Malignant Hyperthermia in an Office Surgery Suite: A Case Report

Ivan M. Turpin, M.D. and Jan Manino, C.R.N.A., J.D.
Irvine, California

Abstract. Malignant hyperthermia is a threat to the life of the surgical patient. It is a pharmacogenic disease that is brought on by contact with certain drugs and is manifest by a hypermetabolic crisis with tachycardia, ventricular ectopy, metabolic acidosis, and a rapid rise in body temperature. Muscle rigidity may or may not be present. Thanks to a reliable porcine animal model of malignant hyperthermia, dantrolene sodium has been found to be effective in the prevention and treatment of malignant hyperthermia. In this article a case report of malignant hyperthermia occurring in an office surgery suite is presented. The patient was 37 years old and underwent a routine septorhinoplasty under general anesthesia. The operation was complicated by ventricular ectopy, rapid rise in body temperature, and muscle rigidity at the end of the case. The malignant hyperthermia aborted spontaneously after 30 minutes; dantrolene was not given.

Key words: Malignant hyperthermia

Malignant hyperthermia (MH) is a pharmacogenic, myopathic disorder brought on by the administration of certain drugs such as inhalation anesthetics and succinylcholine. Affecting both muscle and metabolism, it produces a hypermetabolic crisis characterized by tachycardia, ventricular ectopy, respiratory and metabolic acidosis, and a rapid rise in body temperature. All of these signs are often accompanied by muscle rigidity.

First described in 1960, MH is now recognized as a significant cause of anesthesia-induced death in North America [8]. The trait for MH is found in 1 out of 15,000 children and 1 out of 50,000 adults [7], and approximately 40% of reported reactions have occurred during anesthesia for head and neck procedures [9]. MH is generally considered to be compatible with autosomal dominant inheritance with variable penetrance [5].

Manifested by a variable course, MH may abate spontaneously with cessation of anesthesia or it may progress to its most fulminant form with acidosis, myoglobinemia, severe metabolic derangements, very high temperature, and cardiovascular collapse. Dantrolene sodium, a phenyhydantoin, is now recognized as the drug of choice for both the prevention and treatment of malignant hyperthermia [8]. We report herein a case of malignant hyperthermia in an office surgery suite.

Case Report

A 37-year-old woman came to our office with a complaint of a crooked nose and impaired breathing through her left nasal passage. Her past history was significant in that she admitted to difficulty breathing when she had a general anesthetic for a dental extraction 20 years before. She was told she had a reaction to succinylcholine (Anectine). She denied any hospitalizations or surgical procedures other than natural childbirth. There was no family history of any anesthetic-related complication. In addition, there was no history of drug allergies and the patient was not taking any medication. Physical examination revealed a healthy woman with a nasal septum that deviated to the left, partially obstructing the left nasal passage.

The anesthetist called the patient prior to the surgery and the history of previous anesthesia problems was ascertained. The patient stated that she
was told she probably had a pseudocholinesterase deficiency and should not receive succinylcholine. A general anesthetic technique was discussed with the patient and the decision was made to use norcuronium, a nondepolarizing muscle relaxant, instead of succinylcholine for endotracheal intubation.

On admission to the office surgical facility, routine laboratory values were noted to be within normal limits. Without premedication the patient was transferred to the operating room, where monitoring of the EKG, heart rate, blood pressure, and skin temperature was initiated. Induction of anesthesia was achieved with 200 mg methohexital (Brevital) and 100 mcg fentanyl (Sublimaze). Endotracheal intubation with a Raé preformed tube was facilitated with 5 mg norcuronium. Anesthesia was maintained with enflurane (1.5%), oxygen (50%), and nitrous oxide (50%) delivered through an Ohio machine with a circle absorber. In addition, 1% lidocaine with 1:100,000 epinephrine was injected subcutaneously in the nose at the beginning of the operation. Surgery and anesthesia proceeded uneventfully for the next 2 hours 15 minutes, at which point the patient began having premature ventricular contractions as the lateral osteotomies were being performed. Lidocaine 50 mg IV bolus was administered with immediate conversion of the EKG to sinus rhythm. At the time of the PVCs, her axillary skin temperature was noted to be 35°C. Over the next 30 minutes the patient’s temperature steadily rose to 38.5°C before spontaneously sliding back to 35.2°C. During the episode, she was treated by discontinuing all anesthetic agents, hyperventilation with 100% oxygen, surface cooling with ice packs to the axillae and groin, and the administration of 44.6 mEq sodium bicarbonate intravenously. The soda lime cannister was noted to be extremely hot and the granules had completely changed to purple. The anesthesia machine was disconnected and another machine was used to administer oxygen to the patient. Dantrolene was not available in the surgical suite and was obtained from the hospital next door. Since the patient’s temperature returned to normal without the medication, the decision was made not to administer it. During the febrile episode, she was noted to have diffuse muscle rigidity including the masseter muscles.

In the recovery room she was alert and complaining of diffuse myalgia before being transferred to the hospital for observation. Her hospitalization was uneventful and all laboratory tests were normal except for a CPK of 4235 μ/L and positive urine myoglobin screen.

Later, she was referred to UCLA, the nearest center which is active in malignant hyperthermia research. The patient was felt to have had a spontaneously aborted episode of malignant hyperthermia and a muscle biopsy was not recommended.

Discussion

Malignant hyperthermia is a frightening experience for both the physician and the nurses, especially when it occurs in your office operating suite. Although a muscle biopsy was not done in this case, a review of all the anesthetic records, EKG, and laboratory data left little doubt that the patient had a spontaneously aborted episode of malignant hyperthermia. The patient has since developed an inguinal hernia that was uneventfully repaired under spinal anesthesia and pretreatment with dantrolene. It remains unclear what triggered the malignant hyperthermia episode but, in all likelihood, it was the enflurane. In addition, she was given nitrous oxide and lidocaine which are known to be weak triggering agents.

Diagnosis

The diagnosis of malignant hyperthermia, when it is fully manifested, is easy. However, the early detection of MH can be quite difficult unless you have a high degree of suspicion. When using potent volatile agents or succinylcholine you should be suspicious if there is undue tachycardia, tachypnea, dysrhythmias, mottling of the skin, cyanosis, increasing temperature, muscle rigidity, sweating, or unstable blood pressure. When the above are present you must search for signs of increased metabolism; however, most office surgery suites usually do not have the laboratory facilities available. If possible, the patient should have an arterial blood gas analysis and a serum K⁺ measured, looking for hyperkalemia and metabolic acidosis. The diagnosis is confirmed with a base excess of less than −5 mEq/L and an arterial PCO₂ greater than 60 torr without a reasonable explanation. But in the office operating suite, where laboratory support is not immediately available, treatment should be instituted when the temperature is rising with or without diffuse muscle rigidity and you should have a high degree of suspicion if the patient has an unexplained tachycardia, tachypnea, cardiac arrhythmia, or changes in skin color [5].

Current Treatment Recommendations

If the patient develops evidence of malignant hyperthermia, all inhalation anesthetics should be stopped and all rubber tubing changed. Hyperventilate the patient and give 1–2 mg/kg bicarbonate. A dantrolene bolus of 2.5 mg/kg should be given immediately and can be repeated as necessary (mix with distilled water [4]). Dantrolene indirectly acts on the sarcoplasmic reticulum preventing the release of calcium [1]. Cool the patient with ice packs...