CASE REPORT

Rhabdomyolysis presenting with septic shock in a 21 year old female patient: A case report

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Abstract

Rhabdomyolysis is a clinical condition characterized by the release of intracellular content into the bloodstream, resulting in the breakdown of skeletal muscle. The released intracellular content includes electrolytes, enzymes, and myoglobin, leading to systemic complications. The clinical presentation may vary, ranging from an asymptomatic increase in serum levels of enzymes released from damaged muscles to worrisome conditions such as volume depletion, metabolic and electrolyte abnormalities, and acute kidney injury. The diagnosis is confirmed when the serum creatine kinase (CK) level is > 1000 U/L or at least 5x the upper limit of normal. In this study, we aimed to evaluate a 21-year-old female patient presenting with non-traumatic exercise-unrelated rhabdomyolysis, accompanied by acute renal failure and septic shock.

Keywords: rhabdomyolysis, acute renal failure, sepsis, septic shock.

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Introduction

Rhabdomyolysis is caused by the breakdown and necrosis of muscle tissue and the release of intracellular content into the blood stream. The diagnosis is confirmed when the serum creatine kinase (CK) level is > 1000 U/L or at least 5x the upper limit of normal. Other important tests to request include serum myoglobin, urinalysis (to check for myoglobinuria), and a full metabolic panel including serum creatinine and electrolytes.[1] The course of the disease can vary from asymptomatic elevation of muscle-related serum enzymes to life-threatening electrolyte imbalances and acute renal failure.[2] The etiology of rhabdomyolysis is classified into three main groups: traumatic muscle compression-related, non-traumatic exercise-related, and non-traumatic exercise-unrelated.[3] The management of rhabdomyolysis consists of ensuring fluid and electrolyte balance, treating acute renal failure, and discontinuing medications or toxins that may play a role in its development.[1] In this study, our aim was to evaluate a 21-year-old female patient with known diagnoses of hypoxic-ischaemic encephalopathy, epilepsy, and mental retardation, presenting with non-traumatic exercise-unrelated rhabdomyolysis and septic shock.

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Case Report

A 21-year-old female patient, with known conditions of hypoxic-ischaemic encephalopathy since birth, epilepsy for approximately 10 years, and mental retardation, presented to the district state hospital on July 1, 2023 with complaints of nausea unrelated to meals without accompanying vomiting, and diarrhoea occurring 4-5 times a day for the past two days without associated bleeding. The patient also experienced epileptic seizures in the form of meaningless speech. No response to verbal stimuli. There is a response to painful stimuli. The physical examination at the district state hospital revealed the following vital signs: temperature 37°C, arterial blood pressure 100/60 mmHg, pulse rate 105/min, oxygen saturation 91% (on room air), and respiratory rate 28/min. Auscultation of lung sounds was normal, and no abnormal heart sounds or murmurs were detected. Abdominal examination showed no tenderness, guarding, or rebound tenderness. Upon examination at the district state hospital, the patient was found to have hyperkalaemia, metabolic acidosis, and elevated creatinine levels, leading to the decision of transferring the patient to the Giresun Training and Research Hospital, a tertiary care center on July 1, 2023.

During the initial assessment at emergency department, it was observed that the patient had been regularly taking topiramate 100 mg twice daily for epilepsy but had no other regular medication use. The patient was not on any nephrotoxic drugs. The physical examination at emergency department revealed the following vital signs: temperature 36.8°C, arterial blood pressure 90/60 mmHg, pulse rate 100/min, oxygen saturation 90% (on room air), and respiratory rate 30/min. Auscultation of lung sounds was normal, and no abnormal heart sounds or murmurs were detected. Abdominal examination showed no tenderness, guarding, or rebound tenderness. No hepatosplenomegaly was detected, and bilateral pretibial oedema was absent. The patient had a urinary catheter, and macroscopic haematuria was observed. There was a 3/5 muscle strength

loss observed in both lower and upper extremities. The laboratory tests of the patient on admission to the emergency department of our hospital are shown in Table 1.

The patient was admitted to the internal medicine department on July 1, 2023 with diagnoses of sepsis, acute gastroenteritis, urinary tract infection, rhabdomyolysis, acute renal failure, epilepsy, hypoxic-ischaemic encephalopathy and mental retardation.

Table-1: Laboratory tests on emergency department admission.

Parameter	Admission	Reference interval
pH	7.43	7.35–7.45
PO_2	38	83–108 mmHg
SO_2	70	% 95–99
lactate	3.3	0.5-1.6 mmol/L
HCO_3	20.6	22-26 mmol/L
PCO_2	24	35-48 mmHg
WBC	13.140	4.000-11.000/mm^3
Neutrophil	8.170	2.000-7.000/mm^3
Lymphocyte	2.580	800–4.000/mm^3
HGB	11.3	12–16 g/dl
MCV	81.7	80–96 fL
Platelet	297.000	150.000–450.000/mm^3
Glucose	102	74–100 mg/dl
Creatinine	1.3	0.5–0.9 mg/dl
ALT	39	0–33 U/L
AST	46	0–32 U/L
Total bilirubin	0.4	0–1.2 mg/dl
Direct bilirubin	0.3	0–0.3 mg/dl
LDH	305	135–214 u/L
Amylase	14	28-100 u/L
Calcium	6.8	8.6–10.2 mg/dl
Albumin	22.3	35-52 g/L
Sodium	140	136–145 mmol/L
Potassium	3.7	3.5–5.1 mmol/L
CK	1833	0-170 U/L
CRP	285	0–5 mg/L
PT	10.4	8.4–10.6 seconds
APTT	39.1	23.6–30.6 seconds
INR	1.1	0.8–1.2
Leukocytes	3	HPF
Erythrocytes	8	HPF
Squamous epithelial cells	4	HPF
Bacteria	5	Negative or Pozitive
Ketone	Negative	0–0,6 mmol/L
Leukocyte esterase	Negative	Negative or Positive
Nitrite	Negative	Negative or Positive
HbsAg	Negative	0–0,99 S/CO
Anti HBs	Negative	0–10 IU/L
Anti HCV	Negative	0–0,99 COI
Anti HIV	Negative	0–0,99 COI

WBC: white blood cell, HGB (hemoglobin), MCV (mean corpuscular volume), ALT (alanine aminotransferase), AST (aspartate aminotransferase), LDH (lactate dehydrogenase), CK (creatinin kinase), CRP (c-reactive protein), PT (prothrombin time), APTT (activated partial thromboplastin time), INR (international normalized ratio).

The patient was not mentally alert. Informed consent form was obtained from the patient's father.

Immediately after admission, during the initial bedside visit, the patient developed decreased level of consciousness, profound hypotension (arterial blood pressure: 80/60 mmHg), and unresponsiveness to painful stimuli. Glasgow Coma Scale was 11.[1] Due to the septic shock condition, the patient was transferred to the third-tier internal medicine intensive care unit. The patient was started on isotonic fluid therapy at a rate of 150 ml/hour, and a central venous catheter was inserted for adequate vascular access. Positive inotropic support with noradrenaline infusion was initiated. The patient received oxygen therapy via a face mask. During follow-up, the patient remained afebrile. Blood and urine cultures were sent to determine the causative microorganisms. The patient's intake and output were closely monitored, and haematocrit monitoring was performed due to macroscopic haematuria. A wide range of laboratory tests was conducted in the internal medicine intensive care unit, and the results are shown in Table 2.

Due to the positive inotropic support, tachycardia, and procalcitonin level of 52 ng/ml, the patient was considered to have septic shock. $Sp0_2$: 88 (without oxygen), ejection fraction: 60%, mean arterial pressure: 65 mmHg.

The infectious diseases department was consulted, and it was suggested to discontinue the current antibiotic therapy of ceftriaxone and metronidazole and initiate piperacillin-tazobactam 4.5 g intravenously four times daily. Piperacillin-tazobactam therapy was initiated before the results of blood and urine cultures were available.

The patient's isotonic fluid therapy was continued as required, and the antibiotic therapy was revised accordingly. Neurology consultation was requested for the patient with decreased level of consciousness. Brain

Table-2: Additional laboratory findings in the internal medicine intensive care unit.

Parameter	Admission	Reference interval
Procalcitonin	52	0–0.5 ng/ml
Albumin	20.2	35-52 g/L
Total protein	40.2	66–87 g/L
Uric acid	2.6	2.4–5.7 mg/dl
ALP	61	35–105 u/L
GGT	32	5–36 u/L
Sedimentation	72	0–20 mm/h
D-dimer	6459	80–500 ng/ml
Vitamin B12	338	197-771
Folic acid	5.1	3,8–20 uq/L
TSH	0.4	0.2–4.2 mU/L
FT4	0.7	0.9–1.7 ng/dl

ALP: alkaline phosphatase, GGT: gama glutamyl transferase.

diffusion MRI, brain CT, and EEG were performed as per the neurology department's recommendations. However, no acute lesions that could explain the patient's current clinical condition were detected on imaging. The EEG report indicated mild diffuse background activity without lateralizing findings. Considering the patient's long-term use of topiramate for epilepsy and the absence of fever and the current presentation (acute renal failure secondary to diarrhoea), rhabdomyolysis related to topiramate therapy was ruled out. The patient's topiramate 100 mg twice daily was continued with the administration via a nasogastric tube.

The patient had positive blood culture results for "Staphylococcus hominis," and infectious diseases consultation confirmed the continuation of the current antibiotic therapy. The urine culture was considered as consistent with contamination. During follow-up, the patient's liver function tests, creatinine kinase (CK), creatinine, and liver function parameters showed a trend of improvement. The macroscopic haematuria resolved. The patient did not experience any epileptic seizures while on topiramate 100 mg twice daily via nasogastric tube under close observation. As the patient's vital signs remained stable, and her CRP, procalcitonin, creatinine, liver function tests, and CK levels returned to normal ranges after completing the 14-day antibiotic therapy, the patient was transferred to the internal medicine ward with recommendations and a discharge prescription.

The patient whose laboratory parameters returned to normal under the current medical treatment, did not experience epileptic seizures, and had stable vital signs;

temperature 36.5°C, arterial blood pressure 120/70 mmHg, pulse rate 70/min, oxygen saturation 95% (on room air), and respiratory rate 13/min on discharge.

Discussion

Rhabdomyolysis was first described by Fleisher in 1881 as haemoglobinuria seen after muscle exercises.[2] The etiology of rhabdomyolysis can be classified into three main groups: traumatic muscle compression-related, non-traumatic exercise-related, and non-traumatic exercise-unrelated.[3] Our case was classified as non-traumatic exercise-unrelated rhabdomyolysis. Various factors can contribute to the etiology of rhabdomyolysis in this form, including medications, toxins, infections, electrolyte imbalances, endocrinopathies, and inflammatory myopathies.[4] The CK level at admission was found to be 1833 U/L, above 1000 U/L, consistent with the literature. The patient's corrected calcium value was found to be 8.2 mg/dl. The patient had no significant electrolyte imbalance at admission. Our patient presented with acute gastroenteritis accompanied by acute renal failure, and her long-term use of topiramate for epilepsy was noted. Neurology consultation was sought to evaluate whether topiramate treatment might be implicated in the etiology of rhabdomyolysis. Drug-induced rhabdomyolysis was not considered as a possibility.

Literature search did not reveal any cases of rhabdomyolysis secondary to topiramate treatment. Fatal cases of heat shock syndrome with hyperthermia related to topiramate have been reported in the literature. Acute renal failure is a common complication of rhabdomyolysis, accompanying the condition in 15-50% of cases.[5] In our case, acute gastroenteritis and subsequent acute renal failure were identified as the cause of rhabdomyolysis. Rhabdomyolysis has been associated with various bacterial and viral infections.[6] Bacterial infections linked to rhabdomyolysis include legionella, tularemia, streptococcus, salmonella, escherichia coli, leptospirosis, Coxiella burnetii (Q fever), and staphylococcal infections.[7] Rhabdomyolysis caused by streptococcal and staphylococcal exotoxins can be associated with toxic shock syndrome, sepsis, and septic shock.[6] Neutrophilic leukocytosis and elevated CRP were observed. Procalcitonin value was found to be quite high (52 ng/ml) and these laboratory values were compatible with bacterial infection. In our case, the patient presented with septic shock and was followed up in the internal medicine intensive care unit. The blood culture revealed growth of "Staphylococcus hominis." The patient's blood culture results and laboratory tests were found to be compatible. "Staphylococcus hominis" is a coagulase-negative staphylococcus species that is normally found in human skin flora but can also be isolated as a pathogen in opportunistic infections. It is predominantly found in the head, axilla, arms, and legs as part of the normal flora.[8] "Staphylococcus hominis" is not one of the most commonly isolated staphylococcal species. Limited studies are available on the susceptibility profile of S. hominis isolates. The patient responded well to treatment with piperacillin-tazobactam.

Conclusion

Our case was evaluated as rhabdomyolysis secondary to bacterial infection. CK value was found to be 1833 above 1000 in accordance with the literature. The blood culture grew staphylococcus hominis and the patient presented with acute renal failure and sepsis. The 21-year-old patient had no known comorbid disease except epilepsy. Early aggressive isotonic therapy and piperacillin tazobactam antibiotherapy resulted in clinical improvement. Although rhabdomyolysis can be fatal, it is a clinical syndrome that can be treated with early diagnosis and treatment in

patients without comorbid disease, as in our case.

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References

1. Mehta R, Chinthapalli K. Glasgow coma scale explained. BMJ 2019;365:l1296. doi: 10.1136/bmj.l1296
2. Cabral BMI, Edding SN, Portocarrero JP, Lerma EV. Rhabdomyolysis. Dis Mon 2020;66:101015. doi: 10.1016/j.disamonth.2020.101015
3. Baeza-Trinidad R. Rhabdomyolysis: A syndrome to be considered. Med Clin (Barc) 2022;158:277-83.
4. Dall'Aglio A, Kissling S, Vollenweider P, Jaccard E. Rhabdomyolysis: early management. Rev Med Suisse 2020;16:2272-8.
5. Harmelink M. Uncommon Causes of Rhabdomyolysis. Crit Care Clin 2022;38:271-85. doi: 10.1016/j.ccc.2021.11.004
6. Blanco JR, Zabalza M, Salcedo J, Echeverria L, García A, Vallejo M. Rhabdomyolysis of infectious and noninfectious causes. South Med J 2002;95:542-4.
7. Huerta-Alardín AL, Varon J, Marik PE. Bench-to-bedside review: Rhabdomyolysis -- an overview for clinicians. Crit Care 2005;9:158-69. doi: 10.1186/cc2978
8. Mengeloglu FZ, Terzi HA. Susceptibility Profile in Staphylococcus hominis Isolates. Flora 2011;16:103-6.

Author Contribution:
EK: Final approval and agreement to be accountable for all aspects of the work.