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What You NEED to Know about Malignant Hyperthermia

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Malignant hyperthermia reactions are associated with over eighty genetic defects (Mitchell, Brown, 2012) with the gene RYR1 on chromosome 19 coding the most prevalent. The RYR1 is a ryanodine receptor that mediates calcium release from the sarcoplasmic reticulum, which is essential for muscle contraction. Normal cesarean delivery, surgical, or trauma leads to a release of calcium from the SR, which stimulates the contraction of the muscle. It is estimated that calcium release exceeds the capacity of calcium reuptake by the SR, leading to sustained muscle contraction and rigidity, increased metabolism and gene expression. Eventually, the oxygenated blood is depleted of oxygen and adenosine triphosphate (ATP), their energy source (Mitchell, Brown, 2012). MH is an autosomal dominant inherited disorder, meaning a child or sibling of a susceptible patient has a 50% chance of inheriting a defective gene (Mitchell, Brown, 2012).

Treatment

Once MH is suspected, it is extremely important to take prompt action to “discontinue the inhaled anesthetics” (Seifert, Pace, Cochrane, & Marienau, 2014). “The excessive calcium leads to sustained muscle contraction and rigidity, increasing metabolism and gene expression. Eventually, the oxygenated blood is depleted of oxygen and adenosine triphosphate (ATP), their energy source” (Mitchell, Brown, 2012). The hallmark sign of malignant hypercapnia, tachycardia, hyperthermia, muscle rigidity, compartment syndrome, rhabdomyolysis, and acidosis (MH can lead to end organ damage due to decreased perfusion to these centers). This genetic test screens for the 17 most common RYR1 mutations. The CHCT test must be performed on a fresh muscle specimen, the patient must travel to one of these centers for testing. Currently, it is estimated that 1 in 5000 to 50,000 people has MH susceptibility, but not all is exposed to inhaled anesthetics. Some of the inhaled volatile anesthetic agents that can trigger MH include halothane, methoxyflurane, and isoflurane (Genetics Home Reference, 2015). MH is also known to be associated with emotional stress, trauma, or extreme heat stressors such as vigorous exercise and high temperatures that can trigger malignant hyperthermia (Federal Medical Center, 2014). The risk of MH is 1 in 15,000 to 1 in 50,000 (Vincent, 2012; Marienau, 2002).

Pathophysiology

Malignant hyperthermia is a serious, life-threatening reaction that occurs after being exposed to certain inhalational and local anesthetics. Some of the inhaled volatile anesthetic agents that can trigger MH include halothane, methoxyflurane, and isoflurane (Genetics Home Reference, 2015). MH is also known to be associated with emotional stress, trauma, or extreme heat stressors such as vigorous exercise and high temperatures that can trigger malignant hyperthermia (Federal Medical Center, 2014). The risk of MH is 1 in 15,000 to 1 in 50,000 (Vincent, 2012; Marienau, 2002).

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Nursing Implications

The amount of procedures in the US alone top over 10 million, with many of them being done with local anesthetics (CDC, 2014). With such a high number of cases in the continental United States, it is important to be aware of possible triggering factors of MH, such as MH. Professional health care workers, such as anesthesiologists, nurses, critical care physicians, and perioperative personnel and registered nurses are the first line of responders to recognizing the signs and symptoms of MH as well as prompt and proper treatment. It is extremely important to obtain a thorough medical history before providing anesthesia for possible episodes of MH reaction. Once MH has been triggered and stabilized as long as an increased risk of the triggering agents is key. It is not recommended or necessary to perform these tests with all patients, but having it available is crucial (Kraus, Bounmythavong, Riazi, Brown, & Nicholson, 2010). Researchers have decreased the mortality rate of MH reactions from 40% to 1.4% (Denholm & Spruce, 2015). Researchers have proven that stocking of dantrolene is essential in the event of MH reaction, whether it is an emergency or not. It is crucial to have the medication available to immediately treat MH (Seifert, Pace, Cochrane, & Marienau, 2014).

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