Rhabdomyolysis after marathon run

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We describe an athelete who presented with red colour urine after a marathon run. She was subsequently found to have myoglobinuria and rhabdomyolysis. Excessive muscular activity is a well-documented cause of rhabdomyolysis but is uncommonly seen in Hong Kong. A high index of suspicion is necessary to make the diagnosis. (*Hong Kong j.emerg.med.* 2001;8:38-39)

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Introduction

Rhabdomyolysis is a clinical syndrome caused by injury to skeletal muscle that results in release of its contents into the circulation. Severe trauma, massive burn, infections and seizures are amongst the commonest cause of rhabdomyolysis seen in hospital. Intrinsic muscle dysfunction when the normal muscle is overstressed, is a cause of rhabdomyolysis associated with long distance runner undergoing vigorous exercise. If not promptly treated, complications like acute renal failure can occur.

Case

A 30-year-old female presented to our emergency department with complaint of passing red urine after having a marathon run that morning. She had history of iron deficiency anaemia and was on iron supplement. The red urine was not associated with dysuria, abdominal pain or loin pain. She did not have muscle pain.

On examination, the general condition was satisfactory. She was not in distress. She was afebrile, blood pressure was 116/68 mmHg, heart rate 71/min. Examination of the cardiovascular system and chest was unremarkable. The abdomen was soft and there was no loin tenderness. The muscle was not tender. Urine was brownish-red in colour and urine multistix showed large amount of red blood cells. The blood creatine kinase (CK) level was 1070 IU/L. The diagnosis of rhabdomyolysis and myoglobinuria was made. She was given intravenous fluid and was admitted.

She was treated by forced diuresis using intravenous normal saline and advised to take large amount of fluid orally. The urine output was good. Urine was positive for myoglobin. The renal function remained normal all along. CK declined gradually and returned to normal eight days later. She was subsequently discharged.

Discussion

Rhabdomyolysis is the breakdown of muscle fibres. Enzymatic destruction and mitochondrial dysfunction within the muscle cell lead to release of cellular content into the bloodstream, including myoglobin, creatine kinase, potassium, uric acid, phosphate and others.[1]

Rhabdomyolysis is commonly attributed to situations involving high-intensity exertion and possibly heat or dehydration during activities. These include military training, police and fire department candidate testing, weight training, and marathon running.[2,3] There are other non exertional causes

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from a wide spectrum of medical conditions such as alcoholism, crush injuries, prolonged myoclonus, cocaine, other drugs or toxins.[2]

Rhabdomyolysis has previously been noted to be rare in women, perhaps due to differences in body cooling or CK release patterns between men and women.[2] In studies of muscle damage following exercise, men exhibit greater serum CK levels than women. An increased level of circulating oestrogen has been postulated to have a protective effect.[1,4]

Rhabdomyolysis more frequently occurs after eccentric or repetitive exercises. In eccentric contractions, muscles work during lengthening and result in higher serum CK levels and a higher incidence of muscle pain and stiffness.[2,3] Shorter repetitive exercise places a greater demand on muscle glycogen stores, leading to a greater potential for muscle injury than long periods of less intense exercise.[5]

Patients typically present with muscle pain, weakness and discoloured urine.[1] The diagnosis is confirmed by finding a raised creatine kinase with myoglobinuria. Myoglobinuria gives a positive dipstick test but there is absence of red blood cells on microscopy. It can be confirmed biochemically.

The main aim of management of rhabdomyolysis is to prevent renal failure.[1] The mechanism of rhabdomyolysis-induced renal failure is not completely understood, but likely involves a combination of myoglobinuria, aciduria, and decreased renal perfusion due to hypovolemia.[6] Complications such as hyperkalemia, hypocalcemia, compartment syndrome, disseminated intravascular coagulation may also occur. The development of complications depends on age, sex, underlying chronic illness, pre-existing renal impairment, dehydration, the extent of muscle damage and the presence of sepsis. The incidence of renal failure in exercise-induced rhabdomyolysis is lower than those due to other causes. In a retrospective study of 35 patients with exercise-induced rhabdomyolysis, none developed renal failure.[7] It may be because patients are likely to be younger and in better general health.[1]

An intravenous infusion of normal saline is used to maintain a high urine output to prevent renal damage.[1] It is designed to increase the pressure and flow through the renal tubules, increasing excretion of toxic compounds. Alkalinization of the urine with intravenous sodium bicarbonate is recommended to counter myoglobin's higher toxicity in acidified urine and the formation of uric acid crystals in the urine.[2] Some also prescribe diuretic agents, usually fursemide, to increase urine output. However, diuretics should not be given if there is volume depletion.

Prevention of rhabdomyolysis remains the best solution. The incidence of rhabdomyolysis correlates with the degree of prior conditioning in an athlete. Training seems to provide a level of tolerance to exertional rhabomyolysis. A careful assessment of an individual's activity history and capabilities is needed. Increases in exercise level should be kept to small increments. Extra precautions should be taken in extremes of heat and humidity. Adequate hydration and rest periods are important.[2,5]

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