

Rhabdomyolysis

Diagnosis and Management
Pediatric Emergency Medicine

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PGY-1

A 16 year old male presents to the ER after a MVA. He was brought in by EMS after a prolonged extraction from the vehicle, although he appears alert and no head injury is reported. The patient is complaining of some mild muscle soreness in his thighs and cramping in his calves. He has a laceration over his right thigh and some bruising over his thighs bilaterally. His Heart rate is 128, Blood pressure is 102/74, Respiratory rate is 23. You notice dark urine coming out of his Foley. What is the best initial management for this patient?

Large volume of Normal Saline and Furosemide

Large volume of Normal Saline and Bicarbonate

Large volume of Normal Saline

Immediate Dialysis

Answer:

A. Large volume of Normal Saline and Bicarbonate

- **Characteristic triad in rhabdomyolysis:** muscle pain, weakness, and dark urine.
- **Remember:** More than half of patients may not report muscle symptoms and others can have very severe complaints.
- **Affected muscles:** proximal muscles such as the thighs, shoulders, but the lower back and calves are also commonly involved.
- Patients may complain of **cramping or stiffness**.
- **Severely affected patients:** altered mental status, fever, malaise, tachycardia, nausea/vomiting, and abdominal pain.
- Altered mental status is usually more related to an underlying etiology such as trauma, toxins, drugs, or electrolyte abnormalities.

- ❑ **Management of rhabdomyolysis** focuses on treatment of the cause, preventing renal failure, and management of life-threatening or limb complications.
- ❑ The main principal in managing a patient presenting with rhabdomyolysis is **aggressive fluid resuscitation** to prevent myoglobin-induced renal failure.
- ❑ Patients are often dehydrated secondary to fluid sequestration in the affected muscles.
- ❑ **Early fluid resuscitation** is recommended, especially in patients who have had **prolonged extraction times**.

- **Normal saline and sodium bicarbonate are recommended versus normal saline alone.**
- Normal saline leads to an increase in chloride ions and can cause an iatrogenic metabolic (hyperchloremic) acidosis, which increases myoglobin precipitation in acidic urine.
- Urine alkalization with sodium bicarbonate is thought to limit redox recycling of myoglobin and help prevent myoglobin induced acute renal failure.
- Furosemide is not suggested; although it does increase urine flow, no studies show any benefit for use in patients with rhabdomyolysis.
- Dialysis is reserved for uncorrectable metabolic acidosis, life-threatening hyperkalemia, and other electrolyte disturbances despite medical management.

The patient has an elevated CK, which is the hallmark of diagnosing rhabdomyolysis. It correlates with the degree of muscle damage and is elevated within the first twelve hours, peaks during the first three days, and normalizes around five days after the injury. What other diagnostic lab findings would you expect to find in a patient with rhabdomyolysis?

- A. Hypokalemia and early hypocalcemia
- B. Early hypercalcemia and elevated myoglobin
- C. Hypophosphatemia and hypokalemia
- D. Hyperkalemia and late hypercalcemia
- E. Increasing myoglobin after 24 hours and hyperkalemia

Answer:

D. Hyperkalemia and late hypercalcemia

- Rhabdomyolysis causes increased CK, increased myoglobin, hyperphosphatemia, hyperkalemia, early hypocalcemia, and late hypercalcemia.

CK is the hallmark of rhabdomyolysis. It correlates with the degree of muscle injury. It rises a few hours later than myoglobin and reaches its peak at 24 hours.

In the past, myoglobin was used to diagnose rhabdomyolysis because it was the **first to peak**. However, it has a very short half life of 1-3 hours and is completely absent after 24 hours. Myoglobin would not be increasing after 24 hours.

Hyperkalemia and hyperphosphatemia occurs due to the **release of intracellular components from damaged muscle cells**.

Early hypocalcemia occurs because the calcium remains sequestered in the damaged muscle cells. Late hypercalcemia occurs due to **mobilization of calcium that was trapped** in the damaged muscle

- References:
- Uptodate.com
 - “Clinical manifestations and diagnosis of rhabdomyolysis.”
 - Author: Marc L. Miller, M.D.
- Rosen's Emergency Medicine - Concepts and Clinical Practice, 8th ed.
 - Chapter 127: Rhabdomyolysis.