Malignant Hyperthermia

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Introduction:

According to the Malignant Hyperthermia Association of the United States (2015), “Malignant hyperthermia (MH) is a potentially fatal, inherited disorder usually associated with the administration of certain general anesthetics and/or the drug succinylcholine.” Malignant hyperthermia has been presented to me during hospital skills days over the past year due to the increased need for knowledge regarding this topic. I choose this topic because I find it interesting due to the fact that I could encounter this in the remainder of my days in the intensive care unit, but most importantly because I will be dealing with these drugs on a daily basis as a Nurse Anesthetist. Researching this topic in detail and presenting it will make me feel even more comfortable if one of my patients would experience the negative effects of anesthesia and go into malignant hyperthermia.

Signs and Symptoms

As with all diseases and illnesses there are signs and symptoms that medical personnel should be aware of and able to recognize. According to the Malignant Hyperthermia Association of the United States (2015), signs and symptoms for MH include:

- Increased heart rate
- Greatly increased body metabolism
- Muscle rigidity
- Vomiting that may exceed 110 degrees F along with muscle breakdown, derangements of body chemicals and increased acid content in the bloodstream which causes hyperkalemia.

More severe complications:
- Cardiac arrest
- Brain damage
- Internal bleeding or failure of other body systems

Malignant hyperthermia crisis can mimic other complications and it should be addressed quickly or death could occur.

Underlying Pathophysiology

Those who are susceptible to malignant hyperthermia (MH) experience a metabolic dysfunction in their cells that results in increased cellular energy. The energy production of the body is dependent on adenosine triphosphate (ATP), which is the source of cellular energy. The muscle cells will not be able to use this and once the cells release large amounts of potassium into the bloodstream which causes hyperkalemia. The hyperkalemia can cause ventricular arrhythmias.

Malignant hyperthermia crisis usually results from the administration of non-depolarizing neuromuscular blocking agents, such as vecuronium or rocuronium. The release of myoglobin can be toxic to the kidneys, so any early recognition of MH is crucial.

Understanding the pathophysiology about MH can be beneficial for many reasons. As stated by Heffron (2013), it is crucial for medical personnel to make a more accurate diagnosis of perioperative fever or hyperthermia and subsequently choose the proper course of treatment. This would increase patient outcomes, decrease length of stays, etc. MH can have many poor outcomes if not treated promptly and accurately. Release of potassium causes hyperkalemia which can result in cardiac arrhythmias. Treating the high K will decrease the risk of cardiac arrhythmias and or death. The release of myoglobin can be toxic to the kidneys, so making an early diagnosis can be beneficial. The patient’s body temperature must be controlled so the brain does not become injured. Understanding what the body is going through during a MH crisis, those caring for the patient are able to treat the underlying causes more effectively.

Significance of Pathophysiology

Malignant hyperthermia crisis can occur in a wide variety of areas and those working where MH can occur they must be properly educated and prepared to recognize and act properly so poor patient outcomes don’t occur. However, according to Cain, Riess, & Novalija (2014) “Many clinicians are unprepared to manage an MH crisis in the perioperative setting because it requires the use of low-flow, high-risk skills and procedures. Simulation is a recognized educational method for cumulative and integrative learning in a safe environment that resembles real-life clinical scenarios” (pg1). As clinicians we must be properly educated and use all our resources including the MH hotline who is ran by the Malignant Hyperthermia Association of the United States.

Conclusion

Malignant hyperthermia can occur in a wide variety of areas and those working where MH can occur they must be properly educated and prepared to recognize and act properly so poor patient outcomes don’t occur. However, according to Cain, Riess, & Novalija (2014) “Many clinicians are unprepared to manage an MH crisis in the perioperative setting because it requires the use of low-flow, high-risk skills and procedures. Simulation is a recognized educational method for cumulative and integrative learning in a safe environment that resembles real-life clinical scenarios” (pg1). As clinicians we must be properly educated and use all our resources including the MH hotline who is ran by the Malignant Hyperthermia Association of the United States.

References


Implications for Nursing Care

Nurses must be attentive and recognize when a patient is deteriorating. Patients must be closely monitored for malignant hyperthermia as it can happen during surgery and the first hour after anesthesia, which is the most crucial time. It also can occur if the anesthetic or succinylcholine is given in the emergency room or ICU for induction. Nurses must recognize hemodynamic changes, rising cardiac output, levels, increased temperature, muscle rigidity, and brownish colored urine. Once MH is suspected the nurse should notify the physician and use all resources to help assist with a patient whose body is going through an MH crisis. Orders will be given and a protocol should be followed. Dantrolene must be reconstituted and pushed. Tubes/drains should be flushed with chilled saline as well as chilled intravenous fluids should be started. The patient should be moved to the intensive care unit and monitored closely. The nurse caring for the patient must make sure the patient is safe and cared for in an appropriate and timely manner.