

## **C-55 Malignant Hyperthermia Versus Thyroid Storm**

**Moderator(s)/Facilitator(s):** Steven Halle, M.D.

### **Objective**

After completion of this session, the participant will be able to:

- Differentiate between the perioperative presentations of Malignant Hyperthermia and Thyroid Storm.

### **Case Stem Question**

A 32 yo F presents for laparoscopic myomectomy . She has c/o menorrhagia and occasional SOB for the past year. She appears very anxious about the procedure and is distracted and tremulous and states she couldn't fall sleep last night.

Currently complains of a headache while in the OR holding area. She reports that her occasional anxiety attacks are accompanied by palpitations. She often jogs to relax, but has to stop and rest after a short distance, because she overheats and sometimes sweats profusely. What additional questions would you ask regarding this, ( ie does warm or cold weather make a difference)? Does she jog on an empty stomach or after meals?

She states that she is otherwise healthy and had only one uneventful surgery (strabismus repair) as a child.

Physical exam-goiter on her right thyroid gland. Anxious, and has sweaty hands.

BP 150/90 HR 100 RR-20 Hct 28mg/dl Airway exam- you observe an enlarged area of her thyroid, mallampati 2 airway, with good flexion/extension of neck.

### **Guiding Questions for Discussion**

What are your thoughts regarding her anxiety? During questioning about her excess anxiety, the patient remembers being told thar her aunt died 'under anesthesia' and this worries her.

During her preoperative interview with you, she reports dizziness and lightheadedness. How should you respond?

Her exercise tolerance history reveals fatigue after 3-4 blocks.

What information would you obtain to differentiate the causes of her fatigue?

Her EKG shows atrial fibrillation to 105. Lungs clear. Causes of A.fib (look up)? Would you proceed with surgery?

(Cardiology consult-consider thyroid workup in a 32 yr old with A.fib.)

Any additional info prior to proceeding? Thyroid labs-T4, T3, TSH. TSH level 0.2mU/L ; elevated FT4-2.2ng/dl (nml -.07-1.9ng.d/dl)

Does she have abnormal thyroid function? (Organ systems affected by hyperthyroidism-CV most important-? chronotropic and inotropic effects)

What labs are important to acquire to diagnose 10 or 20 hyperthyroidism?,

What about 10 and 20 hypothyroidism?

Should the case proceed? If not, what optimization is necessary?

What are the various causes of hyperthyroidism?

-Graves' disease (for Mod Disc-most common cause of hyperthyroidism- the immune system)

Any additional pre-op information needed?

PSH: only one prior surgery as a child, which she states was uneventful (any relevance?).

FH: As mentioned, a maternal aunt "almost died" after a laparotomy 15 yrs ago. No further information known by the patient regarding this

Would you postpone surgery to investigate this further? Other possible causes of perioperative death? (diff dx of aunt's surgery-surgical complications, bleeding, cardiac, pulmonary (including PE, anaphylaxis)

The patient is brought to the OR. Standard ASA monitors applied. Any additional anesthetic monitors/equipment? Have both curved and straight laryngoscope blades available; also video laryngoscope, (healthy-exercise tolerance is ok-may consider arterial-line after induction)-would place 2 large-bore IV's (2nd one after induction) have blood products available.

You are concerned that the patient may be a challenging intubation because of her goiter.. What muscle relaxant will you use and why?

You proceed with induction and the patient is intubated without incident. What if you couldn't visualize the vocal cords and glottis?

You successfully intubate the patient.

After approximately 45 minutes of surgery, you notice her HR rising.

What are the possible causes ?

PVC's are seen on the ECG. Differential dx of PVC's?

You collect blood for CBC and electrolytes: Hct returns as 31mg/dl; K+ 3.8 Mg2+ 2.0mg/dl (nml Mg levels are between 1.7 and 2.2 mg/dl)

You treat the PVC's with IV lidocaine, which resolves the rhythm but tachycardia persists.

Her blood pressure remains high despite additional opioid and inhalational anesthesia.

The surgeon asks you if the patient is completely relaxed. You check train-of-four twitches, and despite only 1 twitch out of 4, you give additional rocuronium. After 15 minutes, the surgeon asks if more relaxant can be given. What are the possible causes of refractory relaxation?—muscle rigidity possibly secondary to MH, incomplete relaxation—look up other causes)

A colleague comes in to give you a break and notices the goiter. After endorsing above events, she asks if you think this is thyrotoxic crisis (thyroid storm). Your response?

What are the perioperative manifestations of thyroid storm?

You notice the ETCO2 increase from 35 to 55mmHg and increase the patient's minute ventilation. You suspect malignant hyperthermia (MH). Temperature is slightly elevated to 38.10C (from 37.0). Does this temp effect your suspicion?

In view of the goiter and patient's family history, you are in a dilemma on which syndrome to treat.

What are the clinical differences between perioperative thyroid storm and MH?

You decide this clinical picture is most consistent with MH.

You notice the ETCO<sub>2</sub> continue to rise to 65mmHg and temp goes to 40 C

List plan and treatment options.

Dosing and mechanism of action of dantrolene? How long should dantrolene be administered for?

Case finishes-What is the post-op plan and recommended monitoring?

What advice would you give this patient? What formal testing can be done to establish MH susceptibility?

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