Title: Malignant Hyperthermia

Policy #: PSM 200-221

Purpose: To provide guidelines for early recognition and emergency response for patients at risk or with known Malignant Hyperthermia (MH)

Policy Statement:

1. The staff in the perioperative setting will be knowledgeable in the recognition and emergency response to malignant hyperthermia.

2. The pre-procedure assessment of patients will include a determination of risks for malignant hyperthermia.

Triggers

Halothane and succinylcholine are the most common triggers. Additional triggers include: Isoflurane, Enflurane, Sevoflurane, and Desflurane.

Agents which are safe include:

- Nitrous Oxide
- Induction anesthetics, i.e. pentothal, propofol, ketamine.
- Benzodiazepines
- Narcotics
- Spinal, epidural and local anesthetics
- Nondepolarizing muscle relaxants including: Pancuronium, Cistacurium, Vecuronium, Rocuronium, Atracurium, and Mivacurium.

Guideline(s) for Implementation:

1. All Perioperative staff are trained in the recognition and treatment of MH.

2. Competencies are maintained and documented on a bi-annual basis.

3. Identification of patients susceptible to malignant hyperthermia

4. Obtain a detailed medical and family history with particular reference to:
   a. previous anesthetic exposure
   b. family history of malignant hyperthermia, or deaths secondary to anesthesia
   c. history of spinal curvature which required treatment
   d. history of muscular dystrophies such as Duchene’s, King-Den borough syndrome, Becker muscular dystrophy, Schwartz-Jampel syndrome, Fukuyama-type congenital muscular dystrophy, Mitochondrial myopathy,
Sarcoplasmic reticulum adenosine triphosphate deficiency, Central Core Disease, Myotonia Congenita.

5. Pre-procedure assessment will be completed as an element of the pre-procedure assessment and documented in the Perioperative Information Management System (PIMS).

6. A caffeine-halothane muscle biopsy may be indicated as part of the pre-procedure assessment in patients that are identified to be at risk.

7. **Note:** Patients who have a significant medical history should be treated as malignant hyperthermia susceptible regardless of findings on the above test.

8. Pretreatment of Malignant Hyperthermia susceptible patients
   a. Do not administer Phenothiazines as they may induce malignant neuroleptic syndrome and an anticholinergic may confound the diagnosis of MH by causing tachycardia.
   b. Obtain the MH cart from it’s designated parking spot
   c. Assist the anesthesiologist in preparing the machine as needed.

9. Suggested protocol for emergency treatment of MH (not in strict order)
   a. Stop anesthesia
   b. Administer 100% oxygen using bag and mask.
   c. Hyperventilate aggressively.
   d. Stop surgery and call for help
   e. Administer Dantrolene (Ryanodex) as described below.

10. Dantrolene (Ryanodex) administration: (Also refer to Pharmacy IV Drug Administration Guideline for Dantrolene (Ryanodex) which is available in PPGD on line policy manual
    a. Dantrolene (Ryanodex) is kept on the MH cart in the Anesthesia Workroom in the Feldberg OR and outside of O.R. 15 in the West OR.
    b. 2.5mg/kg IV bolus
    c. Dantrolene (Ryanodex) given early will abort or limit the fulminant course
    d. Each ampule contains 250 mg of Dantrolene (Ryanodex) in lyophilized powder form
       i. Reconstituted with 5 ml of non-bacteriostatic water (in the pack)
       ii. Shake vigorously until a uniform orange color.
    e. Do not use glass I.V. bottles for infusion and protect from light.
    f. Onset of action is usually 2 – 3 minutes and half life is 11 hours.
    g. The initial dose may be repeated every 5 – 10 minutes up to a total of 10 mg/kg if symptoms reappear or smolder.
    h. Call pharmacy to replace the supply of Dantrolene on the unit.
11. Assess clinical labs and treat as described below:
   a. Send blood to lab for tests
      i. ABG
      ii. 50ml of unheparinized blood for electrolytes
      iii. Enzymes
      iv. CPK
      v. Lactate
      vi. Coagulation studies etc.
   b. Correct acidosis with cold sodium bicarbonate, 1 – 2 mg/kg according to ABGs.
   c. Correct hyperkalemia according to lab results using bicarbonate, glucose & insulin, and diuresis.
   d. Treat dysrhythmias with standard medication but avoid calcium channel blockers.

12. Monitor urine output
   a. insert urinary catheter
   b. send first urine to lab for myoglobin estimation
   c. administer mannitol and furosemide.

13. Cool patient aggressively (end point <38 degrees C) using the following:
   a. ice packing especially to groin, axillae and around head
   b. turn down room temperature
   c. shut off overhead surgical light
   d. lavage bladder, rectum and esophagus with cool normal saline as needed.

14. Document episode including patient response, personnel involved, interventions times and patient outcomes

15. Post procedure the patient should remain in the PACU/ICU for at least 36 hours after all signs have returned to normal. Dantrolene treatment should be continued.

16. Call pharmacy to replace the supply of Dantrolene on the unit.

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