

Hypokalemia-associated catastrophic rhabdomyolysis in ulcerative colitis

Plamen G. Tzvetanov, MD, PhD.

ABSTRACT

انحلال العضلات المخططة الوحيم مرتبط بنقص بوتاسيوم لدى التهاب القولون التقرحي (UC). يصف هذا التقرير الحالة الصحية لرجل يبلغ من العمر 60 عام ويعاني من التهاب القولون التقرحي (UC) الحاد ونقص البوتاسيوم نتيجة عن الإسهال الذي استغرق مدة طويلة. أصيب المريض أثناء معالجته في المستشفى بانحلال العضلات المخططة ويربطه بتدهور نقص البوتاسيوم. لم تظهر استجابة للعلاج وتم استمرار وتطور نقص البوتاسيوم. تطور لدى المريض التشنج الموجه في المجموع العضلي للوجه والبعوم وذلك لوجود الضعف العادي في المجموع العضلي. وتم انتشار الضعف والوهن على عضلات الحجاب الحاجز وبين الضلعين، والتي أدت إلى نقص التنفس. كانت درجة التركيز المصلي لكيناز كرياتين مرتفعة جدا. توفي المريض نتيجة نقص القلب والأوعية الدموية. يناقش دور نقص البوتاسيوم لإصابة بالعضلات ووجود انحلال العضلات المخططة وذلك عند المرضى الذين يعانون من أمراض ملتهبة للأعضاء.

A case of catastrophic hypokalemia-associated rhabdomyolysis in patient with ulcerative colitis (UC) is reported. A 60-year-old man presented with an exacerbation of UC and hypokalemia due to long-term diarrhea. While in the hospital, rhabdomyolysis developed in association with worsening hypokalemia. The hypokalemia was refractory to treatment and progressive course. Patient developed painful cramps of the masticatory and facial musculature associated with a moderated weakness in distal muscle groups. The weakness extended to intercostals and diaphragm muscles and led to respiratory deficiency. Serum concentration of creatine kinase was highly increased. Patient died from advancing and insurmountable cardiovascular deficiency. The causative role of hypokalemia for muscle involvement and rhabdomyolysis in patients with inflammatory bowel diseases was discussed.

Saudi Med J 2009; Vol. 30 (9): 1225-1227

From the Department of Neurology and Neurosurgery, Medical University of Pleven, Pleven, Bulgaria.

Received 1st May 2009. Accepted 8th July 2009.

Address correspondence and reprint request to: Prof. Plamen G. Tzvetanov Department of Neurology and Neurosurgery, University Hospital, G. Kochev St. 8A, 5800 Pleven, Bulgaria. Tel. +359 (64) 835242. Fax. +359 (94) 600530. E-mail: tzvetanovplamen@hotmail.com

Rhabdomyolysis is defined as dissolution of the skeletal muscle, resulting in extravasation of the intracellular toxic metabolites into the circulatory system, and the acute increase in serum concentration of creatine kinase (CK) to more than 5 times the upper normal limit.¹ Inflammatory bowel diseases (IBD), referring primarily to ulcerative colitis (UC) and Crohn's disease (CD), is a group of idiopathic intestinal disorders of complex pathogenesis rarely accompanied by skeletal muscle involvements usually reported in CD.² The present report refers to case of hypokalemia-associated rhabdomyolysis in a patient with ulcerative colitis (UC) with fatal consequences.

Case Report. A 60-year-old man was admitted to our emergency department with severe abdominal pain associated with tenesmus, and bloody diarrhea. He had a history of UC. Two months before he had complained of multiple episodes of defecations with blood and mucus in the stools, loss of appetite, fatigue and weight loss. Laboratory data on admission showed hemoglobin 13.1 g/dL, hematocrit 44.2%, white blood cell count 5,700/mm³, and platelet 210,000/mm³. His serum sodium level was 145 mmol/L, potassium 2.1 mmol/L, chloride 99 mmol/L, fasting glucose 52 mg/dL, serum albumin 2.5 g/dL, blood urea nitrogen 1.4 mg/dL, and creatinine 6.2 mg/dL. An electrocardiogram revealed sinus rhythm with new ST segment changes and U waves. Patient received intravenous (IV) hydration and potassium replacement totaling 700 mmol. While in the hospital no pathologic changes in ultrasonography of the abdominal organs had been found. Colonoscopy of sigmoid and descending colon demonstrated intensive and diffuse inflamed hyperemic mucosa with polyp-like lumen reducing inflammatory infiltrations extending all the way down the length and circumference of the gut. Numerous shallow ulcerations at a wide area, preferentially in the sigmoid colon were found.

Histological results. Chronic type inflammatory infiltrations of bowel mucosa with round cells associated with focal atrophy and mucosal metaplasia

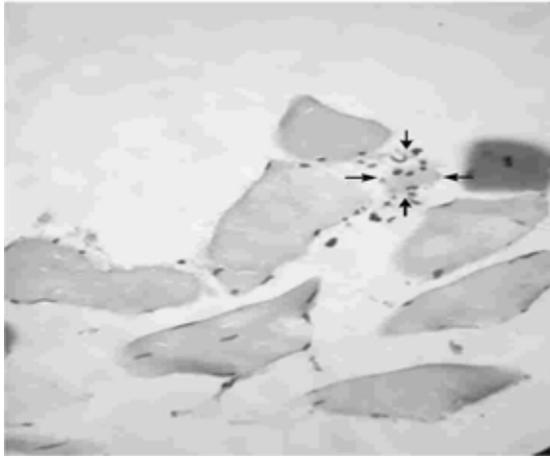


Figure 1 - Biopsy of deltoid muscle. Hematoxylin-eosin staining, magnification x150. An area showing hyalinated muscle fibers, and the presence of small clusters of endomysially located lymphocytes.

of the glands, and presence of polymorphonuclear cells and crypt abscesses in lamina propria. After a 10-day course of treatment with mesalazine 2000 mg/day and metronidazole, the complaint of lower dyspeptic syndrome was significantly reduced. On the background of the improving gastrointestinal disease, painful cramps of the masticatory and facial musculature appeared, as well as in the distal skeletal muscle groups of the upper and lower extremities. From the neurological examination it was established that there was significantly limited muscle strength in the proximal and increased muscle tone in the distal muscle groups. Laboratory testing demonstrated increased values of serum CK 484 IU/L with normal concentrations of the thyroid and parathyroid hormones. The hypokalemia had refractory to treatment, and progressive course. The level of potassium decreased to 1.3 mmol/L associated with a mild hypocalcemia (1.7 mmol/L). Electromyography demonstrated a myopathic pattern in the deltoid and quadriceps femoris muscles bilaterally. The investigations additionally carried out for the presence of autoantibodies, antigliadin IgA and IgG antibodies, anti-GAD, and anti-Hu antibodies (in a clinical laboratory in Heidelberg, Germany) did not find out any deviations in their serum levels. Normal values of IgM, IgG, IgA, and a double increase of the C-reactive protein were established. Anticardiolipin and antinuclear antibodies were not found. Rheumatoid factor was negative. Cerebrospinal fluid parameters were normal. Computed tomography of head revealed multiple infarctions with an intact brain stem. Muscle biopsy of the anterior tibial muscle and deltoid muscle revealed the presence of small clusters

of endomysially located lymphocytes characteristic of myositis (Figure 1). Single degenerative muscle fibers with cytoplasmic vacuolization, interiorized nuclei, and small number of hyalinated muscle fibers were also found. Corticosteroid therapy (IV methylprednisolone 500 mg/day) has been performed for 5 days. The muscle weakness extended to the respiratory (intercostals and diaphragm) muscles, and serum CK value increased to 11 262 UI/L. Arterial blood gases showed pH 7.25, PCO_2 67.8, HCO_3 28.8 mmol/L. After a 3-day artificial ventilation, the patient died with the picture of advancing and insurmountable cardio-vascular deficiency and cardiac dysrhythmia. Autopsy was not performed because of his family members' refusal.

Discussion. The reported clinical case presents a rare combination of UC with long-term diarrhea causing severe and refractory to treatment hypokalemia associated with catastrophic rhabdomyolysis. The IBD is associated with a variety of extraintestinal manifestations that may produce greater morbidity and mortality than underlying intestinal disorders.³ Combination of IBD with peripheral nervous system involvement is rare and often controversial.⁴ Peripheral neuropathy is a recognized complication of IBD more commonly encountered in UC. It usually presents as an acute and chronic inflammatory polyneuropathy probably related to immunologic abnormalities and association with autoimmune states of UC.² Muscle involvement is rare and usually related to electrolyte and serum osmolality abnormalities. Hypokalemia in patients with IBD, variously caused by corticosteroid therapy, decreased oral intake, malabsorption, or increased intestinal losses may produce a dyskalemic myopathy (DKM) and rhabdomyolysis.^{2,4} The DKM usually presents with generalized weakness, which may be may be profound, with hypotonia and depression of the tendon reflexes, and so may resemble the Guillain-Barré syndrome.⁵ In some cases weakness is episodic, resembling familial hypokalemic periodic paralysis. The serum CK level is usually markedly raised and myoglobinuria and acute renal failure may develop. Histological changes in affected muscles consist of swelling and vacuolation of muscle fibres, and in more severe cases, necrosis and regeneration, and in rare case perivascular inflammatory infiltrate and perifascicular atrophy characteristic of dermatomyositis.^{2,5} Extreme electrolyte losses in patients with IBD are risk factors for rhabdomyolysis.⁶ The hypokalemia is the most common precipitating electrolyte abnormality, because potassium is the chief intracellular ion, and considerable total body loss of potassium (less than 2.5 mEq/L.⁷ Disrupt the sodium-potassium pump, causing the cell membrane to

fail while allowing toxic intracellular contents to escape from muscle cells.⁸ The causative role of hypokalemia is often overlooked, because it may disappear after overt myonecrosis and following renal failure. Renal failure in patients with rhabdomyolysis is pigment-induced and has a relatively benign prognosis. The hypokalemia may predispose patients to cardiac dysrhythmia, as the etiology has been attributed to arteritis of nodal vessels.⁹ Significant fraction of IBD patients has experienced at least one episode of myocarditis or pericarditis associated with cardiac failure.¹⁰

To summarize, although rarely, simultaneous damage of the bowel and striated muscle is possible. Such a combination is more often in CD, but is also possible in UC. The hypokalemia-related rhabdomyolysis may have catastrophic course with severe muscle weakness leading to respiratory and cardiac deficiency. Despite the inflammatory changes in muscle biopsy the application of corticosteroids in patients with hypokalemia-associated rhabdomyolysis aggravate the muscle weakness and provoke fatal cardiac dysrhythmia.

References

1. Lane R, Phillips M. Rhabdomyolysis. *BMJ* 2003; 327: 115-116.
2. Lossos A, River Y, Eliakim A, Steiner I. Neurologic aspects of inflammatory bowel disease. *Neurology* 1995; 45: 416-421.
3. Rankin GB. Extraintestinal and systemic manifestations of inflammatory bowel disease. *Med Clin North Am* 1990; 74: 39-50.
4. Perkin GD, Murray-Lyon I. Neurology and the gastrointestinal system. *J Neurol Neurosurg Psychiatry* 1998; 65: 291-300.
5. Comi G, Testa D, Cornelio F, Comola M, Canal N. Potassium depletion myopathy: a clinical and morphological study of six cases. *Muscle Nerve* 1985; 8: 17-21.
6. Trimarchi H, Gonzalez J, Olivero J. Hyponatremia-associated rhabdomyolysis. *Nephron* 1999; 82: 274-277.
7. Lucas da Silva PS, Iglesias SB, Waisberg J. Hypokalemic rhabdomyolysis in a child due to amphotericin B therapy. *Eur J Pediatr* 2007; 166: 169-171.
8. Russell TA. Acute renal failure related to rhabdomyolysis: pathophysiology, diagnosis, and collaborative management. *Nephrol Nurs J* 2000; 27: 567-577.
9. Ballinger A, Farthing MJG. Ulcerative colitis complicated by Wenckebach atrioventricular block. *Gut* 1992; 33: 1427-1429.
10. Abid MA, Gitlin N. Pericarditis – an extraintestinal complication of inflammatory bowel disease. *West J Med* 1990; 153: 314-315.

Related topics

Khawaja AQ, Sawan AS. Inflammatory bowel disease in the Western Saudi Arabia. *Saudi Med J* 2009; 30: 537-540.

Jun S, Hua RZ, Lu TJ, Xiang C, Dong XS. Are endoscopic grading and scoring systems in inflammatory bowel disease the same? *Saudi Med J* 2008; 29: 1432-1437.

Al-Moundhri MS, Al-Thahli K, Al-Kindy S, Salam J, Rao L. Metastatic gastrointestinal stromal tumor and hypercalcemia in a patient with ulcerative colitis. *Saudi Med J* 2006; 27: 1585-1587.

Karaoglu AO, Yukselen V, Ertem GT, Erkus M. Salmonellosis and ulcerative colitis. A causal relationship or just a coincidence. *Saudi Med J* 2004; 25: 1486-1488.