

EXERTIONAL RHABDOMYOLYSIS – CASE REPORT

POWYSIŁKOWA RABDOMIOLIZA – OPIS PRZYPADKU

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Summary

We present a case of exertional rhabdomyolysis in a 52-years-old healthy man, following a 4-hours-long physical effort in a cooled gymnasium. Non-specific symptoms including muscle and joint pain occurred the same day. In the following days patient's general condition worsened, body temperature transiently rose to 39.4°C and he noticed joint oedemas, malaise, and abnormal urine colour. On the sixth day the patient was admitted to the district hospital. Due to his rapid deterioration, increasing haemorrhagic diathesis, abnormal creatine kinase and increased liver tests as well as acute progressing renal insufficiency, the patient was transferred to the Department of Nephrology and then, with signs of multiorgan failure, he was admitted to the Intensive Therapy Unit. Directly after tracheal intubation, cardiac arrest occurred. Ninety-minutes-long resuscitation gave no effect.

KEY WORDS: exertional rhabdomyolysis, multiorgan insufficiency, creatine kinase, low temperature.

Streszczenie

W pracy przedstawiono przypadek powysiłkowej rabdomiolizy u 52-letniego, dotąd zdrowego mężczyzny. Czynnikiem etiologicznym była czterogodzinna gra w koszykówkę w nieogrzewanej sali gimnastycznej. Pierwsze symptomy – bóle mięśni i stawów pojawiły się jeszcze tego samego dnia. W ciągu kilku następných dni stan chorego pogarszał się, temperatura ciała wzrosła przejściowo do 39,4°C, dołączyły się obrzęki stawów, ogólne osłabienie, zmieniło się zabarwienie moczu. Szóstego dnia chory zgłosił się do szpitala powiatowego. Wobec pogarszającego się stanu chorego, narastającej skazy krwotocznej, wysokiego stężenia kinazy kreatyny i podwyższonych parametrów funkcji wątroby oraz ostro rozwijającej się niewydolności nerek, chorego przekazano do Kliniki Nefrologii AMG, a następnie z powodu niewydolności wielonarządowej, chorego przyjęto do Kliniki Intensywnej Terapii. Bezpośrednio po intubacji doszło do zatrzymania krążenia. Półtoragodzinna akcja reanimacyjna nie przyniosła efektu.

SŁOWA KLUCZOWE: powysiłkowa rabdomioliza, niewydolność wielonarządowa, kinaza kreatynowa, niska temperatura.

Introduction

Rhabdomyolysis, defined as an acute increase of serum concentration of creatine kinase (to over fivefold normal value) [1] as a result of dissolution of striated muscle cells, may have many causes. Known triggering factors include infections, injuries, drugs, physical factors (such as physical effort, compartment syndromes, ischaemia, reperfusion), pressure from hard surfaces in comatose patients [1], acute poisoning with mushrooms [2] or quail [3] and malignant hyperthermia. Destruction of muscle cells leads to increase in serum concentrations of some enzymes, especially creatine kinase (CPK), myoglobin, potassium, calcium and other substances. Clinical consequences, such as cardiac arrhythmias or acute renal failure can be extremely dangerous and sometimes even fatal [4].

A case description

A 52-years old man, teacher of physical education, was admitted to the Intensive Therapy Unit of Medical University of Gdansk on the first week of February, due to rapidly progressing multiorgan failure in course of acute rhabdomyolysis. There was no previous history of either disease or medication contributing to rhabdomyo-

lysis. The patient played volleyball in a cooled gym for 4 hours seven days before presentation. On the same day muscle and joint pain occurred, affecting mainly upper extremities. Two days later his body temperature rose to 39.4°C at which level it persisted for the next two days. Chest and shoulder X-rays taken the following day showed no abnormalities. On the sixth day after the physical effort, the patient was admitted to the district hospital because of his worsening general condition. He was complaining of joint pain, weakness, dizziness, abnormal colour and decreased amount of the passed urine. He had debilitating joint oedemas; he was pale and perspiring intensively. Laboratory tests revealed leukocytosis (14.5 G/l), thrombocytopaenia (92 G/l) and anaemia (3.99 T/l). Serum creatinine and urea were normal. By the next day patient's condition got worse. Clinical examination revealed purpura over joint areas and hypotension 9.31/6.65 kPa (70/50 mmHg). Because of persistent oliguria, parameters of renal function were rechecked. Marked increase in blood urea (16 mmol/l [120 mg/dl]) and creatinine (344 µmol/l [3.9 mg/dl]) levels were found. Laboratory test revealed also elevated bilirubin level (64 µmol/l [3.8 mg/dl]), coagulation abnormalities (elevated plasma D-Dimers level of 8932 ng/ml, decreased antithrombin concentration) as well as creatine

kinase concentration of 3640 IU/l. Due to exacerbation of acute renal failure and circulatory disturbances patient was admitted to Department of Nephrology of Medical University of Gdansk. Diagnosis of rhabdomyolysis was made and 3 hours later the patient was transferred to the Intensive Therapy Unit (ITU) because of respiratory insufficiency. He was conscious, with logical contact. On admission, marked resting dyspnoea was present. Generalized cutaneous and mucosal cyanosis as well as heavy purpura in both elbow regions and articulations of lower extremities joints with their limited mobility were observed. Non-invasive arterial pressure measurement showed 13.3/8.0 kPa (100/60 mmHg) with dopamine infusion at the rate of 10 µg/kg/min and heart rate was 100 beats per minute. Laboratory data noted on admission to the ITU are presented in Table 1. Decision of starting artificial ventilation was made based on clinical symptoms (tachypnoea) and laboratory signs of respiratory failure (pCO₂ 3.06 kPa [23 mmHg], pH 7.19) shortly after endotracheal intubation cardiac arrest (asystole) was observed. Cardiopulmonary resuscitation was started immediately. Sinus rhythm was obtained several times, converting quickly to ventricular fibrillation. After 90 minutes of resuscitation with no signs of haemodynamically sufficient circulatory function, the patient was recognized dead.

teacher of physical education, therefore he had much experience.

First symptoms were not specific and were suggestive more of a viral infection. On the other hand, muscle pain, joint oedemas and stiffness as well as dark colour of urine in a person after a period of physical activity are classic signs of exertional rhabdomyolysis [11, 14].

The patient presented in this report developed intense rhabdomyolysis confirmed by rapid increase in serum CPK level (from 3640 IU/l to 20120 IU/l) in the following hours. According to De Meijer et al., serum CPK level in most patients with severe rhabdomyolysis is the predictive factor of the acute renal failure [15]. Renal vasoconstriction, formation of tubular myoglobin casts, heme and myoglobin nephrotoxic effect are possible causes of the acute tubular necrosis in course of iron-dependent inhibition of oxidative phosphorylation and iron-dependent gluconeogenesis inhibition [16, 17].

Hyperkalaemia with the following severe arrhythmia and hypocalcaemia, caused by excessive binding of calcium ions by proteins from the disintegrated muscle cells are instant results of rhabdomyolysis, “the silent killer” [4, 18]. Hypocalcaemia is the reason for muscle stiffness [18]. In the presented case, serum potassium and calcium levels were abnormal, muscle stiffness was present and severe arrhythmias occurred.

Table 1. Results of laboratory tests revealed on admission to the ITU

Tabela 1. Wyniki badań laboratoryjnych, wykonanych w chwili przyjęcia chorego do Kliniki Intensywnej Terapii

platelets	30,9 G/l	SGOT	1144 IU/l
PH	7,19	BUN	11.1 mmol/l [67mg/dl]
pCO ₂	3.06 kPa [23 mmHg]	creatinine	433 µmol/l [4.9mg/dl]
BE	(-)19.4	potassium	7.5 mmol/l
HCO ₃	8.8 mmol/l		
Calcium	0.37 mmol/l	APTT	159''
CK-MB	379 ng/ml	D-dimers	3038 ng/ml
Troponine I	2.72 ng/ml	AT	40.4%,
CPK	21120 IU/l	INR	1,7
SGPT	350 IU/l	prothrombin index	66%

Discussion

Clinical signs and symptoms and laboratory findings observed in the presented case suggest exertional rhabdomyolysis. The condition was not diagnosed initially, leading to multiorgan failure and eventually to patient's death. The 4-hours-long game of volleyball in a cooled gym was probably the inducing factor. Strenuous physical activity in high temperature is a well-known cause of exertional rhabdomyolysis and many authors describe it as a complication of exertional heat stroke [5–9]. In the presented case, the environment temperature was low. Similar cases were described in the literature [10, 11].

In most cases, victims of exertional rhabdomyolysis are not trained up, but persons following training programmes are also at risk [12, 13]. Our patient was a

Rhabdomyolysis is a very serious condition, in which early recognition and treatment are crucial. The aim of treatment is to minimise the effects of myoglobin nephrotoxicity. It is necessary to maintain urine output at the level of 200–300 ml/h, which should be achieved by intravenous saline infusion [1]. If necessary, diuretics should be used. Myoglobin is toxic in acidic environment, therefore alkalinisation of urine is another important aim of treatment. If the before-mentioned procedures are ineffective, dialysis should be concerned. Monitoring of vital functions and laboratory parameters should be performed constantly.

Some authors suggest the use of dantrolene, an inhibitor of calcium ion release from endosarcoplasmic reticulum, in order to minimise muscle pain and stiffness [19].

The best way to remain in a good state is to be careful while strenuous physical activity. A gradual increase in exercise intensity, constant hydration and avoiding exercise in extremely hot or humid environments are should be a part of proper behavior [20].

In the presented case, reasons for ineffectiveness of treatment should be considered viewing the fact that the patient was admitted to the hospital 6 days after the symptoms' occurrence, already being in the state of quickly progressing multiorgan failure. Besides, medical care suppliers who looked first after the patient did not take into consideration the possible relationship between physical effort in a low temperature and rhabdomyolysis.

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