Thyrotoxic Periodic Paralysis – A Case Report

Paige Robinson, DO, PGY-2 and Steven Nagelberg, MD
Jefferson-Northeast, Philadelphia, PA

HPI/PRESENTATION

A 24-year-old male presented to the emergency room via Emergency Medical Services after he was found down in his home after lying on the floor approximately 5 hours. He had fallen 1-2 hours after eating a large carbohydrate dinner and was unable to get up. He reportedly crawled to the front door and knocked until someone found him and called 911. Earlier that day, he had worked out at the gym. Two weeks before the fall, he had travelled by plane for 5 hours and experienced nausea, vomiting, and myalgias. The myalgias persisted for several days, but were mild and limited mostly to his thighs.

In the Emergency Room, the patient had no complaints other than the persisting weakness. He denied recent illness or vaccination. He did travel to Europe several months ago, and the northeastern region of America more recently. He denied insect bites, rashes, or other skin changes.

Upon further questioning, he reported he had an abnormal thyroid test about 4 years ago, took a supplement for a few months, and when repeat testing was normal, he stopped taking it. He had not followed with a primary doctor since then. He denies other past medical history or past surgical history.

Review of Systems:

- Positive for weight loss of 5 pounds in the past 6 months
- Negative for fever, chills, changes in hearing, congestion, dysphagia, throat pain, cough, dyspnea, chest pain, lower extremity swelling, abdominal pain, diarrhea, dysuria, headache, changes in vision or hearing

Social History: denied tobacco products, denied alcohol, admitted marijuana use for the first time 1 month ago

Physical Examination:

- Vital signs: 130/92 mm Hg, 125 beats/minute, 18 breaths/minute, 100% on room air, 98.4°F
- Sinus tachycardia, thyroid symmetrically enlarged to 40g without overlying bruit, abdomen soft with bowel sounds, profound flaccid paralysis (see Figure 1), sensation intact to light touch, 2+ reflexes, no tremor or abnormal movement, no dysarthria, AAOx3

Physical Examination

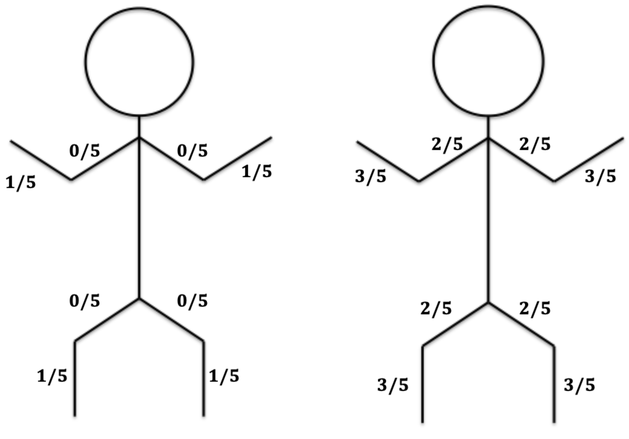

Figure 1. Muscle strength examinations on initial presentation to the Emergency Room (left) and approximately 4 hours later, after infusion of 80 mEq of potassium chloride (right).

Laboratory Results

Basic Metabolic Panel:

140	106	14	114
1.9	23	0.68	

Complete Blood Count:

	16.5	
13.4		377
	49.2	

Thyroid Function Tests:

TSH	<0.01
Free T4	2.99

VBG:

7.44	32	62	22.3

Thyrotoxic Periodic Paralysis

Common Characteristics of Thyrotoxic Periodic Paralysis[1]	
Demographic	Predominantly young men (20-40 years old) of Asian ancestry (Chinese, Japanese, Vietnamese, Filipino, Korean)
Presentation	Recurrent transient episodes of muscle weakness from mild to complete flaccid paralysis; proximal greater than distal, lower greater than upper; rarely respiratory/bulbar/ocular; never bowel/bladder
Timing	Few hours after heavy meal or early morning upon waking, sometimes preceded by milder symptoms
Trigger	Carbohydrate-rich meal, sweets, alcohol, strenuous exercise
Labs[2]	Hallmark is hypokalemia 1.9 +/- 0.5 mmol/L Hyperthyroidism Hypophosphatemia 0.61 +/- 0.23 mmol/L [1.1-2.4 mg/dL] Hypomagnesemia 0.60-0.80 mmol/L [1.5-1.9 mg/dL]
Pathogenesis[3]	Increased sodium-potassium-adenosine triphosphatase (Na-K ATPase) pump activity causing hypokalemia Thyroid hormones bind thyroid hormone-responsive elements (TREs) upstream of Na-K ATPase activity via transcriptional and posttranscriptional mechanisms Oral glucose challenge causes exaggerated insulin response, further stimulating Na-K ATPase activity
Treatment	Potassium repletion. Recommend slow rate of correction (10mmol/h) to avoid overcorrection except with cardiopulmonary complications. Nonspecific beta blockade (propranolol) Treatment of hyperthyroidism (methimazole)
Prevention	Avoid triggers such as heavy carbohydrate intake, high-salt diet, alcohol ingestion, undue exertion until thyrotoxicosis resolves.

Table 1. Common characteristics of Thyrotoxic Periodic Paralysis, including demographic, presentation, timing, triggers, laboratory abnormalities, pathogenesis, treatment, and prevention.

Discussion: Differentials and Follow-up

Hypokalemic Periodic Paralysis – no family history

Renal Tubular Acidosis – no acidosis on laboratory tests

Bartter's Syndrome – no alkalosis on laboratory tests

Gitelman's Syndrome – no alkalosis on laboratory tests

Primary Hyperaldosteronism – no hypertension; normal renal and aldosterone levels

The patient had complete resolution of his symptoms and normalization of his potassium level after 24 hours after being started on potassium repletion (oral and intravenous), propranolol, and then methimazole.

Unfortunately, the patient did not keep the scheduled follow-up outpatient endocrinology appointment but the tentative final diagnosis was Thyrotoxic Periodic Paralysis due to Graves' disease, which is the most common association.

References

1. Kung, A. 2006. "Clinical review: thyrotoxic periodic paralysis: a diagnostic challenge." *The Journal of Clinical Endocrinology & Metabolism* **91** (7): 2490-2495.
2. Manoukian, M.A., Foote, J.A., Crapo, L.M. 1999. "Clinical and metabolic features of thyrotoxic periodic paralysis in 24 episodes." *Arch Intern Med* **159**: 601-606.
3. Chan, A., Shinde, R., Chow, C., Cockram, C., Swaminathan, R. 1991. "In vivo and in vitro sodium pump activity in subjects with thyrotoxic periodic paralysis." *BMJ* **30**: 1096-1099.