## CLINICAL VIGNETTE

# Rhabdomyolysis: An Unclear Cause

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### *Clinical Case*

A 34-year-old female with a history of ventricular septal defect was initially seen for severe muscle pain in her legs two days following an exercise spin class. On examination, she had swelling of both proximal lower extremities with muscle tenderness and preserved pulses and sensation. Laboratory evaluation showed an elevated creatine kinase (CK) of 6525 with an AST/ALT elevation of 1117/300 respectively. The patient was instructed to increase her hydration, avoid strenuous activity, and return for repeat blood work in one day. The follow-up labs showed worsening muscle injury with a CK total of 192500 and AST/ALT of 1919/583. She was also complaining of dark colored urine, weakness in both legs, and impaired ambulation. She denied any fevers, recent infections, or illicit drug use. Of note, she reported consuming an herbal drink called nopalea periodically in the three weeks prior. She was admitted to the hospital for more aggressive treatment.

She was treated with aggressive intravenous hydration with normal saline to maintain a high volume urine output of 200-300 cc/hour. Her AST/ALT, renal function, and CK levels were monitored daily with gradual improvement and no evidence of kidney injury. By hospital day #6, her CK level was nearing 10,000 and was discharged home. She reported pain and weakness for a few more days but eventually made a full recovery.

### *Discussion*

Rhabdomyolysis is a syndrome of muscle injury that ranges from mild, asymptomatic elevations in creatine kinase to life threatening electrolyte disturbances and kidney injury. Timely diagnosis and treatment are crucial for minimizing the risk of complications. The etiology is often categorized as traumatic or non-traumatic.[1] Common traumatic causes include crush injuries and prolonged immobilization. Non-traumatic causes include heat stroke; extreme exertion, such as running a marathon; seizures; inherited mitochondrial disorders; illicit drug use; prescription medications; malignant hyperthermia; neuroleptic malignant syndrome; and both viral and bacterial infections.[1] Implicated illicit drugs include alcohol, opioids, amphetamines, cocaine, LSD, and PCP. Prescription drugs that have been associated with rhabdomyolysis include statins, colchicine, anti-psychotics, and anesthetics.

The common clinical presentation of rhabdomyolysis is muscle pain, weakness, and dark colored urine. Patients often describe pain in the lower extremities and have objective weakness on examination.[2] The diagnosis is typically made by history and the laboratory finding of a serum CK five times the upper limit of normal. The secondary manifestations of severe muscle injury can be life-threatening and include electrolyte disturbances and acute renal failure. Hyperkalemia, hyperuricemia, and hyperphosphatemia can occur from destroyed cells. Calcium levels in the bloodstream typically decline. Hyperkalemia is potentially life threatening given the risk of cardiac dysrhythmias and serum potassium levels should be monitored regularly and treated aggressively. A subset of rhabodmyolysis patients, about 7-10%, will also develop acute renal failure.[3] Survival is high when appropriate treatment is initiated early. Theorized mechanisms of renal injury include tubule obstruction from precipitated myoglobin, direct tubule injury by myoglobin, and renal vasoconstriction.[3] Drenth et al[4] showed that higher total CK levels at admission and peak correlated with increased risk of renal injury. Additionally, their cohort of survivors that required dialysis from acute renal failure recovered and none developed chronic dialysis dependence.

The mainstay of treatment for hospitalized patients with rhabdomyolysis includes aggressive volume resuscitation and correction of electrolyte disturbances. The target urine output is generally 200cc/hr; the rate of normal saline administered is adjusted to reach this goal. Some animal studies have shown benefits to alkalization of the urine with sodium bicarbonate, but this remains controversial.[3] Mannitol can also be used as an osmotic diuretic to aid in elimination of nephrotoxic agents and expand circulating volume.[3] In rare instances, renal replacement therapy with dialysis is required for correction of hyperkalemia, acid-based disturbances, and/or anuria with resultant volume overload.

### *Conclusion*

The patient underwent outpatient testing for inherited myopathies, metabolic testing, and EMG, all of which were normal. While the exact etiology for her severe rhabdomyolysis was never officially discovered, one possible explanation is the nutritional supplement consumed along with vigorous exercise. According to the manufacturer's website, the nopalea juice supplement appears to contain prickly pear cactus extract, vitamins, fruit extracts, and various enzymatic supplements. While none of the ingredients appear to have a clear link with rhabdomyolysis, it is possible the patient had an unexpected reaction. Notably, she has resumed normal

levels of physical activity without recurrence and can continue to do so without restriction.

## REFERENCES


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