



## Emergency Department Policy

**SUBJECT: MALIGNANT HYPERTHERMIA EMERGENCY**

**POLICY:** Malignant Hyperthermia is a rare, life-threatening complication that may be triggered by drugs commonly used in anesthesia and during Emergent Rapid Sequence intubation. All Emergency Medicine personnel shall be familiar with the management of malignant hyperthermia.

### PROCEDURE:

#### ACUTE PHASE TREATMENT (MH HOTLINE 1-800-644-9737)

- I. Get Help. Get Dantrolene - Notify ED Provider
  - A. **Notify Emergency Department provider.** Discontinue agents and/or succinylcholine.
  - B. Hyperventilate with **100% oxygen at 10L/minute or more.**
  - C. **Halt the procedure as soon as possible** or if emergent continue with non-triggering drugs.
  
- II. Dantrolene 2.5 mg/kg rapidly IV through large-bore IV if possible – **ED Pharmacist to assist with obtaining medication and administration**
  - A. Immediately give **dantrolene sodium** (Dantrium) 2.5 mg/kg IV. (2.5 mg/kg approximates 1 mg/lb).
    1. **Mix each vial Dantrolene with 60 ml, sterile, preservative free water for injection.**
  - B. Repeat until **signs of MH are reversed.**
  - C. Sometimes more than 10 mg/kg (up to 30 mg/kg) is necessary.
  - D. Each 20 mg bottle has 3 gm mannitol for isotonicity. NaOH **the pH of the solution is 9.**
  
- III. Bicarbonate for **metabolic acidosis.**
  - A. Refer to arterial blood gas values to determine dosage.
  - B. If ABG is not available, consider 1 to 2 mEq/kg IV.

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- IV. Begin **active cooling** of patient with core temperature  $>39^{\circ}\text{C}$ .
  - A. Inject iced saline IV 15 ml/kg every 15 minutes x3.
  - B. Use iced saline to lavage open body cavities.
  - C. Cool the body surface with a hypothermia blanket.
  - D. Place ice packs to groin area, axillary regions, and sides of neck where major arteries are located.
  - E. Stop cooling when core temp reaches 38 degrees.
  
- V. Dysrhythmias
  - A. **Dysrhythmias** usually respond to treatment of acidosis and hyperkalemia.
  - B. If not, use standard drug therapy **except calcium channel blockers, which may cause hyperkalemia or cardiac arrest in the presence of dantrolene.**

**Procainamide 200mg IV to treat arrhythmias secondary to electrolyte imbalances**

- VI. **Hyperkalemia** - treat with hyperventilation, bicarbonate, glucose/insulin, calcium.
  - A. Bicarbonate 1-2 mEq/kg IV.
    - 1. For **pediatric**, 0.1 units insulin/kg and 1 ml/kg 50% glucose **or for adult**, 10 units regular insulin IV and 50 ml 50% glucose.
  - B. Calcium chloride 10 mg/kg or calcium gluconate 10-50 mg/kg for life threatening hyperkalemia.

***Muscle cells are destroyed during an MH crisis and the myoglobin that is released accumulates in the kidneys, obstructing urinary flow, referred to as myoglobinuria. Diuretics are given IV to promote and maintain urinary flow, in order to prevent renal damage. Mannitol 0.25g/kg IV; Furosemide 1mg/kg IV; up to four doses each. Urinary output of 2ml/kg/hr or higher must be maintained to prevent renal failure.***

- C. Check glucose levels hourly.
  
- VII. **Follow** ETCO<sub>2</sub>, electrolytes, blood gases, CK, core temperature, urine output and color, coagulation studies.
  - A. If CK and/or K<sup>+</sup> rise more than transiently or urine output falls to less than 0.5 ml/kg/hr, induce diuresis to  $>1$  ml/kg/hr to avoid myoglobinuria induced renal failure.
  - B. Venous blood gas values may document hypermetabolism better than arterial values.
  - C. Central venous or PA monitoring as needed and record minute ventilation.
  - D. Place Foley catheter with temperature monitoring capability and monitor urine output.
  
- VIII. Post ED Care
  - A. Patients who had symptoms in the Emergency Department:
    - 1. Coordinate ongoing management with Critical Care Team
    - 2. Observe the patient in an ICU setting for at least 24 hours due to the risk of reoccurrence.
    - 3. Dantrolene 1mg/kg q 4-6 hours or 0.25 mg/kg/hr by infusion for at least 24 hours.
    - 4. Follow vitals and labs, frequent ABGs, CK every 6 hours.

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5. Follow urine myoglobin and institute therapy to prevent myoglobin precipitation in renal tubules and the subsequent development of Acute Renal Failure. Follow standard intensive care therapy for acute rhabdomyolysis and myoglobinuria.
6. Counsel the patient and family regarding MH and further precautions; refer them to MHAUS.

IX. Supplies

MWLED: Obtain cart from MMC CT Room 2  
(along the south wall)  
MMC ED Obtain cart from TBA  
MMC Radiology: 2 Carts: 1 in MMC East Tower MRI; 1 in MMC CT Room 2

X. Follow Up/Resources

- A. MHAUS 24-Hour HOTLINE NUMBER phone (800)644-9737
- B. Provide teaching regarding Malignant Hyperthermia and its treatment and testing or registering the patient with MHAUS organization. Distribute "What is MH?" educational packet to patient and family.
- C. Post MH emergency, restocking of supplies will be handled ASAP by SPD and the unit housing the cart.

**REFERENCES**

Malignant Hyperthermia Association of the United States (MHAUS): Emergency Therapy for Malignant Hyperthermia.

AORN Malignant Hyperthermia Guideline, 2013 Perioperative Standards and Recommended Practices.

Anesthesiology News; December 2011, Malignant Hyperthermia Diagnosis, Treatment, and Prevention.

Preparation of the Drager Fabius Anesthesia Machine for the Malignant Hyperthermia Susceptible Patient, A&A; December 2008, vol. 107, no. 6.

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