

## **Cushing's Triad, a full stomach and a difficult airway- prioritizing concerns for induction.**

**Moderators:** Diane Gordon, MD; Suzanne Numan, MD

**Institution:** Cincinnati Children's Hospital Medical Center, Cincinnati, Ohio

**Goals:** At conclusion of this session, the learner will:

- be able to discuss congenital hydrocephalus and its complications
- be familiar with Cushing's Triad and ways to address elevated intracranial pressure prior to and during induction
- participate in a discussion of competing priorities and best means to optimize a neurologically tenuous baby for an emergent surgery

**Case:** A 5-month old male (10.8kg) with a PMH of congenital aqueductal stenosis diagnosed prenatally, who had a VP Shunt placed on day two of life for hydrocephalus and massive macrocephaly, presented with acute shunt malfunction. The patient was taken to the hospital yesterday by his parents for concern of bulging fontanelle and left deviation medially. They also noted that he was sleeping a bit more than usual and was overall fussier. Otherwise, the patient did not have signs of infection and had no vomiting, seizure activity or evidence of sunset eyes. Earlier in the day he had an episode of hypertension and bradycardia on the inpatient floor that was treated with urgent tapping of the shunt at the bedside to relieve pressure, but the neurosurgeon is reluctant to repeat the procedure due to increasing risk of infection with multiple taps. The neurosurgeon scheduled the patient for emergent VP shunt removal and EVD placement.

When we went to pick the patient up for surgery we found that the NPO order had been forgotten and his g-tube feeds had only been off for one hour. His fontanelle was taut and protruding from his skull contour about 3 centimeters! He had extreme macrocephaly and significant plagiocephaly, making his airway alignment suboptimal. His heart rate was in the 90s, with normal blood pressure. How would you go about the induction of anesthesia for this patient?

**Patient Measurements:**

Weight: 10.8 kg; Length: 64 cm; Head Circumference: 60cm

**(FYI: A men's basketball is 75cm in circumference)**

**Labs:**

CBC: WBC: 13.8; HGB: 15.4; HCT: 44.6; Platelets: 598

CSF gram stain: no organisms or white blood cells seen.

CSF Culture: no growth- final results pending

**CT Head w/out contrast:**

## IMPRESSION:

1. Marked enlargement of the lateral ventricles and third ventricle, similar to previous exam. There does however appear to be slight bulging of the anterior fontanelle in the interval, concerning for possible shunt malfunction.
2. The brain parenchyma morphology is unchanged compared to recent prior CT examination.
3. No acute hemorrhage.

**Image of CT head will be provided during case discussion.**

**Topics to Discuss:**Preop discussion (30-40 minutes)

What are the competing concerns for this case?

Discuss congenital hydrocephalous and the problems it can cause with anesthesia.

Discuss Cushing's Triad. How can anesthesiologists help during this crisis?

Discuss the full stomach and induction of anesthesia.

Discuss how to induce the patient if you only had to deal with the difficult airway.

Discuss optimal patient positioning for the patient with congenital hydrocephalus.

How would you induce if you had an i.v.? How would you induce if you did not have an i.v.? Would you get i.v. while awake or would you do a mask induction and then place the i.v. line. Would you paralyze? What paralytics would you consider?

Would you have a glidescope or fiberoptic apparatus in the room?

Discuss how induce the patient if you only had to deal with elevated ICP.

What anesthesia-related maneuvers can cause an increase in intracranial pressure? How will you avoid these pitfalls during his induction?

Consider positioning. How is this different then when you positioned for the difficult airway above?

Would you do a mask induction and then place the i.v. line?

Would you hyperventilate during induction?

Discuss how to induce the patient if you only had to deal with the full stomach.

Would you suction out the stomach? If you could not suction anything from the g-tube would you suction from above?

How would you induce if you had an i.v.? Discuss your preferred RSI sequence. How would you induce if you did not have an i.v.?

Is cricoid pressure indicated? What if it obscures the view on laryngoscopy?

### Intraop discussion (20 minutes)

Now, how would you induce this patient when you have to consider all three problems together? Which of his many challenges to safe induction takes priority?

How will you proceed if his i.v was nonfunctional? How and when would you put a new one in to decrease the chance of increasing ICP?

How might he be positioned to optimize laryngoscopy, intubation and ICP?

Will you suction his stomach prior to induction? Will that increase ICP?

If you think the patient's airway will be difficult despite optimal positioning, how will you proceed with his induction? Would you do a rapid sequence induction? If so, would you use succinylcholine? Would you pretreat with atropine to prevent bradycardia? Does an increase in heart rate (and blood pressure) increase ICP? If you do not proceed with an RSI, please describe your induction.

How would you manage the patient if he becomes bradycardic and hypertensive during and after induction? Discuss pharmacological treatment, ventilation strategies and emergency procedures.

## References

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