

# Two Cases of CrossFit®-Induced Rhabdomyolysis: A Rising Concern

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## Abstract

**Background:** The author reports the cases of two adult males who presented with severe rhabdomyolysis following identical CrossFit® workouts performed on the same day, at the same time and at the same location. **Results:** For both cases, symptoms of rhabdomyolysis disappeared upon discontinuation of the regime and within three days of aggressive hydration and rest. Patients made a complete recovery upon discharge. **Conclusion:** The rhabdomyolysis was attributed to the same excruciating workout both men underwent. Exertional rhabdomyolysis exemplified by the cases presented highlights a rising concern over the health consequences of the popular training program. CrossFit®-induced rhabdomyolysis is underrecognized and should be considered in patients presenting with signs and symptoms of rhabdomyolysis.

**Keywords:** Exercise, Rhabdomyolysis, Supplements, Dehydration, Sport (Source: MeSH, NLM).

## Introduction

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Extensive information has been published about rhabdomyolysis caused by high-intensity CrossFit® training regimes, and yet the diagnosis of CrossFit®-induced rhabdomyolysis remains underrecognized in the emergency department.<sup>1</sup> In rhabdomyolysis, contents of injured muscle cells leak into the circulation, resulting in electrolyte abnormalities, hypovolemia, acidosis and acute renal failure.<sup>1</sup> An increase in free intracellular calcium triggers activation of proteases, increased skeletal muscle cell contractility, mitochondrial dysfunction, and the production of reactive oxygen species, resulting in skeletal muscle death. The association between rhabdomyolysis and triggering events such as the intense CrossFit® workout regimes (the equivalent to a high intensity military workout) was first explored by Greg Glassman in 2005 in a case series out of Santa Cruz, California.<sup>1</sup> Since then, this prevalent condition has surfaced across the United States with a plethora of etiologies.

## The Cases

A 33-year-old male presented to the Dekalb Medical Center Emergency Department in Atlanta, Georgia for complaints of muscle pain, soreness and stiffness in his biceps and across his chest ongoing after a CrossFit® workout that he had three days prior involving 100 plus push-ups, pull-ups, squats and sit-ups all in the span of thirty minutes. Patient also had some diarrhea with very dark colored urine and reported feeling nauseous but denied vomiting. He had been taking Atorvastatin 40 mg daily for hypercholesterolemia. Physical examination revealed a pulse rate of 114 beats/minute and a blood pressure of 137/86 mmHg. The remainder of the examination was unremarkable. His complete blood count and comprehensive metabo-

### Key Points:

- Although the causal link between rhabdomyolysis and intense workout regimens has been well documented, exercise-induced (exertional) rhabdomyolysis generally goes unreported as very few cases are fatal and most resolve with adequate treatment.
- The use of supplements among those undergoing CrossFit® training may increase their vulnerability to skeletal muscle breakdown and obscure the diagnosis of rhabdomyolysis.

lic panel were unremarkable. Urinalysis was positive for trace amounts of blood. In addition, patient's creatine kinase (CK) level was severely elevated at 98,559 U/L on admission (normal range 52-336 U/L), and abdominal ultrasound was unremarkable. The emergency department physician clinically made the diagnosis of rhabdomyolysis without any further testing.

The second case is of a 37-year-old male presented to Dekalb Medical Center Emergency Department immediately following the above mentioned patient who also complained of upper extremity pain after undergoing the same CrossFit® workout at the same gym and at the same time three days prior to admission. Patient had very dark colored urine and abdominal pain, but denied nausea and vomiting. He had been taking Colonix® and Toxinout®, two weight supplements as part of his workout regime. Physical examination revealed a pulse rate of 51 beats/minute and, blood pressure was 120/57 mmHg. His complete blood count was unremarkable and comprehensive metabolic panel showed elevated aspartate transaminase at 1997 U/L and alanine transaminase at 638 U/L. Urinalysis was positive for trace amounts of blood. The patient's CK level was 148,182 U/L on admission (normal range 52-336 U/L) and an abdominal ultrasound was benign. The attending physician made the diagnosis of rhabdomyolysis. Both patients were treated

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with IV fluids (Ringer's lactate). All forms of exercise as well as supplements were terminated until they were discharged.

## Discussion

There are two proposed potential reasons that may contribute towards emergency medicine physicians being reluctant to conclude CrossFit® as the precise etiology of a patient's rhabdomyolysis.

*Firstly, it is an underreported diagnosis:* Avid proponents of the CrossFit® workout regimen maintain that musculoskeletal deterioration occurs when athletes over-exert themselves, not just when performing an inordinate amount of repetitions at oftentimes unaccustomed weight levels for above-normal periods of time – the standard protocols for CrossFit®. The demanding nature of the workout has led to its adoption by Canadian Forces, U.S. Army Commands and U.S. Marine Corps. Published records have shown exertional rhabdomyolysis in military training rising in epidemic proportions at 166% per year.<sup>2</sup> However, statistics suggesting a correlation between workouts at CrossFit® locations and cases of rhabdomyolysis have yet to be published. Furthermore, case fatality rates are less than 5% from exertional rhabdomyolysis and most otherwise healthy individuals recover rather quickly with aggressive hydration and management.<sup>3</sup> Hence, metabolic, renal and systemic complications are avoided and a significant number of cases might go unidentified.

*Secondly, it is a confounding diagnosis:* Skeletal muscle breakdown as a side effect of the administration of statins, such as atorvastatin, is an issue of intense interest that has been well-documented. In fact, in a 2010 study by Guis et al, elevation of creatine kinase occurs in 3-5% of medication-induced cases, while significant rhabdomyolysis surfaces in 0.04-0.20%

of them.<sup>4</sup> As a result of the sheer intensity of the workouts, a number of nutritional supplements are popular among CrossFit® athletes to facilitate the training and recuperation phases of the exercise routine and have been heavily publicized in gymnasiums across the nation. Certain products, such as Creatine®, have well-known side effects of muscle cramping, straining and dehydration, all of which can contribute to the rupturing of skeletal muscles.<sup>5</sup> Colonix® utilizes a laxative tea and requires at least 64 oz. of liquid with use. It is contraindicated in patients with dysphagia. Additionally, vomiting, diarrhea and excessive dehydration are all potential adverse effects.<sup>6</sup> Furthermore, its active ingredient, psyllium, functions as a non-systemic cholesterol-lowering agent, just like statins. Dehydration and choking are frequent unfavorable side effects if psyllium is taken without adequate water as it thickens secretions in the throat.<sup>7</sup> Toxinout®, a complex of herbs, amino acids, vitamins and antioxidants, is contraindicated in renal disease – what skeletal muscle rupture could lead to if not treated immediately. Both aforementioned supplements are hence capable of exacerbating rhabdomyolysis and its lethal complications.<sup>8</sup>

## Conclusion

CrossFit® began as an exercise regimen in 2005 with just 10 locations in the United States. Currently, there are over 15,000 locations that offer CrossFit® training across North America, and the number is growing.<sup>8</sup> The workout regime itself, the publicity surrounding its advocates, and the widespread use of products marketed at the CrossFit® locales make it increasingly crucial that emergency room physicians consider CrossFit®-induced rhabdomyolysis in their differential diagnoses when they encounter a case with typical signs and symptoms in the context of a patient who undergoes CrossFit® training.

## References

1. Krivickas LS. Recurrent rhabdomyolysis in a collegiate athlete: a case report. *Med Sci Sports Exerc.* 2006 Mar;38(3):407-10.
2. Springer BL, Clarkson PM. Two cases of exertional rhabdomyolysis precipitated by personal trainers. *Med Sci Sports Exerc.* 2003 Sep;35(9):1499-502.
3. Inklebarger J, Galanis N, Kirkos J, Kapetanos G. Exercise-induced rhabdomyolysis from stationary biking: a case report. *Hippokratia.* 2010 Oct;14(4):279-80.
4. Guis S, Mattei JP, Cozzone PJ, Bendahan D. Pathophysiology and clinical presentations of rhabdomyolysis. *Joint Bone Spine.* 2005 Oct;72(5):382-91.
5. Bosch X, Poch E, Grau JM. Rhabdomyolysis and acute kidney injury. *N Engl J Med.* 2009 Jul 2;361(1): 62-72.
6. Lantner RR, Esperitu, B, Zumerchik P, Tobin M. Anaphylaxis following ingestion of a psyllium-containing cereal. *JAMA.* 1990 Nov 21;264(19):2534-6.
7. Bagley WH, Yang H, and Stan KH. Rhabdomyolysis. *Intern Emerg Med.* 2007 Oct;2(3):210-8.
8. Tietze DC, Borchers J. Exertional rhabdomyolysis in the athlete: a clinical review. *Sports Health.* 2014 Jul;6(4):336-9.

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## Author Contributions

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