Mc Ardle's disease

Clinical features

Patients with this disease usually show a striking history of limited ability to perform strenuous exercise, because of painful muscle cramps. Myoglobinuria often appears following episodes of exercise and muscle cramps. Clinically the patients are normal and well developed and have no abnormalities at rest. They are not hypoglycemic and have normal response to glucagon. Cardiac problems are not characteristic for the disease, but ECG abnormalities have been recorded.

If an exercising subject with McArdle's syndrome can sustain the exercise after symptoms appear, the symptoms will lessen or disappear; this has been called "second wind phenomenon".

Within hours of strenuous exercise lactate dehydrogenase, aldolase and creatine phosphokinase activities in the serum increase dramatically. The muscle damage due to heavy exercise is readily demonstrable. The need to avoid exceeding the exercise tolerance is demonstrated by the reports of acute renal failure following the myoglobinuria associated with excessive exercise.

It is remarkable that this defect although undoubtedly present from birth, produces either mild or no symptoms whatever during childhood.

The clinical history of patients with this disease has been divided into three phases. The first phase occurs in childhood or adolescence, when one finds increased fatigability and few other symptoms. During the second period (20 to 40 years of age), severe cramps and myoglobinuria develops. In the third period (beginning at about age 40), cramps and myoglobinuria are less conspicuous and wasting and weakness appear with increased severity.

Biochemical questions

1. How would you explain the appearance of muscle cramps after physical exercise?
2. What is the explanation for the myoglobinuria?
3. McArdle observed that during ischemic exercise there was no increase of venous [lactate] from the exercised arm. Why?
4. The patients suffering in McArdle's disease can tolerate fasting well. What conclusion can be drawn from this observation concerning hepatic phosphorylase?
5. How could you differentiate between McArdle's disease and phosphorylase kinase deficiency?
6. What is the explanation for the "second wind" phenomenon?
7. After physical exercise the [urate] in the serum is elevated in these patients. Explain the phenomenon!
8. You may remember, that [urate] was elevated in fructose intolerance as well. The two diseases are quite different. Still, what is the common mechanism in the serum [urate] elevation?

References

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