Severe localized scapular pain after a strenuous weight-lifting session

Rosamond E. Lougheed Simpson MD MSc CCFP(SEM) DipSportMed
Steven R. Joseph MD MA CCFP(SEM) DipSportMed Lisa Fischer MD CCFP(SEM) FCFP DipSportMed

Rhabdomyolysis is a medical condition whereby the intracellular contents from damaged skeletal muscle tissues are released into the blood, causing myriad clinical symptoms and outcomes. These can range from muscle pain to compartment syndrome, end-organ failure, and death.[1-3] While the triggers of rhabdomyolysis are numerous, physical exertion as a causal factor has been receiving increasing media attention recently.[4-7]

The incidence of exertional rhabdomyolysis (ER) has been challenging to estimate, as many cases are likely underrecognized.[8] Current incidence estimates range from 22.2 to 29.9 per 100 000 patients a year.[9,10] As ultra-distance endurance events, strength and conditioning programs (eg, CrossFit), and obstacle course races have become wildly popular with the superfit and weekend warriors alike, ER is being increasingly recognized as common in sporting communities.[1] It is paramount that family physicians be adept at recognizing and managing ER, identifying those who warrant further laboratory workup, and providing return-to-play (RTP) counseling (**Figure 1**).[1,10,11]

We report the case of a 29-year-old white man who presented to a Canadian emergency department (ED) with severe localized scapular pain following an uncharacteristically strenuous weight-lifting workout. He was diagnosed and treated for ER secondary to his workout.

Case

A 29-year-old man (178 cm tall, weighing 99 kg) presented to the ED following acute onset of right posterior shoulder pain the night before. Pain was localized along the scapular spine and was severe, with the patient rating it a 9 out of 10 on the pain intensity scale. The pain had started a few hours after an unusually strenuous workout, involving many bench press repetitions with heavy weight. He did not experience an atypical amount of discomfort while performing these exercises, and did not have pain elsewhere worse than that expected postworkout. However, his scapular pain was different and worse than any pain he had experienced previously, which prompted him to go to the ED.

He was a previously healthy former elite athlete, with no history of illicit drug use or personal or family history of metabolic myopathy. The patient treated himself with nonsteroidal anti-inflammatory drugs and ice, with little relief.

His vital signs at triage were normal. Physical examination of his right shoulder revealed range of motion and generalized pain equal to that of the unaffected side. Palpation of the scapular spine was painful, and the area was mildly erythematous and swollen. He noted no change in urine colour or frequency and had been fully ambulatory since his pain began. Findings of the remainder of the review of systems and physical examination were unremarkable.

Given the severity of the patient's muscle pain, visible localized swelling of the proximal upper extremity around the scapula, and his history of weight lifting the previous day (which was in excess of his normal number of repetitions), bloodwork was ordered to investigate possible metabolic myopathy. Initial bloodwork revealed a creatine kinase (CK) level of 32 290 U/L. The extended electrolyte panel results, complete blood count,

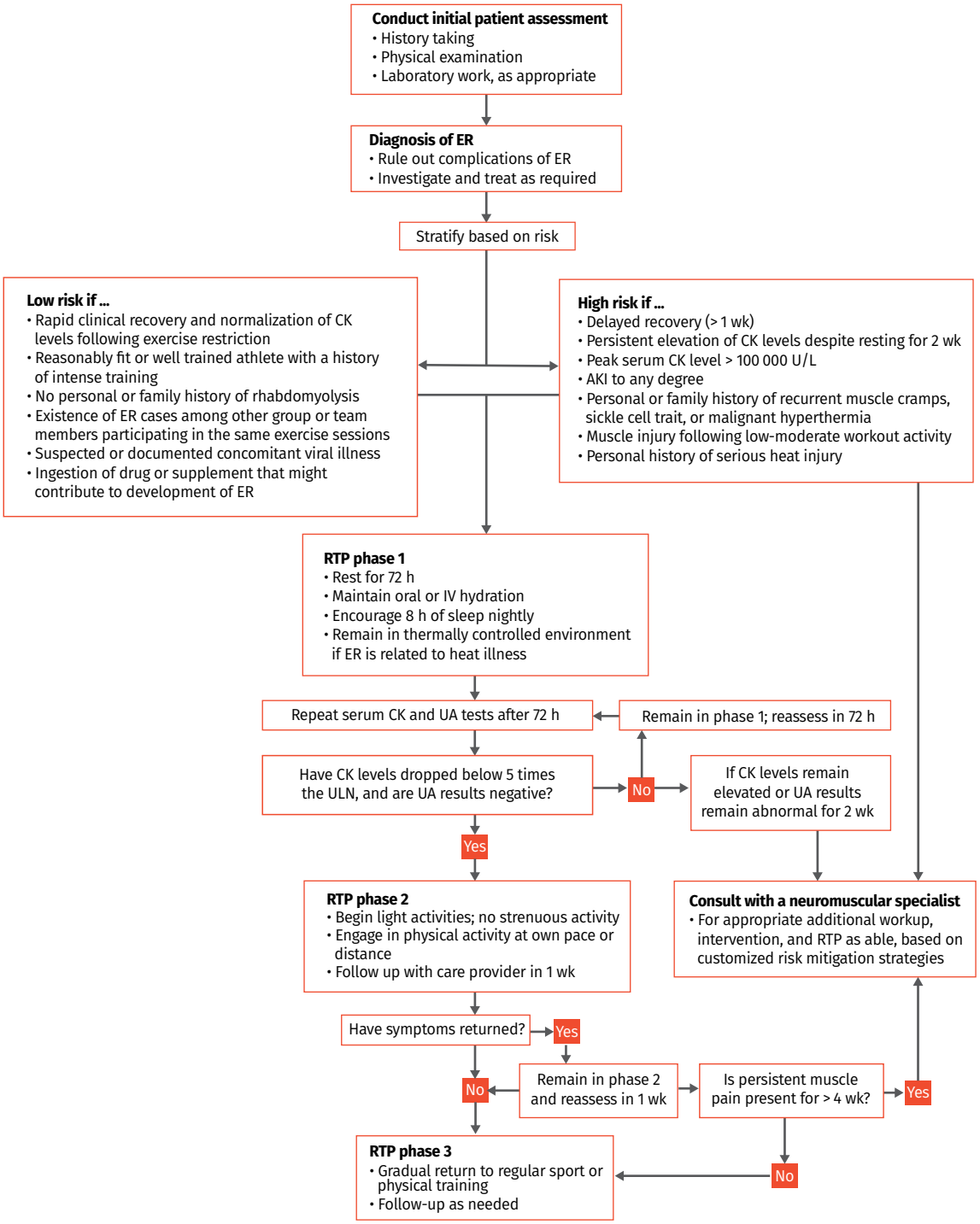
Editor's key points

- With the rising popularity of ultra-distance endurance events, strength and conditioning programs, and obstacle course races, exertional rhabdomyolysis (ER) has become increasingly common in sporting communities.
- Exertional rhabdomyolysis is often characterized by the classic triad of generalized weakness, myalgia, and myoglobinuria; however, it is critical to recognize that many cases will not present with all 3 of these criteria. For the male patient in this report, severe myalgia was his only presenting symptom from the triad.
- The ability to recognize ER, stratify patients into low- and high-risk categories, and understand how risk affects patients' return to play can help family physicians make treatment, referral, and return-to-play decisions with increased confidence. This article offers an algorithm that outlines appropriate ER management based on the most widely accepted practices.

Points de repère du rédacteur

- Compte tenu de la popularité grandissante des épreuves d'endurance d'ultra-distances, des programmes de musculation et de conditionnement, de même que des courses à obstacles, la rhabdomyolyse d'effort (RE) est devenue de plus en plus fréquente dans le monde des sportifs.
- La rhabdomyolyse d'effort se reconnaît souvent par la traditionnelle triade de faiblesse généralisée, myalgie et myoglobinurie; par ailleurs, il est essentiel de reconnaître que de nombreux cas ne se présenteront pas avec l'ensemble des 3 critères. Dans le cas du patient dont il est question dans ce rapport, le seul symptôme de la triade présent était la myalgie sévère.
- L'habileté à reconnaître la RE, à stratifier les patients selon qu'ils sont à risque faible ou élevé, et à comprendre comment le degré de risque influe sur le retour au jeu des patients peut aider les médecins de famille à prendre des décisions avec plus de confiance en ce qui concerne le traitement, une demande de consultation et le retour au jeu. Cet article présente un algorithme qui explique la prise en charge appropriée de la RE en se fondant sur les pratiques les plus largement acceptées.

Figure 1. Treatment and risk stratification algorithm for appropriate ER management and RTP decisions, based on the most widely accepted practices



AKI—acute kidney injury, CK—creatine kinase, ER—exertional rhabdomyolysis, IV—intravenous, RTP—return to play, UA—urinalysis, ULN—upper limit of normal.

Data from Szczepanik et al,[1] Tietze and Borchers,[10] and O'Connor et al.[11]

and bicarbonate, creatinine, and troponin levels were normal. Urinalysis results were positive for trace of blood.

He was admitted to hospital for ER. He was monitored for acute kidney injury and treated with intravenous normal saline, targeting a urine output of 100 to 200 mL/h. His CK level peaked at 62 350 U/L 4 days after hospital admission.

Seven days after admission he was discharged, with a CK level of 9635 U/L and otherwise normal bloodwork results. His scapular swelling was noted to dissipate with dropping CK values. He was instructed to consume more than 2 L of water daily, and to avoid strenuous exercise over the next week. He returned to activity gradually without complications.

Discussion

A PubMed search was completed using the MeSH terms *rhabdomyolysis, exertion,* and *creatine kinase*. Articles that were published in languages other than English, that were published more than 5 years ago, or that included patients younger than age 16 were excluded. Relevant articles were selected by the corresponding author (R.E.L.S.) with preference given to review articles.

The triad of generalized weakness, myalgia, and myoglobinuria is classically used to describe the presentation of ER; however, all patients will not present this way.[8] Typically, within the first 1 to 3 days following the inciting exertion, swelling, stiffness, loss of range of motion, and muscle pain out of proportion to that expected will occur.[1] While these symptoms are nonspecific, when combined with a suggestive history, they should prompt consideration of a diagnosis of ER. The criteria for formal diagnosis of ER have been debated[8] but are widely viewed as involving a serum CK level of greater than 5 times the upper limit of normal (ULN) or a CK level of 5000 U/L, coupled with a supporting clinical presentation.[1,8,12]

Hospital admission is indicated for CK values that are greater than 5 times the ULN.[11] Formal guidelines for the treatment of ER do not exist, and randomized controlled trials in this area are lacking.[13] It is widely accepted that the mainstay of treatment of ER is prompt fluid administration and physical rest.[13] Intravenous normal saline is commonly administered with the goal of maintaining a urine output of approximately 100 to 200 mL/h.[11] Serial (often daily) monitoring of CK levels is advised initially to ensure levels fall appropriately with treatment. Creatine kinase values can be expected to peak at 36 to 72 hours postexertion.[12] Intravenous fluids can generally be discontinued once plasma CK levels drop below 5000 U/L.[14] Once CK levels have been shown to trend downward of this value and symptoms have resolved, patients can typically safely be discharged with outpatient follow-up.

If volume overload occurs, loop diuretics are indicated.[15] Careful attention must be paid to ensure their use does not exacerbate the trend toward hypocalcemia, which might occur in cases of rhabdomyolysis.[15] Acute kidney injury is assumed in those patients who are anuric or oliguric despite fluid resuscitation, and this can occur in 13% to 50% of cases of rhabdomyolysis from all causes.[16] In these patients, hemodialysis or continuous renal replacement therapy might be indicated, the details of which are beyond the scope of this article, but which are explained elsewhere.[16]

Algorithm

Figure 1[1,10,11] helps to outline the management of ER and to identify patients who should be referred for additional laboratory workup. It incorporates criteria recommended by Szczepanik et al[1] for stratifying patients into high- and low-risk categories. This stratification identifies who should be referred for consultation and investigation of potential underlying conditions. The figure also integrates guidelines for RTP, as proposed by the Consortium for Health and Military Performance, with the goal of increasing clarity and confidence among health care providers regarding management decisions and clearance to play.[10,11]

Any patient who meets any of the criteria in the high-risk box should immediately be referred for consultation with a neuromuscular specialist for additional laboratory workup, intervention, and RTP per risk mitigation strategies that have been tailored to the patient. Those patients who meet the criteria in the low-risk box can begin progressing through the RTP process. Phase 1 of RTP involves resting for 72 hours, maintaining oral or intravenous hydration, adhering to the recommended 8 hours of sleep nightly, and ensuring the patient is in a thermally controlled environment. If repeated serum CK levels are less than 5 times the ULN and the urinalysis results are negative, the patient can progress to phase 2 of RTP; however, if these criteria are not met, the patient should remain in phase 1, and CK and urinalysis tests should be repeated in 72 hours. If after 2 weeks the patient still cannot progress to phase 2, consultation with a neuromuscular specialist is indicated.

In phase 2 of RTP, light physical activities can begin. If symptoms return within 1 week, the patient should remain in phase 2 for a second week before reassessment. If the patient cannot be cleared to phase 3 after more than 4 weeks of light activity, he or she should be referred to a neuromuscular specialist for consultation.

If there is no return of symptoms after 1 week of light activity, the patient can progress to the third and final phase of RTP. Once in the final phase, return to routine training and regular sporting activity can be undertaken gradually, with physician follow-up scheduled on an as-needed basis.

Conclusion

Family physicians will see ER when treating both fit and unfit individuals across a large variety of ages. Given the

possibility for subtle presentation and the nonspecific symptoms that characterize ER, physicians are urged to keep this diagnosis on their differential. Although ER is widely regarded as being characterized by the classic triad of generalized weakness, myalgia, and myoglobinuria, it is critical to recognize that many cases will not present with all 3 of these criteria. In the case of the patient in this report, severe myalgia was his only presenting symptom from the triad. It is therefore important to consider ER even in the absence of weakness and myoglobinuria. Also, when ER is diagnosed, stratify patients into high- and low-risk categories to help guide laboratory workup and RTP instructions.

Educating patients, coaches, personal trainers, and others involved with sport and exercise will assist in timely treatment and future prevention of ER. Advising follow-up with physiotherapy is another means of expediting return to activities of daily living, in addition to RTP.

Dr Lougheed Simpson is a family physician practising sport and exercise medicine at Athlete's Care Sports Medicine in the Beach and Cleveland Clinic Canada, and is a team physician for student athletes at Centennial College and Ryerson University in Toronto, Ont. **Dr Joseph** is an Assistant Professor in the Department of Family Medicine at the University of Western Ontario, and a family physician practising sport and exercise medicine at the Fowler Kennedy Sport Medicine Clinic, the Roth McFarlane Hand and Upper Limb Centre, and Fanshawe College, all in London, Ont. **Dr Fischer** is Associate Professor in the Department of Family Medicine and Assistant Professor in the Faculty of Health Sciences at the University of Western Ontario, and Director of Sport and Exercise Medicine at the Fowler Kennedy Sport Medicine Clinic.

Competing interests
None declared

Correspondence
Dr Rosamond E. Lougheed Simpson; e-mail **rloughe5@uwo.ca**

References

1. Szczepanik ME, Heled Y, Capacchione J, Campbell W, Deuster P, O'Connor FG. Exertional rhabdomyolysis: identification and evaluation of the athlete at risk for recurrence. *Curr Sports Med Rep* 2014;13(2):113-9.
2. Keltz E, Khan FY, Mann G. Rhabdomyolysis. The role of diagnostic and prognostic factors. *Muscles Ligaments Tendons J* 2014;3(4):303-12.
3. Manspeaker S, Henderson K, Riddle D. Treatment of exertional rhabdomyolysis in athletes: a systematic review. *JBI Database System Rev Implement Rep* 2016;14(6):117-47.
4. Eichner ER. Exertional rhabdomyolysis stays in the news. *Curr Sports Med Rep* 2016;15(6):378-9.
5. Smoot MK, Amendola A, Cramer E, Doyle C, Kregel KC, Chiang HY, et al. A cluster of exertional rhabdomyolysis affecting a Division I Football team. *Clin J Sport Med* 2013;23(5):365-72.
6. Wright W. Rhabdomyolysis revisited. *CrossFit J* 2011:1-4. Available from: **http://library.crossfit.com/free/pdf/CFJ_Wright_Rhabdo.pdf**. Accessed 2019 Sep 5.
7. Cutler TS, DeFilippis EM, Unterbrink ME, Evans AT. Increasing incidence and unique clinical characteristics of spinning-induced rhabdomyolysis. *Clin J Sport Med* 2016;26(5):429-31.
8. Furman J. When exercise causes exertional rhabdomyolysis. *JAAPA* 2015;28(4):38-43.
9. Rawson ES, Clarkson PM, Tarnopolsky MA. Perspectives on exertional rhabdomyolysis. *Sports Med* 2017;47(Suppl 1):S33-49.
10. Tietze DC, Borchers J. Exertional rhabdomyolysis in the athlete: a clinical review. *Sports Health* 2014;6(4):336-9.
11. O'Connor FG, Brennan FH Jr, Campbell W, Heled Y, Deuster P. Return to physical activity after exertional rhabdomyolysis. *Curr Sports Med Rep* 2008;7(6):328-31.
12. George M, Delgaudio A, Salhanick SD. Exertional rhabdomyolysis—when should we start worrying? Case reports and literature review. *Pediatr Emerg Care* 2010;26(11):864-6.
13. Chavez LO, Leon M, Einav S, Varon J. Beyond muscle destruction: a systematic review of rhabdomyolysis for clinical practice. *Crit Care* 2016;20(1):135.
14. Mikkelson TS, Toft P. Prognostic value kinetics and effect of CVVHDF on serum of the myoglobin and creatine kinase in critically ill patients with rhabdomyolysis. *Acta Anaesthesiol Scand* 2005;49(6):859-64.
15. Sever MS, Vanholder R, Lamiere N. Management of crush-related injuries after disasters. *N Engl J Med* 2006;354(10):1052-63.
16. Petejova N, Martinek A. Acute kidney injury due to rhabdomyolysis and renal replacement therapy: a critical review. *Crit Care* 2014;18(3):224.

This article has been peer reviewed.
Cet article a fait l'objet d'une révision par des pairs.
Can Fam Physician 2019;65:719-22