Case Report

DOI: 10.7860/IJARS/2024/71383.3014

Radiology Section

Excessive Exercise by Gym Enthusiast Leading to Rhabdomyolysis: A Case Report

UTSAVI TEJAS MODI[1], PRAMOD VAIJNATH NAGURE[2], VASUDHA RAVINDRA NIKAM[3], TEJASKUMAR BANKIMBABU MODI[4], TEJAS SUDHAKAR SHETTY[5]

ABSTRACT

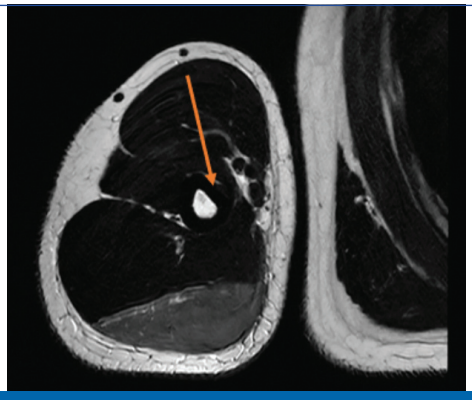
Rhabdomyolysis is a rare condition characterised by muscle oedema and inflammation. Radiological imaging, particularly Magnetic Resonance Imaging (MRI), plays a crucial role in the diagnosis and management of patients with muscle injuries. Hereby, the authors present a case report of a 21-year-old male who recently joined a gym a month ago. After a recent upper body workout, he began experiencing vague pain around the posterior aspect of the entire right arm, radiating towards the shoulder and elbow. An MRI was performed to evaluate the musculature of the right arm and forearm. T2-weighted axial images revealed hyperintense signals within the long head of the triceps muscle. Short Tau Inversion Recovery (STIR) coronal and STIR axial sequences showed increased signal intensity in the short field of view sequences, consistent with the presence of subcutaneous inflammation. The patient was managed conservatively with anti-inflammatory medications. A follow-up scan after one month showed complete resolution of muscle oedema. The ability of MRI to accurately assess the degree and severity of muscle injury allows for appropriate treatment planning and monitoring of disease progression. In cases of suspected muscle injury, prompt radiological evaluation can facilitate early diagnosis and intervention, ultimately improving patient outcomes.

Keywords: Creatine phosphokinase, Exercise physiology, Follow-up scan, Muscle inflammation, Muscle oedema, Radiological imaging

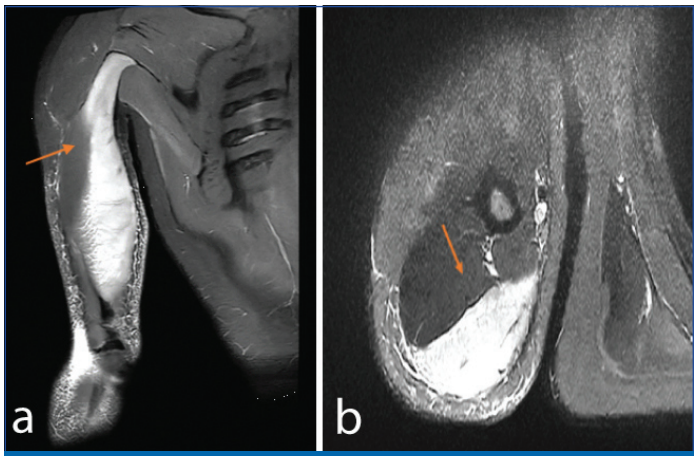
CASE REPORT

A 21-year-old male recently joined a gym a month ago. He regularly performs upper-limb and lower-limb workouts. After a recent upper body workout, he began experiencing vague pain around the posterior aspect of his entire right arm, radiating towards the shoulder and elbow. On clinical examination, mild diffuse tenderness was noted over the posterior aspect of the arm. Investigations revealed mildly elevated creatine phosphokinase levels, while blood parameters, including renal and hepatic parameters, were normal.

An MRI was performed to evaluate the musculature of the right arm and forearm. T2-weighted axial images revealed hyperintense signals [Table/Fig-1] within the long head of the triceps muscle, indicative of muscle oedema and inflammation. Additionally, STIR coronal [Table/Fig-2a] and STIR axial [Table/Fig-2b] sequences showed increased signal intensity in the long head of the triceps, consistent with the presence of muscle oedema within the affected muscle compartment. These findings supported the diagnosis of rhabdomyolysis localised to the long head of the triceps muscle. PD fat-saturated axial and coronal (short FOV) views of the elbow joint showed a normal tendinous portion of the triceps muscle [Table/Fig-3a,b].



[Table/Fig-1]: Images taken from the right mid-arm (10 cm from the shoulder) show T2 axial images hyperintense signal in long head of right triceps (arrow).

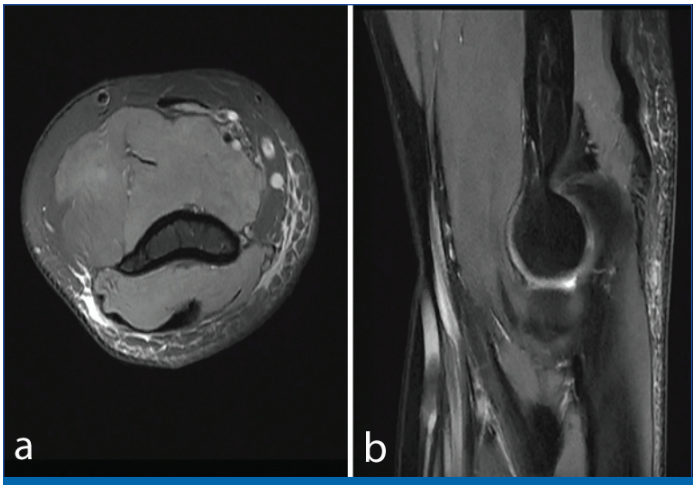


[Table/Fig-2]: a) STIR coronal (posterior aspect of the right mid arm); b) STIR axial {taken from right mid arm (10 cm from shoulder)} shows hyperintense signal in long head of right triceps (arrow).

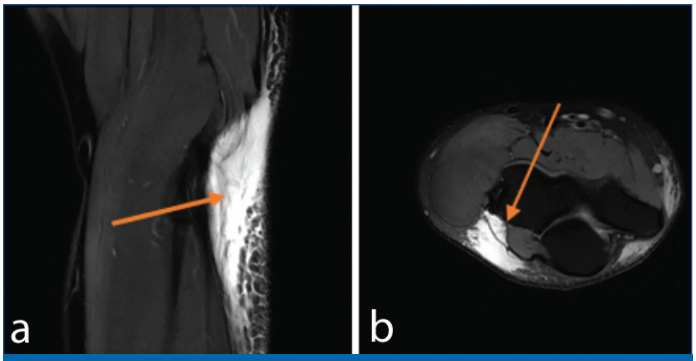
The MRI images of the right mid-arm showed a hyperintense signal on Proton Deficient (PD) fat-saturated axial and coronal {short Field of View (FOV)} views, indicative of subcutaneous oedema, while the rest of the elbow remained unremarkable [Table/Fig-4a,b]. The patient was then treated with anti-inflammatory drugs, specifically aceclofenac and paracetamol (100 mg + 325 mg for 7 days), along with conservative treatment, including multivitamins (Tab Zincovit) for seven days. After a one-month follow-up, a scan showed complete resolution of muscle oedema [Table/Fig-5a-d].

DISCUSSION

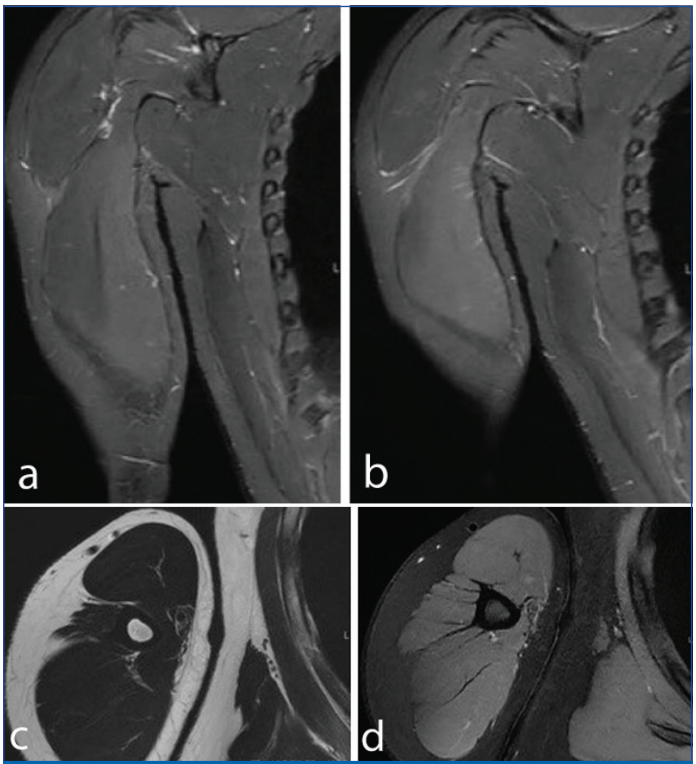
Rhabdomyolysis refers to the dissolution or disintegration of striated muscle. It results in the release of skeletal muscle cell



[Table/Fig-3a,b]: PD fat sat axial taken from right mid arm (10 cm from shoulder) and coronal (posterior aspect of the right mid arm) of the elbow joint (short FOV) views shows the tendinous portion appears normal.



[Table/Fig-4a,b]: PD fat-saturated axial {taken from right mid arm (10 cm from shoulder)} and coronal (posterior aspect of the right mid arm) of the elbow joint (short FOV) views shows hyperintense signal indicative of subcutaneous oedema (arrow).



[Table/Fig-5]: a,b) Follow-up scans after one month, T2 coronal (posterior aspect of the right mid arm); c) T2 axial {rigt mid arm (10 cm from shoulder)} and; d) T2 fat sat axial {right mid arm (10 cm from shoulder)}, shows complete resolution of muscle oedema.

constituents, including enzymes such as creatine kinase, lactate dehydrogenase, aldolase, and the heme pigment myoglobin, as well as electrolytes such as potassium, phosphates, and purines into the circulatory system [1,2]. Rhabdomyolysis can arise from a variety of causes, including alcohol, drugs, excessive muscle exercise, direct muscle injury, ischaemic injury, metabolic disorders, infections, heat stroke, inflammatory myopathies, or hereditary enzyme defects [Table/Fig-6] [3]. The condition may lead to heart failure, arrhythmias, electrolyte imbalances, and serious complications such as renal failure, which can ultimately result in death [2]. Symptoms of exercise-induced rhabdomyolysis resemble those of delayed onset muscle soreness, which can easily be overlooked. Despite its significance, rhabdomyolysis may go unnoticed by those who engage in physical activity [4].

Category	Commonly reported cases
Trauma	Crush syndrome
Exertion	Strenuous exercise, seizures, alcohol withdrawal syndrome
Muscle hypoxia	Limb compression by head or torso during prolonged immobilisation or loss of consciousness, major artery occlusion
Genetic defects	Disorders of glycolysis or glycogenolysis, including myophosphorylase (glycogenosis type V), phosphofructokinase (glycogenesis type VII), phosphorylase kinase (glycogenesis type VIII), phosphoglycerate kinase (glycogenesis type IX), phosphoglycerate mutase (glycogenesis X), lactate dehydrogenase (glycogenesis type XI). Disorders of lipid metabolism, including carnitine palmitoyl transferase II, long chain acyl-CoA dehydrogenase, short chain L-3-hydroxyacyl-CoA dehydrogenase, medium chain acyl-CoA dehydrogenase, very long chain acyl-CoA dehydrogenase, medium chain 3-ketoacyl-CoA, thiolase. Mitochondrial disorders, including succinate dehydrogenase, cytochrome c oxidase, coenzyme Q10 pentose phosphate pathway, glucose 6-phosphate dehydrogenase. Purine nucleotide cycle: myoadenylate deaminase.
Infections	Influenzas A and B, coxsackievirus, Epstein-Barr virus, primary human immune-deficiency virus, legionella species; streptococcus pyogenes, Staphylococcus aureus (pyomyositis), clostridium
Body-temperature changes	Heat stroke, malignant hyperthermia, malignant neuroleptic syndrome, hypothermia
Metabolic and electrolyte disorders	Hypokalemia, hypophosphatemia, hypocalcaemia, non ketotic hyperosmotic conditions, diabetic ketoacidosis
Drugs and toxins	Lipid lowering drugs (fibrates, statins) alcohol, heroin, cocaine
Idiopathic (sometimes recurrent)	

[Table/Fig-6]: Commonly reported causes of rhabdomyolysis [3].

Weightlifters may experience rhabdomyolysis that is localised to their triceps and biceps muscles, the soleus muscle due to a lightning strike, or the bilateral adductor muscles in a hiker. For the early diagnosis of muscle injury, two diagnostic imaging techniques-ultrasonography and MRI- can be utilised. Compared to ultrasonography, MRI appears to be superior for diagnosing and predicting the outcomes of patients with muscle injuries [5]. Radiological imaging, particularly MRI, plays a crucial role in evaluating rhabdomyolysis by providing detailed visualisation of muscle oedema, inflammation, and potential complications such as compartment syndrome. MRI measurements of lesion size, including height on longitudinal sections above the cross-sectional surface, may be useful in evaluating rhabdomyolysis [5]. For these reasons, MRI is essential in confirming the diagnosis and assessing the extent of muscle involvement in rhabdomyolysis [6].

Exertional Rhabdomyolysis (ER) is relatively rare; however, the consequences can be fatal, and therefore, appropriate treatment should be initiated to limit morbidity and mortality [7]. In present case, MRI demonstrated characteristic findings of muscle involvement localised to the long head of the triceps muscle, aiding in the confirmation of the clinical diagnosis. The present patient was managed conservatively with anti-inflammatory medications and hydration. His renal parameters were monitored carefully and remained normal. The ability of MRI to accurately assess the extent

and severity of muscle injury allows for appropriate treatment planning and monitoring of disease progression. Additionally, ultrasound may be utilised for real-time evaluation of muscle oedema and fluid collections, particularly in cases where MRI is contraindicated or unavailable.

CONCLUSION(S)

Radiological imaging, particularly MRI, is invaluable in the diagnosis and management of rhabdomyolysis, as it provides detailed visualisation of muscle involvement and aids in treatment planning. In cases of suspected rhabdomyolysis, prompt radiological evaluation can facilitate early diagnosis and intervention, ultimately improving patient outcomes. Close collaboration between clinicians and radiologists is essential for the accurate interpretation of imaging findings and the delivery of optimal patient care.

REFERENCES

[1] Armfield N. Exertion-induced rhabdomyolysis of the long head of the triceps. Sonography. 2015;2(4):92-95.
[2] Filipopoulos B, Balanathan S. Isolated rhabdomyolysis of long head of triceps mimicking upper extremity deep vein thrombosis. BMJ Case Rep. 2022;15(3):e245478. Doi: 10.1136/bcr-2021-245478. PMID: 35354574; PMCID: PMC8969045.
[3] Bosch X, Poch E, Grau JM. Rhabdomyolysis, and acute kidney injury. N Engl J Med. 2009;361(1):62-72.
[4] Kim J, Lee J, Kim S, Ryu HY, Cha KS, Sung DJ. Exercise-induced rhabdomyolysis mechanisms and prevention: A literature review. Journal of Sport and Health Science [Internet]. 2016;5(3):324-33. Available from: https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6188610/.
[5] Liu W, Wang D, Ouyang H, Chen N, Chang B, Zhu Q, et al. Ultrasound assessment of muscle injury associated with closed limb fracture. Biomed Res Int. 2019;2019:9365291.
[6] Huerta-Alardín AL, Varon J, Marik PE. Bench-to-bedside review: Rhabdomyolysis-An overview for clinicians. Crit Care. 2005;9(2):158-69.
[7] Tietze DC, Borchers J. Exertional rhabdomyolysis in the athlete: A Clinical Review. Sports Health A Multidisciplinary Approach. 2014;6(4):336-39.

PARTICULARS OF CONTRIBUTORS:

1. IIIrd Year Resident, Department of Radiodiagnosis, D.Y. Patil Medical College, Kolhapur, Maharashtra, India.
2. Senior Resident, Department of Radiodiagnosis, D.Y. Patil Medical College, Kolhapur, Maharashtra, India.
3. Associate Dean-Academic, Department of Anatomy, D.Y. Patil Medical College, Kolhapur, Maharashtra, India.
4. Senior Resident, Department of Radiodiagnosis, D.Y. Patil Medical College, Kolhapur, Maharashtra, India.
5. Ist Year Resident, Department of Radiodiagnosis, D.Y. Patil Medical College, Kolhapur, Maharashtra, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Utsavi Tejas Modi,
IIIrd Year Resident, Department of Radiodiagnosis, D.Y. Patil Medical College, Kolhapur-416003, Maharashtra, India.
E-mail: utsavimodi.05@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]

- Plagiarism X-checker: May 01, 2024
- Manual Googling: Aug 12, 2024
- iThenticate Software: Aug 17, 2024 (12%)

ETYMOLOGY: Author Origin

EMENDATIONS: 6

AUTHOR DECLARATION:

- Financial or Other Competing Interests: None
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **May 01, 2024**
Date of Peer Review: **Jun 12, 2024**
Date of Acceptance: **Aug 19, 2024**
Date of Publishing: **Sep 01, 2024**