

Malignant Hyperthermia: A Case Report

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Abstract

Malignant hyperthermia is a rare but very serious complication with high mortality and the treatment is based on the early administration of dantrolene sodium. We report the case of an 8-year-old child who underwent surgery for an eyeball burst and had a very severe malignant hyperthermia attack. The child unfortunately died in the absence of availability of dantrolene.

Keywords: Malignant Hyperthermia; Dantrolene Sodium

Introduction

Malignant hyperthermia (MH) is a rare but potentially serious complication, defined as an abnormal response to halogenated anesthetic agents and / or depolarizing curare in individuals with a genetic abnormality affecting skeletal striated muscle [1].

This pharmacogenetic disorder is generally related to mutations in the receptor calcium channel of ryanodine (RyR1) in the sarcoplasmic reticulum of skeletal muscle [1].

MH remains a very rare accident (incidence reported between 1/10 000 - 1/250 000 of general anesthesia) but still very serious because its morbidity remains surprisingly high, around 20% and rises more than 30% if dantrolene sodium is not administered within 20 minutes of the first signs of the attack. In the absence of dantrolene mortality exceeds 80% [2].

Observation

This is a male child, 8 years old, with a history of insulin-dependent diabetes since the age of 5, admitted to ophthalmic emergencies for an eyeball burst following a stone-throwing injury. Before the anesthetic induction, the patient had clinical parameters following: a weight of 25 kg, blood pressure at 110/60 mmHg, heart rate at 88 beats / minute, respiratory rate at 16 cycles / minute, SpO₂ at 97% at the same time, temperature at 38.3 °C for which he received 325mg intravenous paracetamol, capillary glycemia at 1.3 g / l.

Anesthetic induction was performed with Fentanyl 3 µg / kg (75 µg), Propofol 4 mg / kg (100 mg) and 0.6 mg / kg of Rocuronium (15 mg); followed by an orotracheal intubation. Anesthetic maintenance was maintained by FiO₂ = 50%, Air 50%, Isoflurane at 0.8 MAC.

The patient's body temperature at first was normal as well as his blood pressure and SpO₂, the heart rate ranged between 95 to

120 beats / min. The CO₂ teletype pressure (ETCO₂) was initially normal (ETCO₂ between 30 and 34 mmHg).

At the end of the procedure (after 1 hour 30 of induction), the patient presented a rapidly increasing hypercapnia (exceeding 100 mmHg), sinus tachycardia followed with muscle rigidity and major hyperthermia (T > 41 °C). Unfortunately dantrolene sodium was not available and the child died despite all the resuscitation measures administered.

Discussion

Malignant hyperthermia is a rare complication and most often without previous pathological clinical expression. It has an autosomal dominant inheritance with 50% risk for children to inherit the causal mutation of MH.

Absence of a history of MH does not eliminate the risk, even with previous exposure to triggering anesthetics [3]. MH risk screening should be systematic in anesthesia consultation based on the interview because patients are most often asymptomatic.

For patients at risk, it is recommended to specify the diagnosis of MH sensitivity by "In Vitro Contracture Tests (IVCT)" on muscle biopsy (halothane and caffeine contracture tests) or by genetic DNA analysis extracted from the peripheral blood. This test searches ryanodine receptor (RYR1) genes present on chromosome 19q13 [4] and α1 subunit dihydropyridine receptor (CACNA1S), which correspond to genes coding for the two calcium channels responsible for the coupling between excitation and contraction muscle [5]. Indeed, IVCT sensitivity is greater (99%) than DNA analysis (50%).

Apart patients with a personal or family history of MH, the other MH risk situations that must be detected during anesthesia consultation are mainly congenital myopathies with cores associated with RYR1 gene, unexplained chronic elevation of CPK which may be an indicator of congenital myopathy leading to MH risk.

Patients on statin therapy should be questioned about their CPK [6-7]; Muscular dystrophies, the most common of which are Duchenne and Becker's diseases, affect striated muscle, cardiac muscle and sometimes smooth muscle. Membrane fragility of muscle of these patients, marked by chronic rhabdomyolysis, leads to a risk of cardiac arrest by hyperkalemia in the event of exposure to a halogen and / or succinylcholine [8].

Severe stress hyperthermia or severe stress rhabdomyolysis also present a risk of MH [9]. It should be noted that the antecedents of neuroleptic malignant syndrome do not constitute a risk situation for anesthetic MH [10].

In our case, the patient had never received general anesthesia and there was no family history suggestive of MH.

General anesthesia for patients at risk must respect three absolute principles: exclusion of all halogenated volatile anesthetic agents as well as the depolarizing curare (suxamethonium); have monitoring of capnography and central temperature; and finally checking the availability of dantrolene sodium. A preoperative and early postoperative CPK dosage is recommended for patient follow-up [1].

In the event of a HM attack, treatment should be started as soon as the diagnosis is made based on immediate halting of administration of the halogenated agent and immediate intravenous injection of dantrolene. Dantrolene is administered at a dose of 2.5 mg / kg IVD, repeated up to 10 mg / kg (dose of 1 mg / kg every 10 minutes), maintenance for 48 hours at the dose of 4mg / kg / day [1].

It is also recommended to assemble elements for the diagnosis: anesthesia card, measure blood levels of potassium, muscle enzymes and myoglobinuria (after the intervention and 12 to 24 hours later) without forgetting to inform the patient and his family about the attack [1].

The assessment carried out for our patient showed the presence of a major hyperkalemia (> 8 mEq / l), with very high muscle enzymes (CPK, transaminases and myoglobin).

Conclusion

Although malignant hyperthermia is a rare perioperative complication, due to its seriousness and unpredictability, it is essential that dantrolene sodium be included in emergency medications that are mandatory in all operating rooms.

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