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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

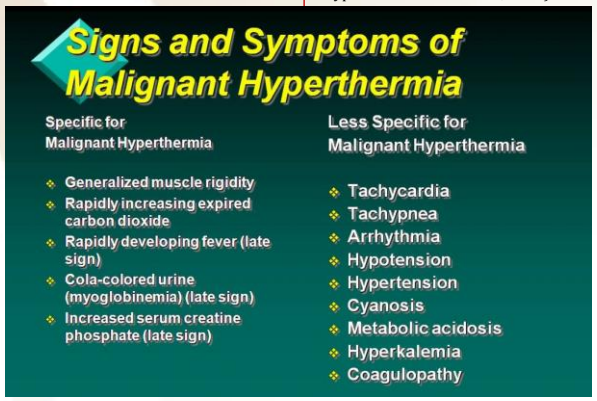
As with all diseases and illness there are signs and symptoms that medical personnel should be aware of and be able to recognize. According to the Malignant Hyperthermia Association of the United States (2015), Signs and symptoms for MH include:

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

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.



[Malignant Hyperthermia]. Retrieved July 29, 2014 from http://www.veomed.com/files/powerpoints_images/node90055/Slide13.JPG

Underlying Pathophysiology

Those who are susceptible to malignant hyperthermia or experience MH have a mutation which causes the presence of abnormal proteins to build up in the muscle cells of their body. According the Kingler, Heiderich, Girard, Gravino, Heffron, Johannsen, & Lehman (2014), the mutation is found on the ryanodine receptor type 1 (RyR1)." Proteins that build up in the muscle cells is a normal occurrence in the human body, but these individuals when exposed to certain anesthetic agents or in some cases extreme heat or strenuous exercise, it causes an abnormal release of calcium from the sarcoplasmic reticulum in the muscle cells. The sarcoplasmic reticulum is where calcium is storage and when this occurs it results in a sustained muscle contraction which increases metabolism and heat production. Once the muscle cells have been contracted for a period of time they are eventually depleted of adenosine triphosphate (ATP), which is the source of cellular energy. The muscle cells will not be able to survive this and once they die the cells release large amounts of potassium into the bloodstream which causes hyperkalemia. The hyperkalemia can cause ventricular arrhythmias. Myoglobin, muscle pigment, is also released during this and can cause injury to the kidneys. (Malignant Hyperthermia Association, 2015).

Significance of Pathophysiology

Understanding the pathophysiology about MH can be beneficial for many reasons. As stated by Herlich (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 sure to persevere kidney function with fluids would be beneficial. The patient's body temperature must be controlled so the brain does not become injured. When comprehending what the body is going through during a MH crisis, those caring for the patient are able to treat the underlying causes more effectively.

[Malignant Hyperthermia- ThingLink]. Retrieved July 29, 2014 from http://a2.mzstatic.com/us/r30/Purple2/v4/70/f7/14/70f71456-d4c2-8854-4924-a5a1d247c5b7/mzl.zuwfzzmg.175x175-75.jpg

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 intubation. Nurses must recognize hemodynamic changes, rising carbon dioxide 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 should make sure the patient is safe and cared for in an appropriate and timely manner.

Conclusion

Malignant hyperthermia can occur in a wide variety of areas and those working in areas 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, Gettrust, & Novalija (2014) "Many clinicians are unprepared to manage an MH crisis in the perioperative setting because it requires the use of low-frequency, 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 educate ourselves and use all our resources including the MH hotline who is ran by the Malignant Hyperthermia Association of the United States.

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