CASE REPORT

Fat burn X: burning more than fat

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SUMMARY

A 50-year-old man presented with a 2-day history of bilateral lower extremity cramping and dark urine. The patient was found to have a creatine phosphokinase (CPK) elevated of up to 2306 U/L, a serum uric acid of 9.7 mg/dL and 101 red blood cell's per high-powered field on urinalysis. On questioning, the patient endorsed daily exercise with free weights. There were no changes in his regular exercise and medication regimen, no muscle trauma, no recent drug use and no illness. The patient did mention using a new fat burner known as 'Fat Burn X', which he had begun taking 2 days prior to the onset of his muscle cramps. The patient was given normal saline intravenous fluid resuscitation for 48 h with resultant normalisation of his CPK and creatinine, and was discharged with primary care follow-up.

BACKGROUND

Under the Dietary Supplement Health and Education Act of 1994, companies producing nutritional supplements do not need official review by the Food and Drug Administration prior to marketing their product in the USA. The responsibility for insuring that the product is safe for consumption and that advertising claims are accurate falls on the company producing the nutritional supplement. As the use of herbal and nutritional supplements increases in the USA, the number of adverse events and drug interactions is increasing.¹ Also, this is not the first instance of a nutritional supplement contributing to a case of rhabdomyolysis—additional cases have been described in the literature.^{2,3} It is likely that adverse events caused by unregulated nutritional supplements are under-reported since their use is not always reported by the patient, even when specifically asked about medication and supplement use. In brief, dietary and nutritional supplements can pose a serious risk to patients, and patient awareness and health literacy in this area remains poor.

CASE PRESENTATION

A 50-year-old man with a medical history of hypertension, gastro-oesophageal reflux disease, osteoarthritis and insomnia presented with a 2-day history of bilateral lower extremity and lower back cramping, and some subjective darkening of urine. The patient was noted to be of a muscular build, and endorsed daily exercise, which had not changed in intensity or duration in the past 2 months. He admitted to some muscle soreness after working out, but described the current lower extremity and lower back cramping as severe, and something he had never experienced previously. He denied any recent changes to his medication

regimen, which included 100 mg sildenafil as needed, 25 mg hydrochlorothiazide four times a day for hypertension, 20 mg omeprazole four times a day for heartburn, codeine 30 mg/acetaminophen 300 mg two times a day for osteoarthritis and 50 mg hydroxyzine as needed for sleep. The patient did mention the use of a new supplement known as 'Fat Burn X', which he had begun taking 2 days prior, shortly before the cramping started. On further inquiry for other possible causes of rhabdomyolysis, he denied any recent trauma to his lower extremities or back, recent illness, drug use or any family history of myopathies.

INVESTIGATIONS

The patient was evaluated with a basic metabolic panel, electrolyte panel, liver function panel, complete blood count with differential, sedimentation rate, coagulation panel and urinalysis. On presentation, he had creatine phosphokinase (CPK) elevated to 2306 U/L, serum uric acid of 9.7 mg/dL, serum creatinine elevated to 1.8 mg/dL above a baseline of 1.4 mg/dL, C reactive protein mildly elevated to 0.7 mg/dL, aspartate aminotransferase of 61 U/L and 101 red blood cell's per high-powered field on urinalysis. All other laboratory values not mentioned here were within the reference range. Over the next 2 days, the patient was treated with intravenous fluid resuscitation and his serum creatinine and CPK was trended. On hospital day two, creatinine had fallen to 1.4 mg/dL and CPK had fallen to 1071 U/L. On hospital day three, the patient's serum creatinine was steady at 1.4 mg/dL and CPK had fallen to 492 U/L.

DIFFERENTIAL DIAGNOSIS

For a middle-aged man presenting with bilateral lower extremity and lower back muscular cramping and dark urine, rhabdomyolysis, spinal cord impingement, embolic events, traumatic injury, electrolyte abnormalities such as hypocalcaemia, inflammatory myopathies, acute kidney injury and liver pathology must be considered. Traumatic injury was ruled out via history, while spinal cord impingement was ruled out by an unremarkable neurological examination. A basic metabolic panel excluded electrolyte abnormalities, and an inflammatory myopathy was considered less likely in the setting of a negative family history and normal sedimentation rate. An ischaemic embolic event was lower on our differential in the setting of a normal cardiovascular and extremity examination. Rhabdomyolysis was considered more likely in the setting of markedly increased CPK. Liver pathology was ruled out with a nearly normal liver function panel, especially considering the need to evaluate

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bilirubin levels in the setting of dark urine. The basic metabolic panel and urinalysis were helpful in determining that a mild acute kidney injury accompanied the rhabdomyolysis.

TREATMENT

Treatment of rhabdomyolysis is primarily concerned with treating its underlying cause, correcting metabolic abnormalities and preventing acute kidney injury. The underlying cause was assumed to be intense exercise or a drug, and so the patient's exercise history, outpatient medications and substance abuse history were reviewed in the emergency department. The patient's basic metabolic panel was unremarkable except for mildly elevated creatinine, which ameliorated the need to pursue correction of any metabolic abnormalities. The patient, who had otherwise normal cardiovascular and renal function, was given a 1 L bolus of normal saline in the emergency department. After baseline electrolytes returned to the normal range, the patient was started on a maintenance intravenous infusion of normal saline at 150 mL/h. After approximately 12 h, this was decreased to 100 mL/h in light of decreasing CPK and stable creatinine. After an additional 12 h, it was noted that the CPK had fallen below 500 U/L, and the patient's creatinine was at baseline. The patient was taking in adequate oral fluids, and the intravenous hydration was discontinued. Education on the causes, symptoms and complications of rhabdomyolysis was reviewed with the patient, and cessation of any nutritional supplements, especially fat burners, was strongly recommended prior to discharge. The patient was in agreement with these recommendations.

OUTCOME AND FOLLOW-UP

The patient's rhabdomyolysis resolved without complication per down trending CPK and serum creatinine returning to baseline prior to discharge. The patient has scheduled follow-up with his primary care physician.

DISCUSSION

Rhabdomyolysis can be caused by a variety of insults, which are classified as physical or non-physical. Examples of physical causes include crush injuries (the most common cause), excessive muscle exertion, vessel occlusion, electrical shocks and sepsis. Examples of non-physical causes include enzyme deficiencies, electrolyte abnormalities, endocrine derangements, drugs such as cocaine, toxins and inflammatory myopathies.^{4 6} Classic symptoms of rhabdomyolysis include muscle pain, weakness or fatigue and dark urine. The major complications associated with rhabdomyolysis include the acute fluctuations in electrolytes such as hyperkalaemia and hypercalcaemia, which can lead to cardiac dysrhythmias and disseminated intravascular coagulation, respectively.⁶ In addition, depending on the severity of the myoglobinaemia and subsequent myoglobinuria, acute kidney injury resulting in a need for dialysis can occur. Between 10 and 50% of patients with rhabdomyolysis will have some component of acute kidney injury.⁵ In the work up for rhabdomyolysis, a CPK (CK) level, basic metabolic panel, coagulation panel and urinalysis are vital. If an infectious or inflammatory source is suspected, a complete blood count with differential and sedimentation rate are useful adjunctive tests. The treatment of choice remains early and aggressive intravenous hydration, as described above. Mannitol and bicarbonate have been used for the prevention of acute kidney injury, but there is little clinical evidence to support their use.⁶ Despite fluid resuscitation, some patients will go on to develop acute kidney injury. For these

patients, renal replacement therapy is needed to correct fluid, electrolyte and acid-based disturbances.⁶

When looking into the medical literature, Scroggie *et al*² reported two cases of rhabdomyolysis occurring after ingestion of nutritional supplements in otherwise healthy 23 and 29-year-old men. Both patients were athletic, with no medical history and no pertinent family history, and lacked risk factors for rhabdomyolysis. Both patients had begun taking a nutritional supplement, Diet Fuel and GlutaMASS, respectively, about a week prior to presentation, with initial/peak CPK's of 56 600/616 000 U/L and 4062/6448 U/L, respectively. Both patients made a complete recovery with aggressive intravenous hydration. Mansi *et al* reported a case of an otherwise healthy 54-year-old woman who began experiencing chest pain 3 h after taking an herbal supplement, and was subsequently diagnosed with rhabdomyolysis, with a peak CPK of 1028 U/L and troponins within the reference range. The ingredients of Fat Burn X are reported to be caffeine, green tea, grapefruit extract, psyllium husk, *Garcinia cambogia* extract, citrus aurantium, apple cider vinegar and juniper berry, but the concentrations or dosages are not reported. In reviewing the literature with regards to these various ingredients, caffeine has been reported to cause rhabdomyolysis but only in extremely high doses on the order of multiple grams, generally associated with suicide attempts.^{7 8} Grapefruit has been rarely implicated in rhabdomyolysis, but only in the context of statin consumption, and even this risk is being re-evaluated in the literature.⁹ Citrus aurantium, also known as bitter orange, contains the active ingredient synephrine, a sympathomimetic. Rhabdomyolysis in an otherwise healthy 22-year-old man due to dietary supplements containing synephrine as the active ingredient has been reported in the literature.¹⁰

Some common ingredients seen in the nutritional supplement in our case and in these other reported cases include caffeine in the form of *Guarana* extract, *Garcinia cambogia* extract, *Ma huang* extract, chromium and various minerals, such as magnesium and potassium. Scroggie *et al* discuss an in depth analysis of potential contributions from ingredients in their supplements of interest with regard to rhabdomyolysis, which is also relevant with regard to Fat Burn X.² The pathway by which many of these ingredients could contribute to muscle injury remains poorly evaluated in the medical literature.

Learning points

- ▶ Nutritional and herbal supplements are not evaluated by the Food and Drug Administration, and the safety and efficacy of these products is the sole responsibility of the company producing them.
- ▶ Nutritional and herbal supplements can have dangerous interactions with prescribed medications, or cause adverse events on their own.
- ▶ Rhabdomyolysis is a disease of acute muscle injury and breakdown associated with acute kidney injury and electrolyte derangements, which can be caused by a large number of physical and non-physical insults.
- ▶ Rhabdomyolysis is one adverse event associated with 'fat burning products', and a relevant history regarding dietary supplements should be obtained in patients presenting with this condition.

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Competing interests None declared.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

- 1 Timbo BB, Ross MP, McCarthy PV, *et al.* Dietary supplements in a national survey: prevalence of use and reports of adverse events. *J Am Diet Assoc* 2006;106:1966–74.
- 2 Scroggie DA, Harris M, Sakai L. Rhabdomyolysis associated with nutritional supplement use. *J Clin Rheumatol* 2000;6:328–32.
- 3 Mansi IA, Huang J. Rhabdomyolysis in response to weight-loss herbal medicine. *Am J Med Sci* 2004;327:356–7.
- 4 Sauret JM, Marinides G, Wang GK. Rhabdomyolysis. *Am Fam Physician* 2002;65:907–12.
- 5 Ward M. Factors predictive of acute renal failure in rhabdomyolysis. *Arch Intern Med* 1988;148:1553–7.
- 6 Huerta-Alardín AL, Varon J, Marik PE. Bench-to-bedside review: rhabdomyolysis—an overview for clinicians. *Crit Care* 2005;9:158.
- 7 Wrenn KD, Oschner I. Rhabdomyolysis induced by a caffeine overdose. *Ann Emerg Med* 1989;18:94–7.
- 8 Campana C, Griffin PL, Simon EL. Caffeine overdose resulting in severe rhabdomyolysis and acute renal failure. *Am J Emerg Med* 2014;32:111.e3–4.
- 9 Lee JW, Morris JK, Wald NJ. Grapefruit juice and statins. *Am J Med* 2016;129:26–9.
- 10 Burke J, Seda G, Allen D, *et al.* A case of severe exercise-induced rhabdomyolysis associated with a weight-loss dietary supplement. *Mil Med* 2007;172:656–8.

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