

Muscle Injury Due to Vigorous Heavy Weightlifting

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Abstract

Rhabdomyolysis is a life threatening condition with various end organ damage like acute kidney injury, disseminated intravascular coagulation and others. In this case report, we discuss a patient who presented to the Emergency department after developing severe right gluteal and lower limb pain after having a weightlifting session, the diagnosis and management.

Keywords: Rhabdomyolysis; Acute Kidney Injury; Dark Brown Urine; Weightlifting; Creatine kinase.

INTRODUCTION

Exercise induced rhabdomyolysis is a life threatening condition caused by severe physical exertion leading to breakdown of skeletal muscles and releasing the intracellular (intramuscular) components like creatine kinase and myoglobin into the systemic circulation.^{1,2} Exertional rhabdomyolysis has been an increasing disorder seen in the young population being admitted to the hospital.³ Exercise induced rhabdomyolysis generally occurs following sudden and excessive muscle contractions, intense physical activity or prolonged physical activity.¹ The

symptoms of presentation range from mild muscle soreness, headache, fatigue to life threatening conditions like compartment syndrome, acute kidney injury, coagulopathy. The usual presentation to the emergency department is dark coloured urine and muscle soreness. In this case report, we discuss peer pressure induced excessive weight lifting for muscle growth that leads to severe muscle breakdown and kidney injury.

CASE

A 19 year old young male individual was brought to the emergency department with complaints of severe right gluteal and lower limb pain since the last 2 days, gradual onset and progressive in nature with history of brown discoloration of the urine since morning. The patient was lethargic and dehydrated, bilateral lower limb swelling was present (more on right side) and severe tenderness on palpation but there was no focal neurological deficit. Spot urine dipstick was done which immediately clinched the diagnosis of rhabdomyolysis. Further history revealed the patient had recently started taking steroid medications and started having strenuous

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weight lifting sessions for bodybuilding and muscle growth. He started having leg pain after a strenuous weight lifting session at his gymnasium ("leg day") 2 days back, which increased over the last 2 days.



Immediate fluid resuscitation was started and pain medications were given. The patient was admitted in the critical care unit for further management. The blood report of the patient was suggestive of elevated creatine kinase, urea and creatinine, urine analysis was suggestive of presence of myoglobin. The pain sensation subsided even after administration of opioids but even after adequate fluid resuscitation, the kidney function deteriorated. The kidney functions deteriorated over the next 2 days and the patient was taken up for hemodialysis. After 4 cycles of hemodialysis,



the patient's condition started improving. Patient was started with higher antibiotics in the fear of secondary bacterial infection, which could further deteriorate the patient's condition.

After 7 days of admission and vigorous management with fluids, antibiotics and

hemodialysis, the patient started improving. Patient was shifted to the general ward for observation and physiotherapy sessions were started to mobilize the patient. The patient was discharged home with further physiotherapy sessions. Over the weeks and regular follow up, the patient's condition improved.

DISCUSSION

The patient was diagnosed with rhabdomyolysis leading to acute kidney injury. The term rhabdomyolysis means "rod shaped (rhabdo) muscle (myo) breakdown (lysis)". The major contributing factors for exertional rhabdomyolysis include poor body fitness combined with high intensity, prolonged duration and weight bearing exercise.^{1,4} Other factors include hot environment, dehydration, genetic mutations (e.g., Caveolin-3)⁵, drugs like statin⁶, obesity and use of tobacco. Recent studies have shown sickle cell trait has increased risk of exercise induced rhabdomyolysis, even with minor trauma.⁷

Intense physical exercise depletes the adenosine triphosphate (ATP) required by the pumps and channels regulating the calcium in the sarcoplasmic reticulum, which in turn, results in elevated levels of calcium in muscle cells.¹ The elevated levels of calcium increase the activity of proteases and phospholipases A2, leading to damage of the cytoskeleton system of the cell.¹ This facilitates muscle membranes to tear apart, followed by an increase in the cell membrane permeability, release of the intracellular proteins (including CK and myoglobin). This leads to initiation of inflammatory response and necrosis of the cell. The muscle cellular membrane dysfunction and inflammatory reaction leads to an increase accumulation of intracellular fluids and an increase in muscle compartment pressure, and, thus, worse muscle cell ischemia.⁸ Acute kidney injury is caused by renal vasoconstriction secondary to myoglobin deposition, hypovolemia, circulating endotoxins and cytokines and increased sympathetic tone.¹ Myoglobin damages the kidney further by direct toxicity in the proximal convoluted tubules and formation of casts in the distal convoluted tubules.⁹

Treatment of exercise induced rhabdomyolysis includes infusion of crystalloid fluids to achieve urine output between 200 and 300 mL/h.¹⁰ Sodium bicarbonate should be administered to ensure urine pH is higher than 6.5 to reduce myoglobin induced kidney damage.⁹ However, recent evidence suggests urinary alkalization is more effective

than hydration in reducing kidney damage.¹¹ If compartment syndrome is suspected, prompt intracompartmental pressure should be evaluated and, if necessary, emergency fasciotomy should be performed to prevent necrosis of the muscles.^{9,12}

CONCLUSION

The prevalence of exercise induced rhabdomyolysis has increased in recent times due to the demand of rapid bodybuilding and weight lifting for muscle growth. The incidence of exertional rhabdomyolysis is on rise. This case report has described the presentation and various complications associated with rhabdomyolysis and their management. Some protective measures can be warming-up and periodic repetition of eccentric exercises, maintenance of hydration can reduce the incidence of rhabdomyolysis in exercising individuals.

REFERENCES

1. Exercise-induced rhabdomyolysis mechanisms and prevention: a literature review. Kim J, Lee J, Kim S, Ryu HY, Cha KS, Sung DJ. *J Sport Health Sci.* 2016;5:324–333.
2. Muscle soreness and rhabdomyolysis. Paulsen G, Benestad HB. *Tidsskr Nor Laegeforen.* 2019;139.
3. Aalborg C, Rod-Larsen C, Leiro I, et al. An increase in the number of admitted patients with exercise-induced rhabdomyolysis. *Tidsskr Nor Laegeforen* 2016;136:1532–6.
4. Epidemiological analysis of factors influencing an episode of exertional rhabdomyolysis in high school students. Lin H, Chie W, Lien H. *Am J Sports Med.* 2006;34:481–486.
5. CAV3 mutations causing exercise intolerance, myalgia and rhabdomyolysis: expanding the phenotypic spectrum of caveolinopathies. Scalco RS, Gardiner AR, Pitceathly RD, et al. *Neuromuscul Disord.* 2016;26:504–510.
6. Rhabdomyolysis - induced compartment syndrome secondary to atorvastatin and strenuous exercise. Dunphy L, Morhij R, Tucker S, et al. *BMJ Case Rep.* 2017;2017.
7. Sick cell trait, rhabdomyolysis, and mortality among U.S. army soldiers. Nelson D, Deuster P, Carter R, Hill O, Wolcott V, Kurina L. *N Engl J Med.* 2016;375:435–442.
8. Exercise - induced acute bilateral upper-arm compartment syndrome. Traub BC, Lane MK, Traub JA. *Case Rep Emerg Med.* 2017;2017:9454782.
9. The syndrome of rhabdomyolysis: complications and treatment. Chatzizisis YS, Misirli G, Hatzitolios AI, Giannoglou GD. *Eur J Intern Med.* 2008;19:568–574.
10. Beyond muscle destruction: a systematic review of rhabdomyolysis for clinical practice. Chavez L, Leon M, Einav S, Varon J. *Crit Care.* 2016;20.
11. Bench-to-bedside review: rhabdomyolysis an overview for clinicians. Huerta-Alardin AL, Varon J, Marik PE. *Crit Care.* 2005;9:158–169.
12. Exercise-induced leg pain. Bonasia DE, Rosso F, Cottino U, Rossi R. *Asia Pac J Sports Med Arthrosc Rehabil Technol.* 2015;2:73–84.