

# A case of rhabdomyolysis-induced acute tubular necrosis requiring hemodialysis

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## Introduction:

### What is rhabdomyolysis?

Rhabdomyolysis is breakdown of skeletal muscle characterized by muscle necrosis and release of muscle constituents into the circulation. The typical presentation is a triad of muscle pain, weakness, and dark urine. Other typical presenting symptoms include: fever, nausea, and vomiting. Creatinine kinase levels are elevated and myoglobinuria may be present. It can be caused by traumatic or nontraumatic injury (seizures, ischemia, drug reactions, infection, overexertion, dehydration, etc). Relatively common complications include kidney injury, compartment syndrome, and cardiac arrhythmias.

### Pathophysiology:

The hallmark of rhabdomyolysis is elevation of creatinine kinase (CK) or other muscle enzymes. These enzymes induce direct damage to the nephron (known as pigment nephropathy) which precipitates acute tubular necrosis and acute kidney injury. Elevated potassium released from muscle tissue can lead to cardiac arrhythmias and elevated lactic acid can present as an acidosis. A second mechanism of kidney injury is hypovolemia which causes prerenal azotemia.

### Treatment:

Adequate fluid resuscitation and correction of electrolyte imbalances are the goals of treatment. In cases of renal failure, hemodialysis may be required to clear muscle enzymes from the bloodstream.

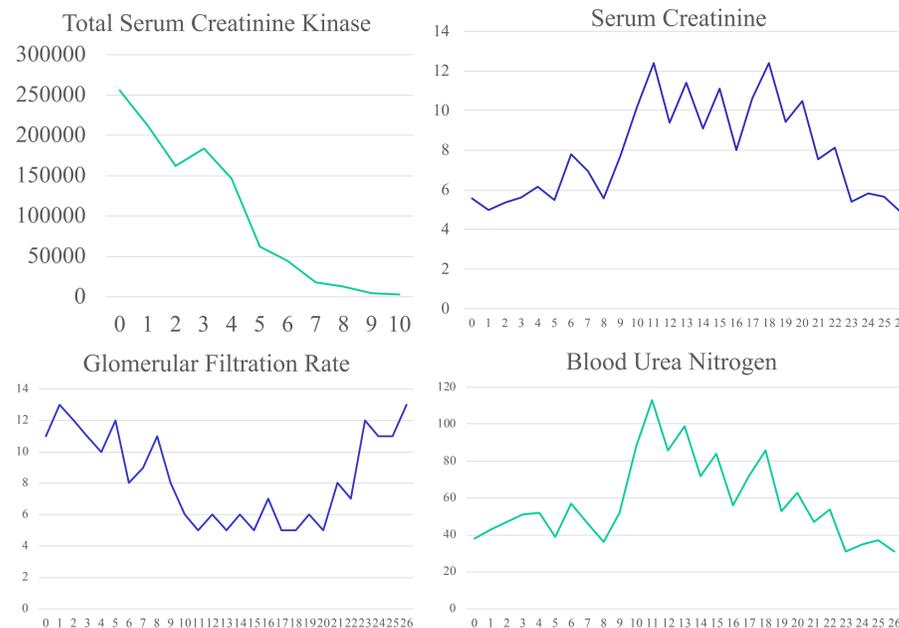
This is a case of rhabdomyolysis with such severity that multiple courses of hemodialysis was required.

## Hospital Course:

Patient is a 54 year-old male with PMHx of significant alcohol and drug abuse, hypertension, bipolar disorder, schizoaffective disorder, and PTSD who initially presented to the ED with weakness.

In the ED, labs were: potassium of 6.7, BUN of 38, creatinine of 5.57, creatinine kinase of 255,804, AST 2,714, and ALT 616. CIWA score was 6. Patient was initiated on IV fluid resuscitation and treated for hyperkalemia. Acute tubular necrosis from rhabdomyolysis was suspected so hemodialysis was initiated. Over a course of about 3 weeks, patient received multiple courses of dialysis. Total creatinine kinase gradually decreased over time. BUN/Cr also returned to baseline.

Patient also presented with buttock pain, which was initially a red, raised bilateral lesion and generalized body aches. Along with leukocytosis, patient was initiated on IV antibiotics for cellulitis. Patient's home medication for hypertension was discontinued due to kidney injury. Patient was discharged with a tunneled catheter for continuation of dialysis in the outpatient setting.



## Discussion:

### What caused this patient's rhabdomyolysis?

Though the etiologies remain multifactorial, the most likely causes are from a combination of severe dehydration from alcohol abuse and crush injury from prolonged immobility on the floor. Wounds resembling pressure ulcers on his buttocks point towards the likelihood of his prolonged immobility. He was potentially withdrawing on admission with a CIWA score of 6. Patient also has an extensive history of previous alcohol intoxication/withdrawal ED visits. Differential causes of this patient's rhabdomyolysis include infection or alcohol withdrawal seizure.

### Why did this patient require hemodialysis?

According to the literature, at an eGFR less than 5 mL/min/1.73m<sup>2</sup>, hemodialysis should be initiated to clear creatine kinase. When eGFR is between 5 and 15 mL/min/1.73m<sup>2</sup> with signs or symptoms of end-stage kidney disease, hemodialysis should be initiated to clear creatinine kinase. Absolute indications for dialysis without delay include uremic pericarditis, pleuritis, or encephalopathy. Other common indications include volume overload, declining nutritional status, fatigue, mild cognitive impairment, malaise, refractory acidosis, hyperkalemia, and hyperphosphatemia.

### References:

Miller, Marc MD, et al. *Causes of rhabdomyolysis*. UpToDate. Updated December 9, 2020. Accessed March 4, 2021. <https://www.uptodate.com/contents/causes-of-rhabdomyolysis>

Agabegi, Steven S. Agabegi, Elizabeth D. *Step Up to Medicine*. Fourth Edition. Wolters-Kluwer; 2016.