Case of leptosuccin induced malignant hyperthermia in a patient with GIST of the rectum

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Malignant hyperthermia (MH) is a form of myopathy that is usually triggered by volatile anesthetics such as halothane, sevoflurane and desflurane and depolarising muscle relaxants such as succinylcholine. Pathologic response in MH include increase in oxygen consumption, increase in endtidal CO2, tachycardia, hyperthermia, hyperkalemia and muscle rigidity.

Immediate recognition and treatment are crucial to avoid lethal outcome. Molecular genetic studies have confirmed that ryanodine muscle receptors are responsible for MH.

We present a case of leptosuccin induced MH with masseter muscle rigidity, mild pCO2 increase (6.3 kPa), elevated body temperature measured with esophageal temperature probe (39.5°C), tachycardia (115 beats/min) and respiratory and metabolic acidosis (pH was 7.23) in a patient who underwent low anterior resection of the rectum for gastrointestinal stromal tumor (GIST) of the rectum.

Key words: malignant hyperthermia; ryanodine receptors; leptosuccin

CASE REPORT

A 56-year old man was admitted to our hospital with symptoms of rectal hemorrhage and loss in weight. Colonoscopy revealed a rectal tumor and approximate distance of its lower margin and the dentate line was 35mm. MRI of pelvis showed an expansive lesion of rectum 72x70x66mm in diameter.

Anesthesia was induced with fentanyl (Fentanyl®-Janssen, Jamnssen-Cilag) 2ml followed with 200mg of Propofol, after which 100mg of succinylcholine (Leptosuccin...) was administered. During the endotracheal intubation we have observed inadequate relaxation of masseter (masseter muscle rigidity - MMR), but intubation went on without any problems at all. Standard anesthesia procedure, including ECG monitoring, pulse oximetry, noninvasive arterial blood pressure monitoring and end tidal gas analysis were applied. Maintenance anesthesia included oxygen/nitrous oxide (35/65) at a flow rate of 3L/min with tidal volume of 700ml and respiratory rate of 12 br/min, along with cisatracurium besylate (Nimbex®, Abbott) and fentanyl (Fentanyl®-Janssen, Jamnssen-Cilag) in boluses.

Heart rate increased from 70 to 115 beats/min over 1 hour. This was associated with mild increase of pCO2 from 3.6 to 6.3 kPa and increase in body temperature from 36.7°C to 40.7°C (skin temperature) and 39.5°C (esophagus temperature probe). Arterial blood gases showed respiratory and metabolic acidosis, with pH of 7.23. Malignant hyperthermia was suspected. The patient was immediately hyperventilated with 100% oxygen and respiratory rate was increased from 12 to 16 br/min. We have placed iced bags on patients neck, axillae and left arm. Cold saline solutions were given IV, and gastric irrigation with same solutions was performed. The CO2 absorbent was changed and hemoculture was obtained. Dantrone was unavailable for administration.
After this measures, within 55 min body temperature declined to 36.9°C (skin temperature) and 37.7°C (esophageal temperature probe), heart rate stabilized at 70 beats/min, and pCO2 decreased to 4.8 kPa. Low anterior resection of the rectum with colonic pull-through anastomosis and loop ileostomy was successfully performed.

Postoperative course was uneventful, but the patient complained of diffuse muscle pain. Levels of creatin-kinase was normal 24h after the surgery. The patient was discharged 9 days after the surgical procedure. Histopathology examination revealed a spindle cell type of gastrointestinal stromal tumor (GIST) with high metastatic risk.

**DISCUSSION**

In almost all recorded cases of MH, patients were diagnosed after being exposed to triggers, or during specific genetic testing if a family member was previously diagnosed with this condition. Pathologic response in MH include increase in oxygen consumption, increase in endtidal CO2, tachycardia, hyperthermia, hyperkalemia and muscle rigidity.4 Immediate recognition, which is sometimes hard, and treatment are crucial to avoid lethal outcome. A group of international experts have presented a clinical grading scale for MH.

This scale includes respiratory acidosis (endtidal CO2>55mm Hg; pCO2> 60mm Hg), cardiac involvement (unexplained sinus/ventricular tachycardia or ventricular fibrillation), metabolic acidosis(base deficit > 8 mEq/l; pH<7,25), muscle rigidity (generalized rigidity; severe masseter muscle rigidity), muscle breakdown (serum creatine kinase concentration >20000/L units; cola colored urine; excess myoglobin in urine or serum; plasma (K+)>6 mEq/L), temperature increase(rapidly increasing temperature; T>38.8°C), other (rapid reversal of MH signs with dantrolene; elevated resting serum creatine kinase concentration) and family history (consistent with autosomal dominant inheritance).5

In our patient, MMR during the intubation was the first symptom that made us think of MH. Our suspicion was confirmed 55 minutes later with the development of tachycardia and elevated body temperature measured with esophageal temperature probe. The pCO2 levels were slightly increased (6.3 kPa). Bonciu et al. reported only mild elevation of pCO2 in their patient with MH, while Steven et al also reported a case with mild increase of pCO2, but in conjunction with a major increase of minute volumen.6,7 The pCO2 decreased to normal values after hyperventilation. Dantrolene sodium, a hydantoin-derived skeletal muscle relaxant represents a lifesaving therapy for MH patients.8 We did not have Dantrolene available, but fortunately symptoms withdrew after conservative measures. Levels of creatine kinase were normal before surgery, as well as 24h after the surgery. Since MH is considered to be inherited myopathy, it was indicated to obtain muscle biopsy for confirmation.9,10 However, molecular genetic studies of MH are not yet possible in our country.

**CONCLUSION**

Although it was technically impossible to prove MH postoperatively in our patient, the fact that MMR along with tachycardia, increase of pCO2, metabolic and respiratory acidosis and hyperthermia were successfully treated with symptomatic management have lead us to conclusion that our case represents an atypical form of MH. Therefore, even atypical symptoms, such as in our case should raise suspicion of MH. Furthermore, Dantrolene must be readily available as a drug of choice for MH, according to standard MH protocols.

**SUMMARY**

Maligna hipertermija (MH) je vrsta miopatije uzrokovane volatilnim anestetikima kao što su halotan, desfluran i desfluran, kao i depolarizujućim miorelaksantima kao što je sukcinin-holin. Patološki odgovor u MH uključuje povećanu potrošnju kiseonika, povećanje pCO2, tahikardiju, hipерtermiju, hiperkalijemiju i mišićnu rigidnost. Brzo prepoznavanje i tretman su presudni kako bi se izbegao letalni ishod. Molekularne genetske studije su potvrdile da su rijanodinski mišićni receptori odgovorni za MH. Predstavljamo slučaj pacijenta sa MH koja je bila indukovana leptosukcinom sa razvojem rigidnosti massetera, blagim porastom pCO2 (6,3 kPa), povišenom telesnom temperaturom (39,5°C), tahikardijom (115/min) i respiratornom i metaboličkom acidozom (PH=7,23) prilikom prednje niske resekcije zbog gastrointestinalnog stromalnog tumora (GIST) rektuma.

**Ključne reči:** maligna hipertermija; rijanodinski receptori; leptosukcin

**REFERENCES**


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