CLINICAL VIGNETTE

Exertional Rhabdomyolysis

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A 51-year-old male presented with excruciating leg cramps two days following an intensive, long distance bicycle ride. The patient is an avid recreational cyclist and regularly rides with a group of cyclists over 40 miles in a day. He reported similar intermittent episodes of severe leg cramps, which limit his long distance cycling over the past several years but this current episode is more severe and prolonged. Approximately 3 years ago, he was found to have an elevated creatine kinase (CK) of 1131 U/L on laboratory testing following a similar episode. At that time, the patient was on atorvastatin for hypercholesterolemia, so statin therapy was promptly discontinued. Despite the cessation of medication and normal CK levels on repeat testing, he continued to have the severe leg cramps with his cycling. Additional work-up including an ankle arm index was normal. He tried various preventative measures such as adequate hydration and supplemental potassium without significant relief. He denied any dark urine or gross hematuria. On physical examination, he had moderate bilateral calf muscle tenderness but no other abnormal findings. A repeat CK was high at 1994 U/L. His urinalysis was normal. There was no sign of any renal injury. He was instructed to hydrate orally and refrain from prolonged cycling. His CK again normalized within 1 week.

Rhabdomyolysis is characterized by muscle necrosis, and the release of myoglobin and other cellular muscle contents into the circulation. Exertional rhabdomyolysis is marked by the muscle breakdown and necrosis after engaging in non-traumatic, physical activity.[1] It is not a common condition with an annual incidence of 7-8 cases per 10,000 patients.[2]

Intracellular calcium has been implicated as a key factor in the pathogenesis of exercise-induced rhabdomyolysis. During exercise, the depletion of adenosine triphosphate (ATP) leads to the dysfunction of the Na-K ATPase. The increased level of intracellular sodium activates the Na-Ca exchanger to facilitate the entry of calcium into the muscle cells.[3] This influx of calcium results in a cascade of events including activation of proteases, contraction of skeletal muscles, dysfunction of mitochondria, and production of reactive oxygen species, which ultimately contributes to death of skeletal muscle cells.[4]

Various sports have been associated with exertional rhabdomyolysis, including football, running, swimming, bodybuilding, as well as group indoor stationary cycling known as spinning.[1,3,5] CK levels peak earlier and are less extreme in endurance than in eccentric resistance type of exercise.[6] Predisposing factors include use of drugs, specifically statins and nonsteroidal anti-inflammatory medications, concurrent viral infections, sickle cell trait, history of myopathy, or concurrent history of dehydration or shock.[6] Another identifiable risk is the continuation of exercise beyond the point of fatigue, as in a group setting, competition, or extreme training.[2]

The diagnosis of exertional rhabdomyolysis is based on the clinical history, physical exam, and laboratory finding. Clinically, the patient may have pain, weakness, and swelling of the affected muscles as well as dark colored urine after engaging in physical activity. Initial screening may be performed with a simple urine dipstick test.[7] If the dipstick is positive for blood, the diagnosis should be confirmed with a urinalysis and the measurement of the serum CK level. The presence of blood without any red blood cells suggests myoglobinuria. CK elevation is the main laboratory criterion for diagnosis of rhabdomyolysis, which is typically defined by a plasma CK level more than 5 times the upper limit of the reference range.[6] However, there is no consensus on the degree of CK elevation, especially given CK levels are often found to be high post strenuous exercise.[2] The CK levels in exertional rhabdomyolysis have been observed to drop within 6-12 days.[3]

The major complications of rhabdomyolysis include acute renal failure, electrolyte derangements, disseminated intravascular coagulation, lactic acidosis, and compartment syndrome.[7] These are all rare with exertional rhabdomyolysis mostly likely because the patients tend to be young and healthy.[2] If acute renal failure develops, full recovery is expected in most patients with exertional rhabdomyolysis.[2] Early intervention involves rest; cessation of strenuous exercise; aggressive hydration; and close monitoring for metabolic, renal, or hematologic complications. Education on proper hydration, safe exercise practices, and rest can help to prevent future episodes.[4]

The physician should maintain a high index of suspicion for acute exertional rhabdomyolysis in patients who present with symptoms of an overexertion injury, most commonly pain and swelling in the affected muscles.

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Submitted May 16, 2016