxicosis due to thyroiditis presenting as TPP.

Case Report

A 23-year-old gentleman was admitted with acute onset weakness of both upper and lower limbs after rising from bed. Weakness was more in lower limbs and proximally. The patient had a past history of similar transient weakness in proximal muscle of lower limbs, 3 weeks back -- after a period of rest, from which he had a spontaneous recovery within 6 hours. There was no fatigability, muscle ache, dysphagia, dysphonia, and no history of symptoms suggestive of ocular, sensory, cerebellar, cranial nerve or bladder, and bowel involvement. He had no history of hypertension, kidney, thyroid disease, no history of trauma, fever, recent vaccination or medication like diuretics, exogenous thyroid hormone intake. Heavy exercise, carbohydrate load, vomiting, and diarrhea did not precipitate the weakness. No family member had similar symptoms.

On examination his vital signs were normal except a regular heart rate of 102/min; his blood pressure was 122/80 mm of Hg. His neurological examination revealed flaccid weakness of both lower limbs, mainly proximally with a power of MRC grade 2/5, and upper limb power of 3/5. His deep tendon jerks were depressed and plantar reflex was flexor bilaterally. He had no weakness of extraocular muscles, no muscle tenderness. His higher function and sensory and cerebellar functions were within normal limits. His respiratory, cardiovascular, and gastrointestinal examination revealed no obvious abnormalities. There was no goiter or fine tremor. Recurrent episodes of flaccid paralysis followed by quick recovery were suggestive of periodic paralysis.

His routine hematological study was normal except a high first-hour ESR of 68 mm/h. Urine routine examination and blood sugar was normal, without any urinary sugar. Biochemical parameters

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including electrolytes were normal, sodium was 138 mEq/l, and serum calcium was 9.2 mg/dl, except for serum potassium of 1.8 mEq/l (normal -3.5--5). A 24-hour urinary potassium concentration was 10 mEq/day (normal:<20 mEq/day), urinary potassium-creatinine ratio was 1 mEq/mmol (normal <2), and transtubular potassium gradient (TTKG) calculated as (urine/plasma[potassium])/ (urine/ plasma osmolality) was 1.5 (normal <3), respectively. The findings' were consistent with hypokalemic periodic paralysis unrelated to any renal potassium loss. There was no history of familial periodic paralysis, chronic diuretic abuse or gastrointestinal disorders causing potassium loss. Fasting urine pH was 4.4 (nl <5) with arterial ph of 7.41 in arterial blood gas, serum bicarbonate of 24 mmol/l was normal ruling out renal tubular acidosis. Ammonium chloride loading test (0.1 g/kg) was normal with urinary pH of 3.6. Electrocardiogram showed sinus tachycardia and ultrasound abdomen was normal without any nephrocalcinosis.

The thyroid function test (TFT) showed a depressed TSH: 0.03 mU/ml (normal -0.5--4.7) raised free T4: 2.8 ng/dl (normal -0.6--2.0) and T3-200 ng/dL (normal -70--190) though clinically there were no features of thyrotoxicosis. His TSH receptor antibody was 0.5 U/L (normal <1) and TPO antibody 74 IU/ml (normal <35). TSH receptor antibodies were measured by the receptor assay method with a competitive binding radioreceptor assay manufactured by Immunotech, SA, Marseille, France. A ^{99m}Tc pertechnetate thyroid scan revealed decreased uptake of 0.1% (normal 0.4- -1%), consistent with thyroiditis [Figure 1].

His nerve conduction velocity (NCV) was normal but electromyography showed myopathic pattern of weakness with no decrement in muscle action potential on repetitive stimulation and normal creatinine kinase level.

He was diagnosed as a case of hypokalemic thyrotoxic periodic paralysis due to silent thyroiditis. He was treated initially with intravenous and later oral potassium (80 meq/day) supplement besides propranolol in the dosage of 120 mg/day. He recovered completely within 4 days and he was discharged on propranolol 80 mg/day. His serum potassium was 4.0 meq/l at discharge. He was followed up regularly and at the end of 2 months TFT was normal. His propranolol was gradually tapered off and he had no fresh attacks even after 2 months of complete propranolol withdrawal.

Figure 1: ^{99m}Tc pertechnetate thyroid scan showing decreased uptake in thyroid gland

Discussion

Hypokalemic paralysis is an important cause of acute flaccid paralysis, but it has a number of clinical differentials like Guillain Barré syndrome, acute transverse myelitis, myositis poliomyelitis, and porphyria. Hypokalemic paralysis presents as acute flaccid weakness with hypokalemia (serum potassium <3.5 mmol/l), without sensory signs, facial, bulbar, autonomic, bladder and bowel involvement, normal creatine kinase, and NCV. Hypokalemic periodic paralysis can be due to hyperaldosteronism, thyrotoxicosis, renal tubular acidosis (RTA), Gitelman syndrome, barium poisoning, and diarrhea. [2] Recognition of the underlying causes is essential for the appropriate management of patients with hypokalemic paralysis. In an Indian study of 30 patients with hypokalemic paralysis, 43.3% patients had a secondary cause for their condition. RTA and Gitelman syndrome were present in 13.3% and thyrotoxicosis in 16.7% of patients.[3] In another study of 31 patients from South India, secondary hypokalemic paralysis was present in 93.6% of patients. Hypokalemic periodic paralysis was due to hyperaldosteronism in 42% of patients, RTA in 42%, thyrotoxicosis in 6.4%, Gitelman syndrome in 3.2%, and sporadic periodic paralysis in 6.4% of patients.[4] TPP cases in both these Indian studies were due to Grave's disease.

TPP is a rare complication of thyrotoxicosis characterized by episodic muscle weakness due to hypokalemia. There can be recurrent, transient episodes of mild muscle weakness to complete flaccid paralysis.[1] Thyrotoxicosis is common in females but TPP is more common in 20- to 40-year-old male, similar to our case. In contrast, in familial hypokalemic periodic paralysis, a close differential, the first attack occurs before the age of 10 years with equal sex preponderance.[5] The cardinal feature of TPP is symmetrical muscle paralysis beginning in the proximal muscles of the legs.[5] The proximal muscles are affected more severely than the distal muscles of lower limbs like our case. TPP attacks mostly occur in the early morning and lasts for a few hours to several days, with complete recovery in between the attacks. Attacks are commonly precipitated by carbohydrate-rich meals, strenuous exercise followed by rest, trauma, cold temperatures.[5] In our patient, there were no precipitating factors and both the attacks occurred in the early morning. The first attack lasted for few hours with spontaneous recovery; the current attack lasted for 3 days and required intravenous and oral potassium and propranolol. Paralysis of respiratory, bulbar, and ocular muscles has been rarely reported in a severe attack of TPP.[6]

TPP may be rarely the first presenting feature of thyrotoxicosis like our case. Diagnosis may be delayed because of subtleness of features of thyrotoxicosis, similar to our patient, who did not have any feature of thyrotoxicosis or thyroiditis or goiter. TPP is mostly caused by Grave's disease. Our patient had TPP due to silent thyroiditis. Thyroiditis presenting as TPP has rarely been reported.[1,7] Other rarer causes of TPP include toxic

nodular goiter, toxic adenoma, TSH-secreting pituitary tumor, inadvertent iodine excess, and exogenous thyroid hormone.[1]

The hallmark of TPP is hypokalemia,usually less than 3.0 mmol/l as present in our case. Severity of paralysis is correlated with degree of hypokalemia but not with the thyroid hormone level. Hypokalemia is likely due to the overactivity of the Na^+ K^+ ATPase pump triggering the intracellular shift of the potassium causing muscle hyperpolarization.[1,8] Probably thyroid hormones and associated increased adrenergic response stimulate this pump. The level of hypokalemia affects the recovery time. Our case had severe hypokalemia with mild thyrotoxicosis, which was not clinically overt.

In cases of acute attacks of TPP immediate restoration of serum potassium via intravenous or oral route and propranolol is necessary.[9,10] To prevent recurrence of attacks until euthyroidism is achieved, precipitating factors should be avoided; also β-adrenergic blockers like propranolol prevent attacks. Because TPP does not recur once the patient is euthyroid, definitive treatment of TPP consists of the management of thyrotoxicosis by antithyroid drugs, radioiodine therapies or thyroidectomy.[1]

TPP is almost 10 times more common in Asian males than North Americans.[11] A study showed that Polynesians had 159-fold higher risk of TPP compared to white Europeans.[12] There may be a genetic basis of this high susceptibility of TPP in Asians with thyrotoxicosis. An association of TPP with human leukocyte antigen (HLA) subtypes (B5, BW46) and genetic mutations (KCNE3) has been seen.[13] The HLA-DRw8 gene in Japanese patients and A2BW22, AW19B17 genes in Chinese patients have also been associated with TPP.[14,15]

TPP may be a rarely presenting feature of any cause of thyrotoxicosis. Subtleness of clinical features of thyrotoxicosis in TPP poses a definite challenge, thus hampering timely diagnosis. Routine assessment of thyroid function in hypokalemic periodic flaccid paralysis especially in Asian men may be helpful as TPP can remit with definitive control of hyperthyroidism.

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