“Carnitine Deficient” Myopathy and Cardiomyopathy with Fatal Outcome

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A 13-year-old boy with a mild limb girdle muscular weakness had a massive rhabdomyolysis and cardiac arrest after general anesthesia. A congestive cardiomyopathy then developed.

Muscle biopsy revealed an unspecific "myopathic" degeneration of muscle fibers and a slight accumulation of lipid droplets. Carnitine content was markedly reduced in muscle and moderately in plasma.

Both prednisone and carnitine therapies were unable to improve the heart insufficiency, and the patient died 1 year after the acute episode of rhabdomyolysis.

Case report

R.F. was a 14-year-old caucasian boy. In his past history, it was noteworthy that the patient had to wear orthopedic shoes because of flat feet since he was 4 years. In addition, at the age of 8, he began to notice muscle pain, especially in his calves, after exercise which lasted for more than half an hour. On some occasions the patient had to stop walking because of these complaints. Cold weather precipitated the discomfort. A paternal uncle suffered from the same complaints. At 13 years of age, the boy was submitted to surgery for appendicectomy and acute massive rhabdomyolysis occurred after general anesthesia complicated by cardiac arrest in asystole. A full report of this event has already been published by Caccia and others [6].
The patient fully recovered after the acute episode but 2 months later he began to feel a marked shortening of breath at rest. Chest-X-rays showed a marked enlargement of the heart. Hepatomegaly was also noted and it was interpreted as being due to blood stasis. Therapy with 20 mg daily of prednisone and cardioactive glycosides improved the cardiac function.

The patient was admitted to our Institute 7 months after the acute episode of rhabdomyolysis. On examination, he was moderately obese (70 kg) - blood pressure 70 Min / 100 Max mmHg - Systolic murmurs on the apex, pulse 90 beats per minute. The liver was palpable 3 fingers beneath the right costal margin. Moderate weakness and wasting of the limb girdle, trunk, neck and tibio-peroneal muscle were observed. Deep tendon reflexes were depressed. On the laboratory examination, routine blood analyses, which included Aldolase, LDH, SGOT, SGPT, lactate and pyruvate, were normal except for a slight elevation of CPK, 75 mU/ml (upper limit of normal: 50 mU/ml). The electrocardiogram showed an incomplete right bundle branch block.

Echocardiographic evaluation showed a clear picture of massive congestive cardiomyopathy. Chest-X-rays showed heart enlargement. EMG of the right deltoid, biceps brachii and quadriceps demonstrated «myopathic» features (short duration, low amplitude and polyphasic action potentials). Maximum conduction velocity was normal in the right ulnar and s.p.e. nerves.

A biopsy of the left quadriceps was performed and the specimens were processed for light and electron microscopy examination by previously described techniques [11, 8]. An aliquot of the muscle biopsy was stored at —80 °C for biochemical studies. Morphological analysis revealed marked variation of muscle fiber diameter and increased numbers of internal nuclei. No degenerating-regenerating fibers were noted. Type 1 fibers were prevalent and more atrophic than the type 2. Type 1 and about 10% of type 2A fibers displayed increased ORO-positive droplets. Ultra-microscopic studies confirmed the slight increase on lipid droplets in the fibers, and also signs of alteration of the myofibrillar organization. No other abnormalities were found. Liver biopsy was not performed because it was considered to be too dangerous because of the liver's blood stasis. Because of the low carnitine content found in muscle (see below) the patient was given 3-4 gm/day by mouth of D,L-carnitine, plus 40 mg of Prednisone on alternate days. In spite of a slight improvement in muscle strength, the cardiac function continued to deteriorate and the patient had to be admitted several times into a cardiology unit because of severe heart insufficiency. The boy died 13 months after the initial episode, at home, because of an acute heart failure. Permission for necropsy was not obtained.

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Fig. 1. Quadriceps muscle. - Frozen section. - Myofibrillar ATPase pH 4.6, 315 X. Small vacuoles are randomly distributed in the three types of fibres.

Fig. 2. Quadriceps muscle. - Frozen section. - Oil Red O, 315 X. Vacuoles contain neutral fat.