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Malignant Hyperthermia

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Malignant Hyperthermia

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Figure 1 Retrieved from
https://www.ha.org.hk/haho/ho/pspa_mirp/MSB15.pdf

Introduction

- Malignant Hyperthermia (MH) is a disorder affecting skeletal muscle metabolism (Riazi et al., 2018).
- The prevalence of MH is about 1 in 100,000 with a higher prevalence in the male population (Yang, Tautz, Zhang, Fomina, & Liu, 2020).
- MH must be detected and treated early to promote minimal complications and effective recovery.
- Presuming that the patient will not have an MH event because of uneventful anesthetic exposure previously may delay diagnosis (Hopkins et al., 2020).
- One cannot provide anesthesia without being knowledgeable of MH.

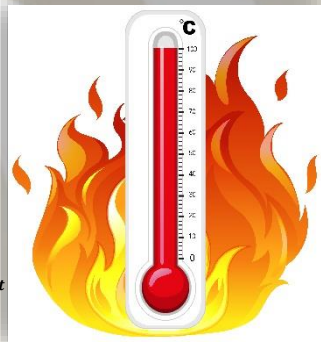


Figure 2 Retrieved from
<https://www.freepik.com/vectors/heat/Heat-vector-created-by-brgfx-www.freepik.com/a/>

Pathophysiological Processes

Pathophysiology

- MH can be induced by volatile anesthetic gases and neuromuscular blocking agents such as succinylcholine (Yang et al., 2020).
- Stimulated ryanodine receptors cause the sarcoplasmic reticulum to release excess calcium leading to “uncontrolled skeletal muscle hypermetabolism” (Yang et al., 2020).
- This hypermetabolism creates heat (Yang et al., 2020).
- The heat leads to elevated temperature, acidosis, hypoxemia, hypercarbia, rhabdomyolysis (Yang et al., 2020).
- If left untreated, MH will progress into renal and circulatory overload becoming fatal (Yang et al., 2020).

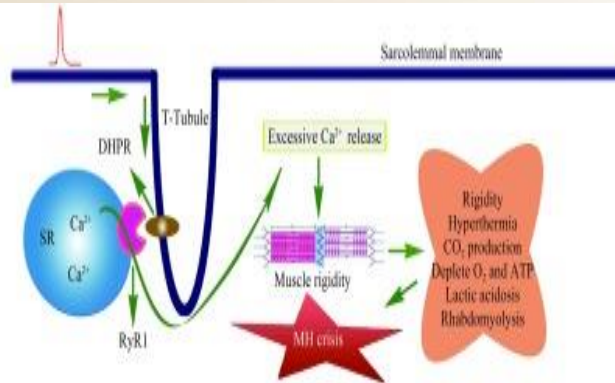


Figure 3 Retrieved from Yang, Tautz, Zhang, Fomina, and Liu (2020).

Signs and Symptoms

- Signs include elevated temperature, hypercarbia, hypoxemia, acidosis, and muscle rigidity (Yang et al., 2020).
- Clinical signs may be nonspecific and may subside if triggering factor is removed (Riazi, Kraeva & Hopkins, 2018).
- Early signs include rise in end-tidal CO₂ and heart rate and may or may not have a rise in temperature (Riazi, Kraeva & Hopkins, 2018).

Nursing Implications

- Delays in treatment increase mortality rate and the severity of complications (Hopkins et al., 2020).
- **Step One:** Identify and discontinue triggering agent and provide 100% oxygen at maximum flow.
- **Step Two:** Administer Dantrolene.
- **Dantrolene is a ryanodine receptor antagonist causing decreased release of calcium to stop MH physiology (National Library of Medicine, 2022).**
- **Step Three:** Initiate active body cooling as needed.
- **Step Four:** Manage acidosis with hyperventilation and administration of sodium bicarbonate as needed.
- **Step Five:** Treat hyperkalemia with administration of sodium bicarbonate, insulin, and glucose. Avoid giving calcium.
- **Step Six:** Monitor and treat any complications that arise including: arrhythmias, disseminated intravascular coagulopathy (DIC), myoglobinuria, and compartment syndrome.

(Steps one through six adapted from Hopkins et al., 2020)

Conclusion

- MH is a current issue in anesthesia requiring attention.
- Early identification is essential.
- MH is easily reversible and side effects can be managed when promptly diagnosed by the anesthesia provider.

Percentage of Appearance of Clinical Symptoms During 255 MH Events

CLINICAL SYMPTOM	PERCENT OF APPEARANCE (%)
Masseter Spasm	26.7
Hypercarbia	92.2
Sinus Tachycardia	72.9
Generalized Muscle Rigidity	40.8
Tachypnea	27.1
Cyanosis	9.4
Skin Mottling	6.3
Rapidly Increasing Temperature	64.7
Elevated Temperature	52.2
Sweating	17.6
Ventricular Tachycardia	3.5
Cola-colored urine	13.7
Ventricular Fibrillation	2.4
Excessive Bleeding	2.7

Table 1 Adapted From Yang, Tautz, Zhang, Fomina, and Liu (2020).

Figure 3 Retrieved from MHAUS (2022)



MH Resources

Malignant Hyperthermia Association of the United States
<https://www.mhaus.org/>
24-HOUR MH HOTLINE
800-644-9737

References



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