

## Management of Malignant Hyperthermia

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- What is MH?



### Malignant Hyperthermia (MH)

An inherited disorder of skeletal muscle triggered in susceptible humans in most instances by inhalation agents and/ or succinylcholine, resulting in hypermetabolism, skeletal muscle damage, hyperthermia, and death if untreated.



### Malignant Hyperthermia (MH)

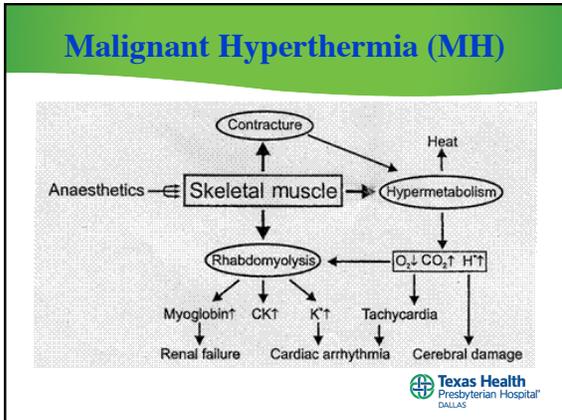
70% of cases involve a mutation in a gene on Chromosome 19 which Encodes the ryanodine receptor protein on the sarcoplasmic reticulum along with several other chromosomal loci (Raymer, 2013)

- Muscle biopsy



### Malignant Hyperthermia (MH)

The underlying physical mechanism- intracellular release of calcium leading to sustained muscular contraction and cellular hyper metabolism

## Malignant Hyperthermia (MH)

### Incidence:

- ◆ 1 in 10,000 to 1 in 50,000 anesthetics in adults
- ◆ 1 in 15,000 in children
- ◆ Based on reports to MHAUS there are about 600 cases of MH per year



## Malignant Hyperthermia (MH)

- ◆ From January 2006 through May 2008, there were 503 calls from hospitals, 28 determined to be MH with 2 deaths (7% mortality)
- ◆ 44 calls from ambulatory settings, 13 determined to be MH with 3 deaths (21% mortality)
- ◆ 2012- 5 deaths (underreported)



## MHAUS.ORG

The screenshot shows the MHAUS.ORG website. At the top, there are navigation tabs for 'Healthcare Professionals', 'Patients', 'Testing', 'FAQs', 'Videos', 'Blog', 'Get Involved', and 'Shop'. Below the tabs is a search bar and a '24 HOUR MH HOTLINE 800-544-9737' button. The main content area features a 'What is MH?' section with a detailed description of Malignant Hyperthermia (MH) as a potentially fatal, inherited disorder. It mentions symptoms like muscle rigidity, rapid heart rate, high body temperature, muscle breakdown, and increased acid content. It also notes that immediate treatment with the drug dantrolene usually reverses the signs of MH. A 'Click here to find out more' link is provided. At the bottom of the screenshot, there are links for 'MHAUS Shop', 'Events', 'Press Releases', and 'MHAUS'.



## SUSCEPTIBLE POPULATIONS

- ◆ Central core diseases and myotonia's
  - ◆ Duchene's muscular dystrophy
  - ◆ Becker's Muscular dystrophy
  - ◆ (Most common age here 20's- we don't usually have peds.)
- Risk factors include Genetic predisposition, Use of General anesthesia and a history of muscle weakness



## Pre-op Assessment

- ◆ Look for susceptible populations- People with muscle disorders.
- ◆ Assessment of patient and family history
- ◆ Complications from any previous surgery



## Malignant Hyperthermia (MH)

### Triggering Agents

- Potent volatile anesthetics such as Halothane, Desflurane, & Sevoflurane
- *Succinylcholine*



### Malignant Hyperthermia (MH)

Not MH Triggers

- Intravenous agents
- Opioids
- Non-depolarizing agents
- Ketamine
- Propofol
- Anxiolytics



### Signs and symptoms

*Early*

**Unexplained tachycardia**

Increased concentration of end tidal CO2

Masseter muscle rigidity on intubation after succinylcholine



### Signs and symptoms

**Marked increase in heart rate**

Abnormal ventricular beats

Hyperkalemia

Mixed Respiratory and metabolic acidosis



### Signs and symptoms

*Late:*

Myoglobinuria

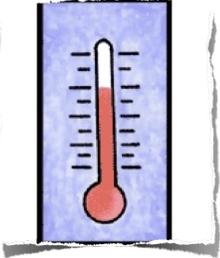
**Rise in skin and core temperature**

Cyanotic mottling of the skin



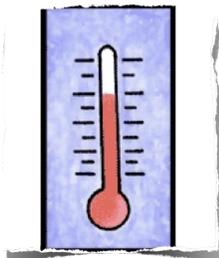
### Managing the Crisis

Early recognition of signs and symptoms



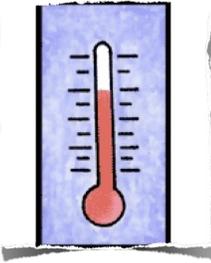
### Managing the Crisis

Stop the trigger anesthetic!  
Stop the surgery/ Procedure!



### Managing the Crisis

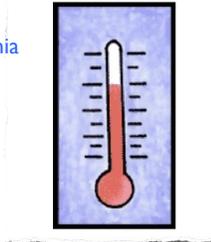
Hyperventilate  
the patient with  
100% oxygen




### Managing the Crisis

Call Malignant Hyperthermia  
Association of the United  
States

Call 911 if Ambulatory  
surgery center




### Managing the Crisis

Dantrolene




### Dantrolene

- ◆ Initial dose is 2.5mg/kg
- ◆ Repeat Dantrolene until signs and symptoms are controlled. Maximum dosing is 30mg/kg
- ◆ Each vial of Dantrolene contains 20mg of Dantrolene
- ◆ Each vial is mixed with 60ml of Sterile water and shaken
- ◆ Minimum 36 vials on hand!



### Managing the crisis

- Cooled normal saline is used intravenously and as gastric lavage for patients with core temps greater than 39 degrees Celsius




### Managing the crisis

- Cooling blankets or ice to the patients groin and axilla




### Managing the crisis

- IV bicarbonate for metabolic acidosis




### M.H. CART

- ◆ 36 vials of Dantrolene
- ◆ 2 liters of sterile water
- ◆ Bicarb to treat acidosis
- ◆ Glucose and insulin to treat hyperkalemia




### M.H. CART

- ◆ Osmotic diuretic or loop diuretic
- ◆ IV glucose and saline
- ◆ 60 ml syringes
- ◆ NG tubes
- ◆ Foley with urimeter



### M.H. CART

- ◆ Large plastic bags for ice
- ◆ Blood gas syringes
- ◆ Lab tubes
- ◆ Urine specimen containers



### After the Crisis

- ◆ Continue Dantrolene in the ICU for at least 24 hours at 1-2 mg/kg
- ◆ Myoglobinuria
- ◆ Renal Failure
- ◆ Disseminated Intravascular Coagulation



### Question

Agents that have been implicated in MH are called triggering agents. The only Safe agent of those listed is:

- A) Desflurane
- B) Isoflurane
- C) Halothane
- D) Nitrous Oxide



### Question

Two Methods used in the treatment of MH are:

- A) Regular insulin and Lidocaine
- B) Dantrolene sodium and Xylocaine 1%
- C) Dantolene sodium and patient cooling
- D) None of the above



### Question

- Dosing with Dantrolene sodium begins at:
- A) 10 mg/kg
- B) 1.0 mg/kg
- C) 5 mg/kg
- D) 2.5 mg/kg

