

# Rhabdomyolysis in a Burned Patient Stuck in a Well – a Case Report

## Rabdomioliza kod opečenog pacijenta zaglavljenog u bunaru – prikaz slučaja

Jerica Založnik Djordjević<sup>1\*</sup>, Jelena Ocvirek<sup>2</sup>, Ivana Rosić<sup>2</sup>, Matej Strnad<sup>1</sup>, Martina Pavletić<sup>2</sup>

<sup>1</sup> University Medical Centre Maribor, Department of Emergency Medicine, Maribor, Slovenia

<sup>2</sup> Clinical Hospital Centre Rijeka, Department of Emergency Medicine, Rijeka, Croatia

**Abstract. Aim:** Rhabdomyolysis is a rare clinical entity. Its manifestation might be acute or delayed, with an acute episode frequently accompanied by severe clinical signs, while delayed rhabdomyolysis presentation has a more benign progression. **Case report:** Here we report a case of a 70-year-old patient with combined rhabdomyolysis, brachial plexus injury, second-degree burn injuries and acute kidney injury with an unusual cause of injury and subsequent mild clinical course. **Conclusion:** Even with a benign clinical course, one must think of rhabdomyolysis in uncertain injury mechanisms or questionable circumstances, and prompt laboratory diagnosis and fluid supplementation should be undertaken.

**Keywords:** Acute Kidney Injury; Burns; Creatine Kinase; Creatinine; Rhabdomyolysis

**Sažetak. Cilj:** Rabdomioliza je rijedak klinički entitet. Njezina manifestacija može biti akutna ili odgođena, s akutnom epizodom često praćenom teškim kliničkim znakovima, dok odgođena prezentacija rabdomiolize ima benigniju progresiju. **Prikaz slučaja:** Ovdje prikazujemo slučaj 70-godišnjeg pacijenta s kombiniranom rabdomiolizom, ozljedom brahijalnog pleksusa, opeklinama drugog stupnja i akutnom ozljedom bubrega s neobičnim uzrokom ozljede i naknadnim blagim kliničkim tijekom. **Zaključak:** Čak i kod benignog kliničkog tijeka treba misliti na rabdomiolizu u nesigurnim mehanizmima ozljede ili upitnim okolnostima te treba poduzeti brzu laboratorijsku dijagnozu i nadoknadu tekućine.

**Ključne riječi:** akutna ozljeda bubrega; kreatin-kinaza; kreatinin; opeklina; rabdomioliza

**\*Corresponding author:**

Jerica Založnik Djordjević, MD  
University Medical Centre Maribor,  
Department of Emergency Medicine  
Ljubljanska 5, 2000 Maribor, Slovenia  
E-mail: jerica.zalo@gmail.com

<http://hrcak.srce.hr/medicina>

## INTRODUCTION

Rhabdomyolysis is a syndrome that involves skeletal muscle injury, necrosis, and release of intracellular contents, including myoglobin and creatine kinase (CK)<sup>1</sup>. Most patients with a risk of rhabdomyolysis are post-injuries that can cause compartment syndromes or prolonged muscular compression. In the majority of cases, it presents with muscle pain and general discomfort. If left untreated, complications can occur such as acute kidney injury (AKI), compartment syndrome, and in rare cases peripheral neuropathy<sup>2</sup>. There are limited data on the incidence with approximately 26.000 cases reported annually in the US<sup>3</sup>, as the true incidence of rhabdomyolysis remains virtually unknown, mainly due to its highly variable presentation and underrecognition. Although rhabdomyolysis generally presents with a severe clinical course, it occasionally can have a benign display, which makes an accurate diagnosis easily overlooked. Here, we report a case of a 70-year-old male patient with combined rhabdomyolysis, brachial plexus injury and second-degree burn injuries with an unusual cause of injury and subsequent mild clinical course.

## CASE REPORT

A 70-year-old Caucasian male with known paroxysmal atrial fibrillation, arterial hypertension, after percutaneous coronary intervention for acute myocardial infarction and after castration with adjuvant radiotherapy for prostate cancer was transferred to our emergency department from a nearby inhabited island due to extensive head swelling and larger burn areas of both upper extremities. He got stuck in a well turned upside down while collecting water. However, the duration of his condition could not be objectively confirmed since his and his neighbour's statements differ. Burn injuries were assumably obtained on a previous day while barbecuing. There was no evidence of previous psychiatric disorders. He was on a regular treatment with atorvastatin, ramipril, amlodipine, bisoprolol, dabigatran, amiodarone and aspirin.

On admission, he was haemodynamically and respiratory stable, yet disorientated and occa-

sionally confused. Diffuse pain located along both upper extremities was his main complain. On physical examination, extensive face swelling was observed with both eyelids' oedema restricting any vision at all. Second degree burn injuries were noticed along both upper extremities with a total surface of approximately 10% body surface area. Mottled skin of both lower extremities was noted. No other injuries were noted. His skeletal and chest X-ray were unremarkable. In the laboratory findings, elevated inflammatory markers (C-reactive protein 63 mg/L, white blood cell count  $20 \times 10^9/L$ ) and kidney biomarkers (creatinine 164  $\mu\text{mol/L}$ , urea 8 mmol/L) with severely elevated CK (43.574 U/L) were observed with otherwise no additional abnormalities. Urine myoglobin values were within normal limits. Metabolic acidosis (lactate 9.9 mmol/L, pH 7.32) was corrected via bicarbonate exhaustion ( $\text{HCO}_3^-$  10.6 mmol/L) and hyperventilation ( $\text{pCO}_2$  2.9 kPa).

Rhabdomyolysis is a rare but dangerous clinical entity. If undiagnosed, it may lead to kidney injury, compartment syndrome, peripheral neuropathy and even death.



Figure 1. Head computer tomography image depicting soft tissue oedema

Due to the injury mechanism, a head computed tomography (CT) scan was obtained and resulted in no significant pathology, although severe soft tissue oedema was noted (Figure 1).

After securing invasive arterial monitoring, a central venous line and a urinary catheter, intensive fluid supplementation with crystalloids (totalling 2500 cc in the emergency department) was administered with the aim of securing at least 200 cc/h of urine output. Empiric antibiotic therapy with metronidazole, cefazolin and gentamicin was initiated.

After transfer to the intensive care unit (ICU), amid massive fluid administration renal function transitory deteriorated (creatinine 304  $\mu\text{mol/L}$ , urea 14 mmol/L) to eventually improve within 11 days after the initial event (Figure 2). No significant electrolyte disturbances were observed during the entire in-hospital stay. All burn injuries were treated conservatively with daily dressing swaddling. Due to dangling right hand, brachial plexus injury was diagnosed and subsequently treated conservatively.

Eleven days after admission, he was discharged home without subjective complaints. At one week after discharge, the patient was clinically stable with normal renal function and normal motion of

both upper extremities. Written informed consent was obtained from the patient for his anonymized information to be published in this article.

## DISCUSSION

Most patients with a risk of rhabdomyolysis are post-injuries that can cause compartment syndromes or prolonged muscular compression, those with prolonged immobilization, drug intoxicated, after epileptic seizures or those on regular treatment with antipsychotics, statins or narcotics<sup>2,4</sup>. Although the presented patient was previously taking lipid-lowering atorvastatin, the actual cause of rhabdomyolysis in this case most probably represents the combination of muscle compression and burn injuries. Whether cranial venous stasis supplement the pathophysiology of rhabdomyolysis remains controversial.

Classic milieu of signs and symptoms consists of myalgias, muscle stiffness, malaise and fever<sup>5</sup>. Regardless of the initial mechanism, all pathophysiological paths lead to myocyte death and disintegration, leading to release of intracellular metabolites (potassium, phosphates, and urates) and intra-cellular proteins (myoglobin, creatine kinase, aldolase, lactate dehydro-genase, among others) in the extracellular space and bloodstream<sup>5</sup>. Apart from muscle pain in the upper extremities, were these classic findings absent in our patient, which makes the accurate diagnosis easily overlooked or delayed.

The postural muscles of the calves, thighs and lower back are the most often involved muscle groups. Due to the unusual injury pattern, the upside-down position has resulted in rhabdomyolysis of a totally different muscle group in our patient. Serum creatine kinase concentrations typically begin to rise 2 to 12 hours after the initial muscle injury, and peak 1 to 3 days in the absence of ongoing injury nor treatment<sup>6</sup>. Since we noticed severely elevated CK values during work-up in the emergency room and started immediate fluid resuscitation, further CK pharmacodynamics are of little help in determining the exact duration of him being stuck in the well.

Electrolyte disturbances, such as hypocalcaemia or hyperkalaemia, can accompany acute rhabdomyolysis episodes. Prompt management is of

In this patient population, intensive fluid supplementation with crystalloids should be administered with the aim of securing at least 200 cc/h of urine output.

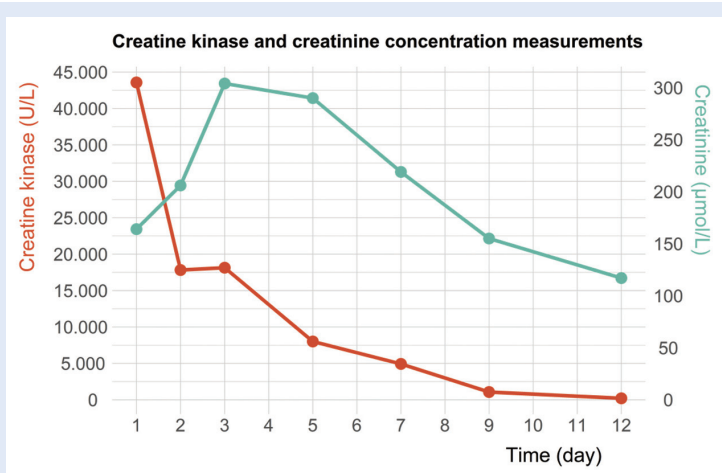


Figure 2. Creatine kinase and creatinine concentration measurements

paramount importance. We have screened our patient's electrolyte scheme twice daily on the day of admission and on a daily basis until discharge with no severe abnormalities encountered.

The use of nephrotoxic drugs, including nonsteroidal anti-inflammatory medications should be avoided, if possible<sup>7</sup>. To avoid potential further kidney function deterioration, antibiotic therapy was discontinued as soon as all inflammatory markers decreased to normal limits. Rare complication in the form of peripheral neuropathy was noticed as our patient developed brachial plexus injury. Multiple mechanisms were proposed with compression being the most prominent among them<sup>8</sup>.

Patients without significant comorbidities with mild, exertional rhabdomyolysis can be hydrated in the emergency department, and often released. Those with significant elevations in the CK, those with acute kidney injury, and those with underlying comorbidities should be admitted for continued hydration and evaluation of renal function<sup>9</sup>, which was the rationale behind our decision to admit this patient with a combined cause of renal failure (rhabdomyolysis, burn injury).

Regarding long-term prognosis, a study on rhabdomyolysis in the burn population depicted that for every 10-fold increase in peak CK, the odds of AKI increased by more than 70%, the odds of renal replacement therapy increased by 67% and the odds of death increased by nearly 50%<sup>10,11</sup>. Total body surface area, abbreviated burn severity index and rhabdomyolysis were found to be independent risk factors for the occurrence of early AKI with only rhabdomyolysis influencing also the severity of AKI in this patient population<sup>12</sup>.

## CONCLUSION

To conclude, rhabdomyolysis is a rare but dangerous clinical entity. If undiagnosed, it may lead to kidney injury, compartment syndrome, peripheral neuropathy and even death. Even with a benign clinical course, one must think of rhabdomyolysis in uncertain injury mechanisms or questionable circumstances, and prompt laboratory diagnosis and fluid supplementation should be undertaken.

**Conflicts of Interest:** Authors declare no conflicts of interest.

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