Severe rhabdomyolysis in a patient with “Heat Stroke”

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Background

-Heat stroke (EHS) is a life-threatening illness characterized by a core body temperature elevated over 40°C and central nervous system dysfunction resulting in delirium, convulsions, cerebellar involvement or coma.
-Heat stroke results from exposure to a high environmental temperature (nonexertional heat stroke) or from strenuous exercise (exertional heat stroke).
-Many similarities exist between Heat Stroke and Malignant Hyperthermia. (MH). It is a pharmacogenetic disorder caused by mutations in the skeletal muscle Ca2+ release channel (or ryanodine receptor, RyR1) characterized by episodes of uncontrolled muscle contracture triggered by halogenated anesthetics such as isoflurane or halothane.
-MH and EHS share many common pathological features, including rhabdomyolysis, increases in serum creatine kinase, hyperkalemia, tachycardia, metabolic acidosis, and increased muscle production of inflammatory cytokines.
-Two human RyR1 mutations (R401C and R614C) are associated with MH, EHS and exercise-induced rhabdomyolysis.

Medical history

-Male ,42-years-old ; He worked as roofing felt layer ;
- Family history negative for neuromuscular disease;
- Hypertension,
-Since 3 days before the hospital admission, he had a normal working day activity with a long exposure to the sun, with a mild pyretic status.

Clinical evaluation and laboratory data

At admission the patient showed:
-Temperature 38.4 °C
- Profuse sweating
- Nystagmus
- Mild dysarthria
- Weakness of lower limb muscles (MRC3)
- Myalgia
- Myoglobin > 4000 (v.n. 0-70)
- Creatine phosphokinase (CPK) > 250.000 (v.n. 0-200)

Molecular analysis for RyR1 mutations was negative.

Clinical evolution and bioptical and MRI data

Due to the presence of acute renal failure, dialysis was started. A vastus lateralis muscle biopsy was performed, revealing only a mild fiber size variability (Fig.3); glycogen content was normal, lipids were slightly increased (Fig. 4). After 36 hours since the hospital admission, the patient became lethargic, dyspnoic and a brain MRI was performed which showed extend colliquative necrosis areas in cerebellar dentate nucleus, related to ischemic lesion due to heat-stroke (Fig.1-2).
The patient was referred to intensive care unit and then he developed a multiorgan failure and he died three days later.

Brain MRI

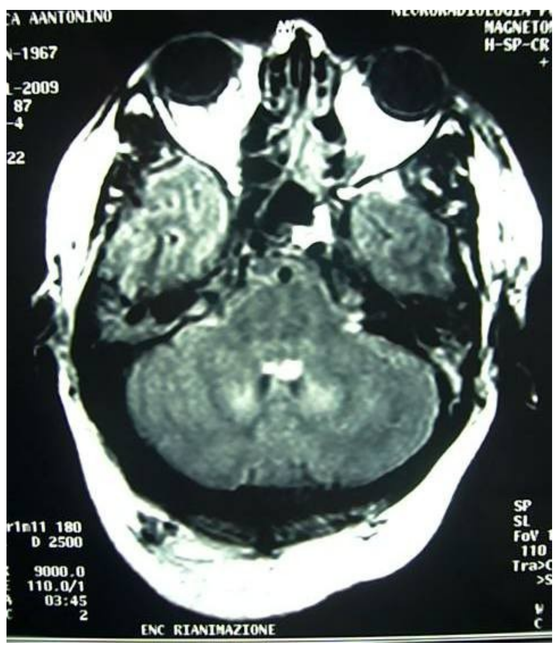

Fig.1

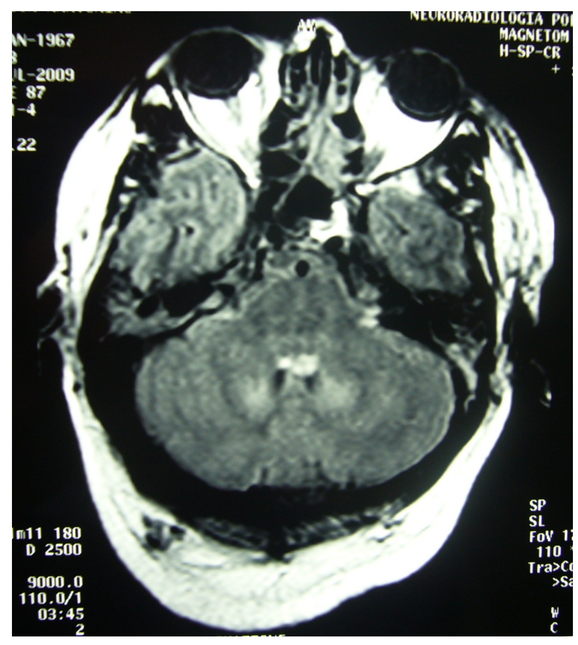

Fig.2

Fig. 1-2
Brain MRI: colliquative necrosis areas in cerebellar dentate nucleus

Muscle biopsy

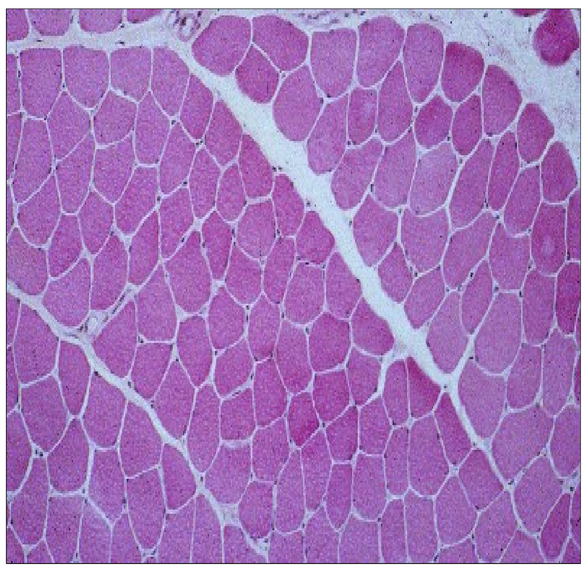

Fig.3 Ematoxilin-Eosin stain:
mild fiber size variability

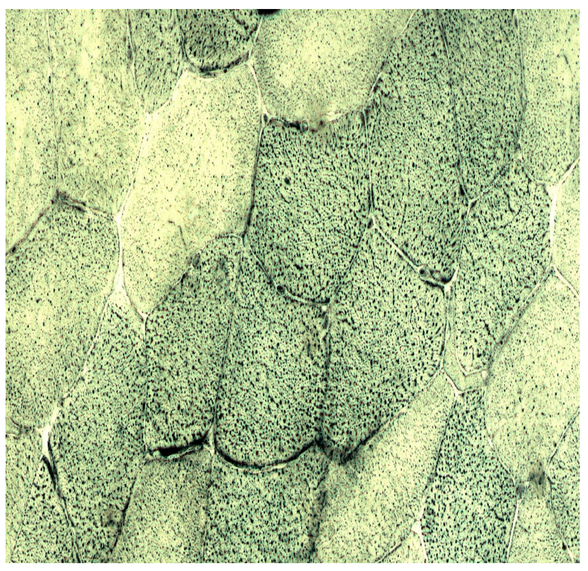

Fig. 4 Sudan stain:
lipids were slightly increased

Muscular biochemical assays:
- Glycolytic and glycogenolytc enzymes: normal
- Acid maltase: normal
- Myoadenilate deaminase : normal
- Carnitil-palmitoyl-transferase II: normal
- Carnitine: normal
- VLCFA beta-oxidation: normal

Conclusions

Our case shows a life-threatening condition that needs to be recognized and treated as soon as possible and that needs a continuous monitoring of vital signs because of high risk of quickly develop a more severe impairment of CNS.
Different conditions could have a role in the induction of massive muscle necrosis (acid-base disorder, acute temperature increase, muscle ischemia, etc); the normality of the biochemical muscle profile lead to exclude a metabolic genesis of heat stroke in our case.
This case stresses the importance to investigate previous exposure to heat source in patients with rhabdomyolysis, hyperthermia, cerebellum or other focal neurological signs.

References

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