



# Exertional Rhabdomyolysis Due to Spin Class is a New Problem in Young People in Singapore

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## Abstract

Exertional Rhabdomyolysis (ER) finds itself an increasingly common cause of rhabdomyolysis as spin classes gain popularity amongst Singaporeans as a means to keep fit. We report 2 cases of ER, both of which were associated with recent attendance at spin classes. Both cases were treated with vigorous hydration and discharged with good renal function and mobility. This paper aims to raise the awareness of ER, which may be especially pertinent for general practitioners and emergency physicians.

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**Keywords:** Spinning class; Rhabdomyolysis; Exercise.

## Case presentation

Exertional Rhabdomyolysis (ER) is getting more common in Singapore with the popularity of high-intensity exercises such as spin classes and CrossFit. Spin classes are a form of indoor exercise that focusses on endurance and strength training. The class is led by an instructor, and typically ranges from 30-60 minutes. In this paper, we report 2 cases of ER from spin classes seen at Tan Tock Seng Hospital, Singapore.

### Case 1

A 21-year-old woman with no significant medical history presented to the Emergency Department (ED) with bilateral thigh pain associated with dark urine. She had attended her first spin class the same week and developed thigh pain 1 day later. She

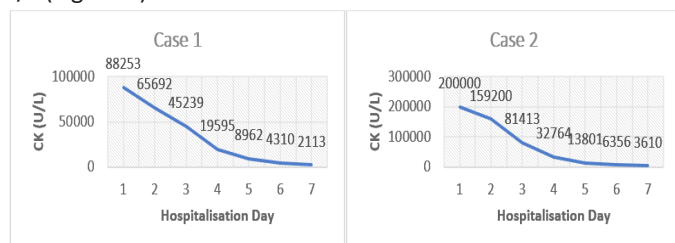
noticed progressively worsening anterior thigh pain over the course of 5 days with darkening of her urine in the last 2 days. Investigations on admission showed a Creatinine Kinase (CK) of 88,253 U/L (normal range 30-250 U/L), an Aspartate Amino-transferase (AST) of 942 U/L (normal range 15-40 U/L) and serum Creatinine (Cr) of 66 µmol/L (normal range 40-75 µmol/L). The urine dipstick was positive for blood; urine myoglobin levels were 264 µg/L (normal range < 21 µg/L). The full blood count, serum electrolytes and thyroid function tests were within normal limits. She was commenced on Intravenous (IV) hydration. She was discharged with a CK level of 2113 U/L and with complete resolution of her symptoms (Figure 1).



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## Case 2

A 32-year-old woman with a history of thyroid nodules presented with bilateral thigh pain 3 days after attending a spin class. She had continued with moderate-intensity exercises (tennis and jogging) in the 2 days after the spin class. She also noticed darkening of her urine 1 day after the onset of thigh pain. The laboratory results were notable for a CK of >200,000 U/L (normal range 30-250 U/L), an AST of 2139 U/L (normal range 15-40 U/L) and serum Creatinine (Cr) of 47  $\mu\text{mol/L}$  (normal range 40-75  $\mu\text{mol/L}$ ). The urine dipstick was positive for blood and the urine myoglobin levels were 2765  $\mu\text{g/L}$  (normal range < 21  $\mu\text{g/L}$ ). She was clinically euthyroid and her thyroid function tests were within normal limits. CK levels were monitored whilst on IV hydration. On discharge, she was clinically well with no muscle tenderness, and the CK levels were 3610 U/L (Figure 1).



**Figure 1:** Serum CK levels for Case 1 and 2 by hospitalisation day.

## Discussion

Due to the popularity of spin class, especially in first-time participants, ER is becoming increasingly encountered in clinical practice. In ER, depletion of Adenosine Triphosphate (ATP), damage to the sarcolemma, and release of calcium ( $\text{Ca}^{2+}$ ) ions by the sarcoplasmic reticulum leads to intracellular hypercalcaemia. This activates apoptotic signals and leads to breakdown of the myocyte and release of myoglobin [1].

Exercising at a level exceeding one's ability and being physically untrained appear to pose a greater risk of developing clinically significant ER. Several case reports have found a lower incidence of ER in conditioned versus sedentary patients [2].

Muscle contractions that cause the greatest injury to muscle are eccentric contractions (spin exercises in thigh muscle), where high-force lengthening contractions place strain on the muscle fibers and cause damage to its protein structure [3]. Such contractions are often encountered in spin and CrossFit classes, possibly explaining the higher incidence of ER in participants of these classes.

Elevated ambient temperatures can also exacerbate ER by accelerating dehydration and electrolyte loss. The use of certain drugs such as statins, recreational drugs, as well as recent viral illness may also predispose a patient to developing ER [4]. It should be noted that the use of Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) before or during physical activity has been associated with the development of renal failure in patients with ER [5].

Cases of recurrent ER precipitated by mild exercise or a strong family history of ER should prompt evaluation of an underlying myopathy (e.g. metabolic myopathies, disorders of calcium homeostasis and other structural myopathies, sickle cell trait) should be undertaken [6]. Type 1 Ryanodine Receptor (RYR1) mutations have been recently recognised to account for a substantial proportion of patients presenting with ER [7].

ER is defined by a constellation of findings including exercise-associated muscle pain, swelling, dark urine, increased CK levels  $\geq 5$  times the Upper Limit Of Normal (ULN), and myoglobinuria [8]. Serum CK is the most reliable diagnostic marker of rhabdomyolysis. It usually peaks 24-36 hours after exertion and then decreases back to baseline at a rate of about 40% per day [9]. Serious complications of ER include compartment syndrome, Acute Kidney Injury (AKI), and Disseminated Intravascular Coagulopathy (DIC). Oedema from muscle injury causes intra-compartmental pressures to rise, eventually compromising neurovascular structures of the limb. A recently developed algorithm showed that the risk of acute renal failure increases with a CK level > 40'000 U/L. As both cases above presented with CK levels exceeding 40'000 U/L, they were commenced on aggressive IV hydration and monitored closely for worsening renal function. In both cases the renal function remained normal. Severe cases of ER with elevated CK levels  $\geq 5$  times the ULN or dark urine should be admitted for IV hydration and monitoring of urine output. A systematic review of 14 studies reported normal saline alone may be effective in resolving ER [10].

## Conclusion

New exercise programs and classes such as spin classes and CrossFit provide an alternative means of keeping fit, but also carry the risk of significant ER in the unaccustomed individual. Awareness of ER and its symptoms will aid in prompt recognition of the condition by the participants to seek early treatment. Fitness centres offering such classes can also provide information leaflets to mitigate the risk of ER. This case series highlights the increasing incidence of ER in such fitness classes, which may be under-reported due to low public awareness.

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