

TRANSIENT HYPERCKEMIA AFTER INTENSE PROLONGED PHYSICAL ACTIVITY - CASE REPORT OF SWIMMER

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The serum level of creatine kinase is an indicator of the functional status of muscle tissue and varies extensively in both pathological and physiological circumstances. An increase in creatine kinase is also characterized as a guide of cellular necrosis and tissue damage following acute and chronic muscle injuries. Changes in serum levels of creatine kinase are also found in normal subjects and in athletes after exhausting exercises. We present the case report of young highly-trained swimmer who was admitted to the hospital because of transient blurred vision, visual field defects of his left eye, accompanied by headache and nausea. Intracranial expansive process was excluded, ophthalmologic pathology also. Transient hyperCKemia was found without myoglobinuria, not linked to any injury, no muscle disease was detected and there was no cardiomyopathy. We can explain transient blurred vision, visual field defects exclusively on one eye following by headache and nausea by excessive exercise, profound fatigue and extremely high desire for success in school and swimming competitions. A follow up of sport's medicine physician, psychologist and balanced nutrition while continue with undertaking physical activity was recommended for this young swimmer. In case of recurrence, the muscle pathology detection and genetic testing should be considered.

Descriptors: CREATINE KINASE, EXCESSIVE EXERCISE, SWIMMER, EXHAUSTING EXERCISES

INTRODUCTION

Creatinine kinase (CK) is a dimeric globular protein consisting of two subunits with a molecular mass of 43 kDa. At least five forms of CK exist: three isoenzymes in cytoplasm (CK-MM, CK-MB and CK-BB) and two isoenzymes (non-sarcomeric and sarcomeric) in mitochondria. CK isoenzymes give specific information on injured tissue because of their tissue distribution: CK-MM is a marker of muscle disease, CK-MB increases in acute myocardial infarction, CK-BB increases in brain damage and mitochondrial CK is raised in mitochondrial myopathies (1). Total CK levels depend on age, gender, race, muscle mass, physical activity and climatic condition and show great variability among individuals. The

level of CK can be related with exercise grade and if it lasts for several days, the muscle disease must be catch out.

CASE REPORT

The patient came to our Department at the age of 16 years because of blurred vision, visual field defects of his left eye, headache and nausea. He was born from healthy and *non-consanguineous* parents, family history was positive for myocardial infarction, high blood pressure, headache and rheumatoid arthritis. Pregnancy, delivery, somatic, psychomotor and intellectual developments were normal. At the age of 6 years he had the head injury without loss of consciousness; besides that he was healthy. He has difficulties with sleeping and sleeps about 6 hours a day. He is studying well at High school with excellent grades; he is the highly-trained swimmer and obtained the 6th place in National junior swimming competition in Croatia.

During last six months he had twice a transient blurred vision without a headache. Four days before his arrival to our

Pediatric Department he had an intense and prolonged physical training and reported pain in all muscles, especially at abdominal part, but he proceeded with physical activity. Color of the urine was normal. During this muscle pain sensation he took paracetamol tablets and he drank high energy drink (Multipower protein shake) and multivitamins as usual.

A few hours before his arrival he reported a visual field defects of the temporal side of his left eye, bitemporal and frontal headache and nausea which lasted for half an hour. At the arrival his vital signs were normal as well as physical and neurological status. There were no signs of muscle weakness or pain.

MRI of the brain, EEG, vision, fundus of eyes, visual field and visual evoked potentials were performed and all results were normal. There was no infection of his upper respiratory tract. During the biochemical investigation, high level of CK 5535 U/L was found and levels of LD 399 U/L, AST 226 U/L, ALT 103

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U/L, BUN 7.5 mmol/L and creatinine 95 µmol/L were above reference values. No myoglobinuria was found. Values of glucose, acid-base balance, K, Na, Cl, Ca, P, Mg, bilirubine, gamma GT, troponin-T, uric acid, Fe, UIBC, TIBC, cholesterol, cholesterol HDL and LDL, tryglicerids, sedimentation rate, C-reactive protein, white blood cells with leukocyte differential count, red blood cells, platelets and urine were normal. Cardiologic examination, ECG, echocardiography and cycle ergometry were normal.

On the second day we repeated biochemical tests: level of CK was two times lower than the previous day - 2965 u/l, MB fraction of CK was 86 u/l. LD was lower, isoenzymes of LD were within reference values. AST and ALT were lower, levels of BUN and creatinine was normal. Myoglobine in urine and urine analysis were repeated each day and the values were normal; there was no change after physical activity. We performed several ECGs at rest and after physical activity and results were normal. After seven days the values of CK (289 U/L), LD, AST, ALT were normal. CK-MB was 38 U/L - slightly above referent values. Carnitine (total, free and acyl) in plasma was done and results were within reference values.

During the stay at our Department the patient had no complain and no pain, somatic and neurological status was normal. Before referring him home from the Department after 8 days, the control findings of sedimentation rate, white blood cells with leukocyte differential count, red blood cells, platelets and urine were normal. We recommended an examination and consultation at the Department of sport's medicine, psychological tests and swimmer training and competitions as before with the control of blood CK level if the pain in muscles after training should become prominent.

DISCUSSION

The serum level of skeletal muscle enzymes is a marker of the functional status of muscle tissue. It varies in some pathological and physiological conditions. An increase in serum CK may represent an index of tissue damage follo-

wing acute and chronic muscle injuries but are also found in normal subjects and in athletes after exhaustive exercise (both metabolic and mechanical causes).

According to Mongios study, sport trainings have obvious effects on the reference intervals for serum CK (2). The reference intervals in male athletes are 82-1083 U/L and 47-513 U/L in female athletes. These values are twice the limits for moderately active non-athletes and up to six times higher than the limits for inactive individuals in the literature. There is also difference in the upper references for different sports, but so high value of CK of 5535 U/L was not mentioned. Total serum CK activity is markedly elevated for 24 h after the exercise but when sportsman rest, it gradually returns to basal levels (1). In our patient after 24 h of rest the values of CK followed to 2574 U/L and after 7 days returned to basal level.

According to Symanski, swimming, performed by highly-trained swimmers at high levels of intensity or for prolonged durations, may not impose sufficient degrees of trauma producing muscular stress (3). Therefore, the structural integrity of the cell membrane is maintained and the loss of intracellular CK to the bloodstream is prevented. Following those result it is very strange that the so high CK transient level was found in our young swimmer.

High CK serum levels in athletes and without any further predisposing factors should prompt a full diagnostic workup with special regards to signs of possible muscle weakness (cranial asymmetry, symmetric position of the inferior angle of the scapula and the iliac spines) which may become manifest only after exercise and may indicate sub clinical muscle disease (1). The increase in serum levels of CK is the most useful screening laboratory test to identify muscular diseases. In our patient inflammations of muscles was excluded. As transient rhabdomyolysis was the first time proven in our boy and was not accompanied by myoglobinuria or disbalance of electrolytes those conditions were not investigated. Our laboratory results did not show any suspicion for mitochondrial disorder. No other

investigations for possible mitochondrial disease were performed. There were no sings of cardiomyopathy. Also there were no signs and symptoms for myopathies and electromyographic examination or muscle biopsy was not recommended.

There was no sign of sports injuries and diagnostic imaging was not performed (4). As it was previously reported in swimmers we think that Multipower protein shake and multivitamins couldn't cause this transient Ckemia (5). If we exclude possible congenital or acquired muscle disease as a cause of transient CKemia, we can explain transient blurred vision, visual field defects only of one eye following by headache and nausea by excessive exercise, profound fatigue and extremely high desire for success in school and swimming competitions. A follow up of sport medical doctor, psychologist and balanced food intake while continuing with physical activity was recommended for this young swimmer. In the case of recurrence, detection of muscle pathology and genetic testing should be considered.

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Sažetak

PROLAZNA HIPERCKEMIJA NAKON DUGE INTENZIVNE FIZIČKE AKTIVNOSTI - PRIKAZ PLIVAČA

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Vrijednosti serumske kreatinin kinaze je pokazatelj funkcionalnog stanja mišićnog tkiva koje se znatno razlikuju u različitim fiziološkim i patološkim stanjima. Povišene vrijednosti kreatinin kinaze su jedan od pokazatelja stanične nekroze i oštećenja tkiva koji prate akutne i kronične ozljede mišića. Promjene u razini serumske kreatinin kinaze se nalaze u zdravih osoba ali i sportaša nakon intenzivnog vježbanja. Prikazujemo slučaj mladog utreniranog plivača koji je primljen na neuropedijatrijski odsjek naše Klinike zbog prolaznih smetnji vida, ispada u polovici vidnog polja lijevog oka, mučnine i glavobolje. Učinjenom obradom isključen je intrakranijalni proces kao i bolest očiju. Prilikom biokemijske obrade uočene su izrazito visoke vrijednosti kreatinin kinaze uz izostanak mioglobinurije, koje nismo mogli povezati sa traumom, mišićnom bolesti ili kardiomiopatijom. Mišljenja smo da su akutno nastale i prolazne smetnje vida, ispad u vidnom polju lijevog s mučninom i glavoboljom uzrokovane intenzivnim vježbanjem, umorom te prevelikom željom za uspjehom u školi i plivačkim natjecanjima. Preporučili smo nastavak fizičke aktivnosti uz uzimanje regulirane prehrane, praćenje kod sportskog doktora i psihologa. U slučaju ponovnog javljanja povišenih vrijednosti kreatinin kinaze učinit će se obrada u smislu isključivanja mišićne bolesti i genetsko ispitivanje.

Deskriptori: KREATIN KINASA, POJAČAN TRENING, PLIVANJE, ISCRPLJUJUĆI TRENINZI