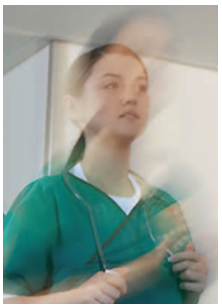

Malignant hyperthermia

This potentially lethal condition calls for quick action.

By Veronica Y. Amos, PhD, CRNA, PHCNS-BC

NATE MARTIN*, an 8-year-old boy, is admitted for a full-mouth dental restoration under general anesthesia. His parents report no family history of anesthesia or surgical issues. Nate was given midazolam 20 minutes before the procedure to reduce anxiety.

Nate receives general anesthesia by induction with a volatile inhalation agent (sevoflurane) and nitrous oxide. Andrew, the CRNA, starts an I.V. of normal saline. Before intubation, Andrew administers fentanyl 25 mcg I.V. and propofol 80 mg I.V.

Andrew maintains Nate's anesthesia on sevoflurane, with a 2.5 minimal alveolar concentration and oxygen 0.5 L/min. Meg, the OR nurse, applies a lower-body warmer unit at 100.4°F (38°C) and administers acetaminophen 250 mg rectally for postoperative pain.

As the dentist begins the procedure, Nate's vital signs are normal: BP 100/63 mmHg, HR 88 bpm, $ETCO_2$ 43 mm/Hg, blood oxygen 100% by pulse oximeter, and temperature 98.4° F (36.9° C) via skin probe.

Clinical assessment

Approximately 45 minutes into the surgery, Nate's $ETCO_2$ rises to 60 mm/Hg, his HR increases to 106 bpm, and the dentist notes masseter muscle stiffness. Despite Andrew's efforts to decrease Nate's $ETCO_2$, his HR increases to 120 bpm and his $ETCO_2$ increases to 66 mm/Hg. Nate's breath sounds are clear bilaterally. Andrew suspects malignant hyperthermia (MH) and alerts the team to activate the MH protocol.

Clinical management

The dentist stops the surgery, and Meg brings the MH cart into the OR. Nate's temperature is 102.9° (39.4°C), so Meg switches the lower body warmer unit to a cooling mode and applies ice packs to his groin and axilla. Andrew discontinues sevoflurane and flushes the anesthesia circuit with hyperventilation of 100% oxygen. He starts a propofol infusion to maintain general anesthesia while Nate receives MH treatment. Andrew starts a second I.V. as Meg prepares dantrolene by diluting the powder with sterile water. Andrew administers dantrolene 2.5 mg/kg.

ABGs and serum potassium levels reveal hyperkalemia and acidosis, which are treated with calcium gluconate, glucose-insulin, and bicarbonate. Meg inserts a urinary catheter and increases the normal saline infusion to 75 mL/hour to maintain Nate's urine output at >1 mL/kg/hr. Within 30 minutes, his $ETCO_2$ decreases to 39 mmHg and his HR drops to 90 bpm.

Nate is transferred to the ICU where he's monitored for myoglobinuria and disseminated intravascular coagulation. He recovers quickly and is discharged home on day 4 with an order for a follow-up caffeine-halothane contracture test, used to diagnose MH.

Education

MH is a genetic life-threatening disease of the musculoskeletal system. A mutation on the ryanodine receptor results in uncontrolled release of calcium, triggering a hypermetabolic state. Almost all MH signs and symptoms occur only after exposure to volatile anesthetic agents or succinylcholine. MH can occur anytime during general anesthesia or during the first 12 hours after the procedure.

MH signs and symptoms include tachycardia, hypercapnia, increased body temperature, and muscle rigidity. The definitive treatment for MH is dantrolene to inhibit further calcium release.

The discharge nurse tells Nate's family they must alert providers to their son's MH before any procedure that requires anesthesia. She also refers them to the Malignant Hyperthermia Association of the United States for information and enrollment in the MH registry. AN

*Names are fictitious.
Access references at myamericannurse.com/?p=74251.

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