

Post-Spinning Exercise Induced Rhabdomyolysis: A Case Report

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Abstract: *Exercise induced rhabdomyolysis (EIR) is a condition that has been described in poorly conditioned individuals involved in prolonged strenuous unaccustomed exercise with high eccentric load. In this case report, we discuss the occurrence, diagnosis and management of a patient developing this condition after a spinning class.*

Keywords: Creatine kinase, Exercise, Muscle, Rhabdomyolysis

1. Introduction

In the last decade, we have witnessed a rise in the fitness industry with more individuals seeking to lead a healthier lifestyle through exercise. Spinning is a popular form of endurance-based exercise in which participants are involved in a group based indoor stationary cycling class, usually guided by an instructor. This exercise involves participants using different positions and resistance on the bike to simulate hill climbs, sprints and cycling on flat.[1]

Exercise induced rhabdomyolysis (EIR) is a condition caused by injury to skeletal muscle following prolonged strenuous unaccustomed exercise such as spinning classes, that involves leakage of large quantities of potentially toxic intracellular contents into plasma which includes myoglobin and other sarcoplasmic contents like aspartate transaminase and creatine kinase.[2]

2. Case Report

Ms FHS, a 29-year-old lady presented to us with progressively worsening left thigh pain for five days after an exercise bout of spin class. She also complained of left thigh swelling for three days and painless hematuria for two days. On examination, the left thigh was larger than the right thigh, more tense than the right, distal pulses were palpable and equal bilaterally, and sensation was normal. The first investigation that came back showed a picture of urinary tract infection. However, based on her clinical presentation, we still had a high index of suspicion for exertional rhabdomyolysis. We started her on intravenous hydration therapy based on bodyweight, encouraged oral fluid consumption, and intravenous antibiotics. The Magnetic Resonance Imaging (MRI) of her left thigh showed diffuse homogenous oedema of the vastus medialis, vastus lateralis, vastus intermedius, and rectus femoris muscles with subfascial fluid collection as seen in Figure 1a and 1b. There was no intramuscular hematoma or tears noted. This further enhanced our suspicion for rhabdomyolysis. Her Electrocardiogram (ECG) showed sinus rhythm. The Creatine Kinase (CK) was later noted to be 92370 U/L. The Aspartate Transaminase (AST) was 1269 IU/L and Alanine

Transaminase (ALT) was 432IU/L. The rest of the Liver Function Test were normal. Her renal creatinine, urea, and electrolyte levels were within normal range. We diagnosed her with Exercise-Induced Rhabdomyolysis with concurrent Urinary Tract Infection (UTI). She was continuously managed with fluid resuscitation and intravenous antibiotics. Her thigh swelling and hematuria progressively improved over one week (Day 10). The blood investigation trend is depicted in Table 1 and Figure 2.

3. Discussion

Rhabdomyolysis is a condition that is caused by injury to the skeletal muscles. EIR is defined as a clinical syndrome associated with severe muscle pain, sudden elevation (and subsequent fall) of serum creatine kinase (CK) levels with or without myoglobinuria.[3] Risk factors that increases the likelihood of developing EIR are prolonged unaccustomed strenuous high eccentric load exercise, in a poorly conditioned individual, hot, and humid environment and poor hydration.[4]

In this case, patient presented with signs and symptoms that warranted investigation for rhabdomyolysis like severe myalgia, weakness with swelling of the thighs with markedly raised CK, AST and ALT following a high intensity bout of cycling. This was similar to findings in the case reported by Young et al in 2004.[1] There was more than five times increment of the CK levels with normal upper limit being 1000 U/L.[5]

The typical sequelae of myoglobinuria seen in rhabdomyolysis are acute kidney injury as myoglobin molecules are large and tend to clog the kidney tubules. However, in this case, patient did not show signs of kidney impairment, instead there were marked increment of AST and ALT. AST is found within the cytosolic and mitochondrial isoenzymes seen in liver, cardiac, skeletal muscles and few other tissues, making it non-specific for liver injuries.[2] ALT on the other hand, is found in high amounts in liver cells compared to skeletal muscles.[2] As discussed by Andy KH Lim[2], while there is a rapid rise of CK and AST following skeletal muscle injury, ALT may

take up to 5 days to peak, with an AST/ALT ratio more than 1, as seen on day 6 with a ratio of 2.93. CK/ALT ratio further supports case for rhabdomyolysis as the ratio was 160.2 on day 6 and 19.3 on day 9. CK/ALT ratio that

exceeds 15 is suggestive of muscle injury with a sensitivity of 67% and specificity of 77%, though notideal, but this specificity is better than ALT alone. [2]

Table 1: Trend of Blood Investigation

Day	Creatine Kinase (U/L)	Aspartate Transaminase (IU/L)	Alanine Transaminase (IU/L)	GGT (U/L)	Total Bilirubin (μmol/L)
5	92370	Not available	Not available	Not available	Not available
6	69208	1269	432	11	6.7
7	32059	840	338	10	2.5
8	14635	625	359	12	6.4
9	8227	488	427	18	6.7
10	4367	329	373	18	5.8
12	1826	183	310	18	7.7
16	354	45	135	16	5.7
26	46	26	41	18	9.4

Normal reference values: Creatine Kinase: 0-192 U/L; Aspartate Transaminase: 0-32 IU/L; Alanine Transaminase: 0-29 IU/L; Gamma-Glutamyltransferase (GGT): 0-38 U/L, Total Bilirubin: 3.0-22.5 μmol/L

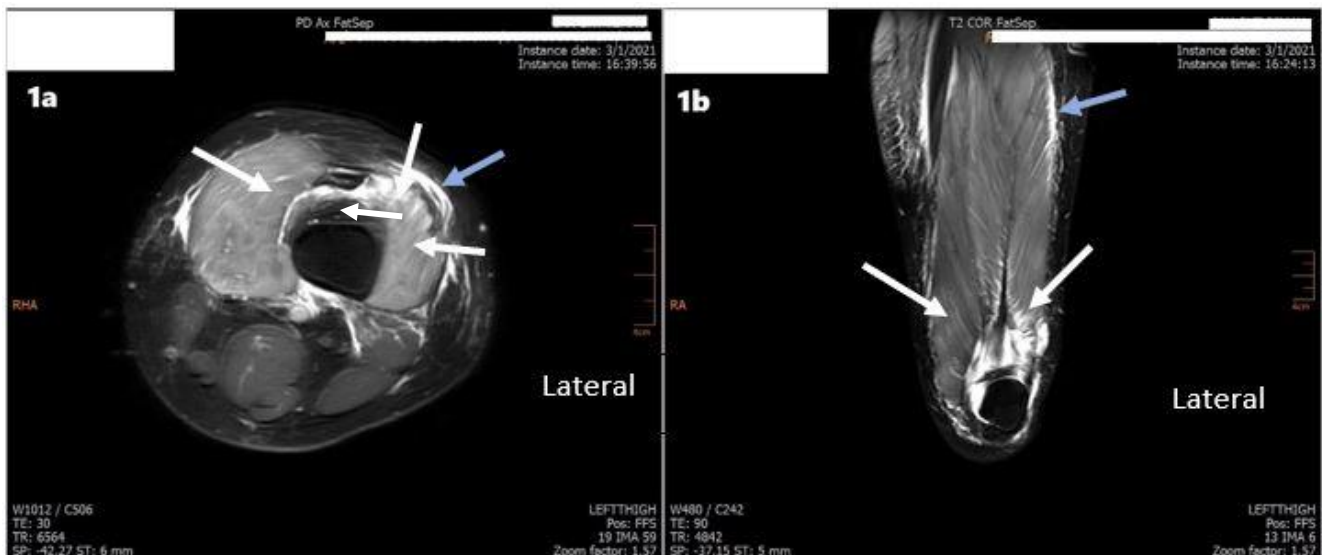


Figure 1a: Axial Proton Density Fat suppressed view of the left thigh. **Figure 1b:** Coronal T2 weighted Fat suppressed view of left thigh. In both image subfascial fluid collection is seen (light blue arrow) and diffuse homogenous edema involving the vastus medialis, lateralis, intermedius and rectus femoris seen with hyperintense feather-like pattern around myotendinous junction of quadriceps favoring muscle strain. (white arrows)

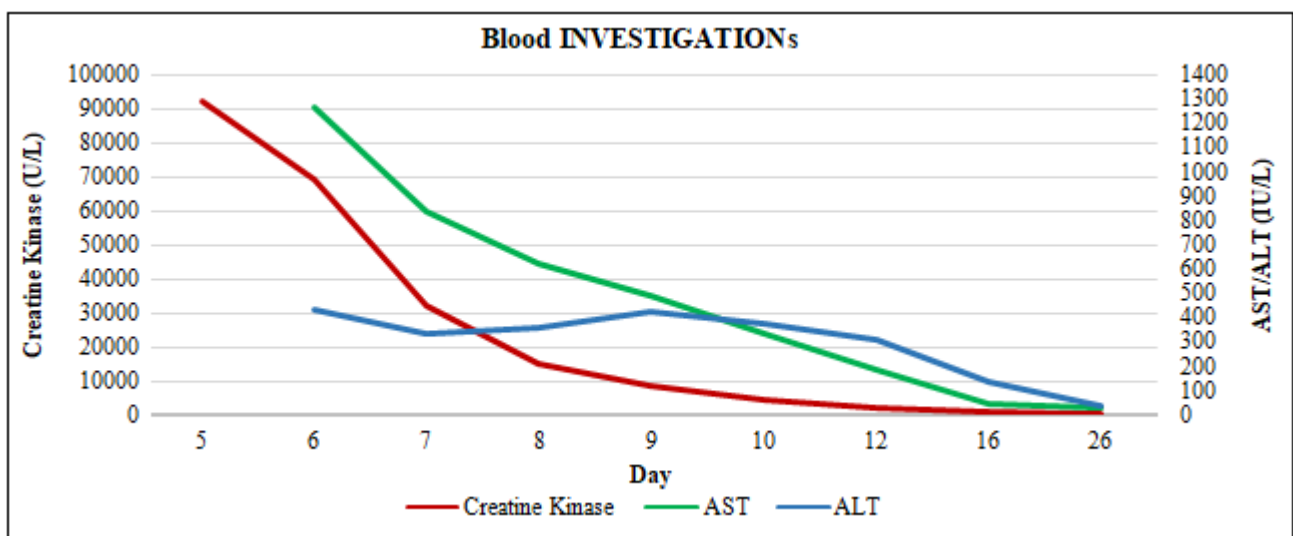


Figure 2: Trend of Blood Investigations. AST: Aspartate transaminase. ALT: Alanine transaminase

Normal GGT and bilirubin levels along with the figures stated above, tilts the raised AST and ALT levels towards rhabdomyolysis.

The MRI findings of homogenous diffuse oedema involving the quadriceps with subfascial collection is a known feature of moderate rhabdomyolysis.[5]MRI is a more sensitive diagnostic investigation compared to Computed Tomography (CT) or Ultrasonography. [5]

The presence of hematuria and leucocytes in her urine analysis was suggestive of a concurrent UTI. Upon starting her on antibiotics and the concurrent hydration, the UTI resolved with leucocytes being negative on day 5 of admission.

The treatment for EIR involves cessation of the activity, and patient must be monitored in an inpatient setting to hydrate patient adequately, aiming to achieve urine output of 200-300 ml/hour, monitor CK levels, kidney and liver profiles and watch out for compartment syndrome of the affected muscle.[1] Patient can be safely discharged, once patient is tolerating well orally, and CK levels have continued to drop steadily till it is below 5 times the upper limit, as seen in this case. Patient was then followed up in the outpatient clinic with blood parameters being regularly monitored till complete normalisation.

EIR is a relatively uncommon condition which can be life threatening if not recognised early and treated promptly. Patients should be advised to be careful when they engage in new unaccustomed activities which are exhaustive as this may predispose them to developing this condition.

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