CLINICAL VIGNETTE

Rhabdomyolysis – A Case for Botox as Inciting Factor

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Introduction

Rhabdomyolysis is a state of muscle injury that can lead to several forms of systemic insult, with the most important being acute kidney injury, electrolyte imbalance, and disseminated intravascular coagulation. The systemic complications associated with rhabdomyolysis results from the leakage of muscle intracellular components into the blood stream. Several etiologies and conditions, such as trauma and drug use, can lead to rhabdomyolysis.[1] It is important to suspect and prevent rhabdomyolysis and stop the resulting complications.

Onabotulinumtoxin A (Botox) is used for chemical denervation in cases of hyperhidrosis unresponsive to drysol or iontophoresis. It is a frequently used as a treatment to relax spastic muscles by preventing acetylcholine release at the motor nerve endings. Prior studies have shown that BTX-A injections cause muscle atrophy and deterioration in target and non-target muscles. Ideally, muscles should fully recover following BTX-A treatments, so that muscle strength and performance are not affected in the long-term. One study concluded that neither target nor non-target muscles fully recover within six months of a BTX-A.[2]

Clinical Case

A 53-year-old Air Force officer developed shortness of breath, palpitations and dizziness during a 1.5 mile run. The patient's work out was part of annual physical fitness testing for the Air Force which he had participated for nearly 10 years. Oral rehydration was started and 911 was called. In the Emergency room, he reported he had hydrated as in prior years as he normally does prior to physical therapy with biking. The following laboratory results were obtained, white blood count 18.1k/uL, hemoglobin 16g/dL, hematocrit 48.3%, platelet 236k/uL, bun 13mg/dL, creatinine 1.5mg/dL, SGOT 30 u/L, prothrombin time of 60.

Echocardiogram showed normal sinus rhythm at 91 bpm. He was further hydrated and sent home. At home, he continued to have diffuse muscle aches and was seen by his primary care physician the next day. His physical examination was notable for slight diffuse muscle weakness but was otherwise unremarkable. Labs included: Na 138 mmol/L, K 3.7mmol/L, creatinine of 1.16mg/dL, Bun 28 mg/dL, Glucose 104 mg/dL, eGFR 16 mL/min/m^2, creatine kinase 1717 u/L, white blood count 13.9k/uL, hemoglobin 15.4 g/dL, hematocrit 45.6%, and platelets 218k/uL. There was significant occult blood in urine with red blood cells 3-10/hpf.

He was admitted for further evaluation and treated with intravenous hydration. Ultrasonography showed 12 cm long kidneys and questionable column of Berlin bilaterally. Computerized tomography scan of the abdomen showed no obstruction, and a normal gall bladder, aorta, and liver. There was moderate sigmoid diverticulosis with very subtle stranding in the right lower quadrant of the abdomen. His acute renal failure was secondary to rhabdomyolysis. Repeat laboratory results three days later showed creatine kinase of 2770u/L, potassium 5.1 mmol/L, bun 29mg/dL, creatinine 2.06 mg/dL, glucose 103 mg/dL, eGFR 36 mL/min/m^2, urinalysis 2+ blood and RBC 3-10/hpf. Eight days after his physical training, the laboratory results showed improving creatine kinase to 406 u/L, improving eGfr to 59 mL/min/m^2. Nephrology concluded that his renal failure was "due to acute renal failure due to rhabdomyolysis myoglobinuria brought on by exercise and probable dehydration, polyuria related to poor concentration capacity from the recovering acute tubular necrosis (ATN)." The patient's symptoms completely resolved and he resumed physical fitness activities without problem.

Discussion

Rhabdomyolysis is injury to the skeletal muscle fibers which can cause muscle necrosis and death. It occurs in about 26,000 people a year in the United States.[3] The first description of rhabdomyolysis was following an earthquake in 1908. Insight into mechanism were made during the Blitz in London in 1941.[4] It is a significant problem for those injured in earthquakes.[4] Several studies found botox[5-8] weakening skeletal muscles and some report up to 6 months before full recovery. Some studies even go further to imply systemic after-effects and generalized muscle weakness though some refute this premise.[2] Our patient was in the Air Force and participated in physical fitness for several years. He had a normal routine of training before taking these tests to include biking, walking and running. He also had been on Botox therapy for hyperhidrosis for years. This presentation was the only occasion in which he had the injection was within six months of a physical fitness test. It is the only known variation to his regular routine. It is possible the residual weakness caused by Botox, added to the rigorous training culminated in the decompensation observed when the three

aspects of the fitness test (abdominal crunches, sit-ups and one and half mile run) were done consecutively.

In rhabdomyolysis, the damaged muscle cells released into the blood stream are harmful to the kidneys and cause kidney failure. The myoglobin excreted in the kidneys accounts for the significant "occult blood" without significant RBC's noted on urinalysis. Our patient exhibited most of the symptoms of rhabdomyolysis including: muscle pains, weakness, confusion, tea-colored urine (myoglobin) and irregular heartbeat.[3] It is essential that the condition is treated quickly as it can result in death and permanent renal failure. Diligent follow up was essential in the positive outcome as Emergency room labs were within normal limits during his initial evaluation.

More studies need to be done to highlight the possible long-term dangers of Botox. These injections are usually done routinely and never considered a problem in relation to physical activities and rhabdomyolysis. Our patient had Botox injections five months prior to his event and, as some studies suggest, neither target nor non-target muscles fully recover within six months of a BTX-A treatment protocol,[2,5] which may have contributed to this patient's presentation.

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