CLINICAL VIGNETTE

Rhabdomyolysis after Low-Intensity Exercise

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Introduction

Rhabdomyolysis is a syndrome of muscle necrosis and subsequent shift of intracellular components to the intravascular system with potentially serious consequences including electrolyte derangements and acute renal failure. When detected and treated early with interventions as simple as intravenous fluid hydration, rhabdomyolysis has an excellent prognosis for recovery with rare recurrence. Although most commonly associated with drug toxicity, immobilization, trauma, and extreme exertion[1], there are a wide variety of less well-understood triggers for this complicated cellular process. We present a 32-year-old woman with recurrent rhabdomyolysis after low-intensity exercise.

Case Report

A 32-year-old female with multiple medical problems including a history of exercise-induced rhabdomyolysis requiring hospitalization (muscle biopsy negative), depression, anorexia nervosa, gastroparesis, and hypothyroidism presented to an urgent care facility with four days of nausea and progressive bilateral proximal arm pain that began after repeatedly lifting five-pound weights. Laboratory studies were drawn, and she was discharged home after receiving Toradol, Phenergan, and one liter of normal saline. The following day her laboratory studies were notable for creatine kinase (CK) of 8800, and she noted worsening arm pain and nausea, prompting reassessment in the emergency room. She denied any recent illness, dark-colored urine, or changes in medications.

Physical examination revealed temperature 36.9°C, blood pressure 129/80 mm Hg, pulse 86, and oxygen saturation 100% on room air. She was in no distress but had bilateral proximal upper extremity tenderness with non-pitting edema with mildly decreased strength and range of motion secondary to pain. Labs were significant for CK 7782, AST 135, ALT 86, and TSH 0.097. Urinalysis, complete blood count, basic metabolic panel, and fasting lipid panel were within normal range. She was admitted for rhabdomyolysis, treated with a normal saline infusion as well as intravenous Lasix, antiemetics and narcotics, and discharged after four days.

Several weeks after discharge, the patient was again hospitalized for a similar episode of rhabdomyolysis occurring after minimal exertion. Upon discharge, she was referred to a neuromuscular specialist. The initial impression based on a history of recurrent rhabdomyolysis, negative muscle biopsy, and normal CK between episodes was carnitine palmitoyltransferase II (CPT2) deficiency. However, sequencing was negative for any deleterious point mutations, and the patient was diagnosed as having a nonspecific dynamic myopathy with exertional myalgias and myoglobinuria.

Discussion

As a syndrome of skeletal muscle cell damage, rhabdomyolysis has a wide range of causative factors, all sharing a final common pathway of adenosine triphosphate (ATP) depletion and increased intracellular calcium, which leads to muscle cell death and the release of creatine kinase and heme-containing myoglobin into damaged tissues.[2] Most instances occur in the context of a one-time trigger such as trauma, compression, prolonged immobilization, toxin exposure, or infection; however, recurrent episodes may be due to an underlying pathology such as hypothyroidism, inflammatory disorders such as polymyositis, and metabolic myopathies of lipid and glycogen metabolism.

Diagnosis of rhabdomyolysis has both clinical and laboratory components and is typically marked by proximal myalgias, muscle weakness, elevation of serum CK, and myoglobinuria; gastrointestinal symptoms and fever may also be present.[3] CK levels peak within one to three days of injury and are typically at least five times the upper limit of normal (at least 1000 international units/L). Myoglobinuria is evidenced by a urine dipstick that is positive for heme and pigmented granular casts but negative for red blood cells. Hyperkalemia, hyperphosphatemia, hyperuricemia, and hypocalcemia are also common consequences of cellular injury;[1] thus, it is reasonable to obtain levels of these electrolytes in addition to an electrocardiogram to assess for related arrhythmias. Diagnosis may be complicated as patients may not present with muscle pain that serum, creatine, kinase, and myoglobin may be increased in context of normal exercise, and that

myoglobin has such a short half-life that serum and urine levels may normalize within six to eight hours.

The priority when treating rhabdomyolysis is the prevention of secondary complications, primarily myoglobinuria-induced nephropathy and electrolyte disturbances. Acute renal failure is uncommon at CK levels under 5,000 units/L and is best averted with aggressive fluid resuscitation in the form of isotonic saline at a rate of 1 to 2 L/hour until the plasma CK is below 5,000 unit/L, and the urine dipstick is negative.[4] Occasionally, intravenous bicarbonate infusion and allopurinol are given to treat metabolic acidosis and hyperuricemia, respectively. Loop diuretics may be helpful in the rare context of fluid overload but carry the risk of worsening existing hypocalcemia. Severe electrolyte derangements may require hemodialysis.

Recurrence in the context of minor triggers, such as recent illness, fasting, or mild exertion, is uncommon and suggests an underlying metabolic or inflammatory myopathy. Metabolic myopathies in particular are common in patients with recurrent, dynamic exertional myalgias and rhabdomyolysis, and span a wide range of defects in the metabolism of lipids and glycogen, as well as mitochondrial disorders.[5] These pathologies can be diagnosed with further studies including serum and urine metabolic markers, electromyography, and muscle biopsy.

Conclusion

In the aforementioned patient with multiple medical problems and recurrent rhabdomyolysis in the context of mild exertion, it is important to maintain a broad differential diagnosis including drug toxicity, endocrine, metabolic, and inflammatory myopathies in order to recognize these rare but serious conditions.

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