



## VP shunt malfunction

JUSTIN MORGENSTERN

READ REVIEWS

WRITE A REVIEW

**CORRESPONDENCE:**

justin.morgenstern@gmail.com

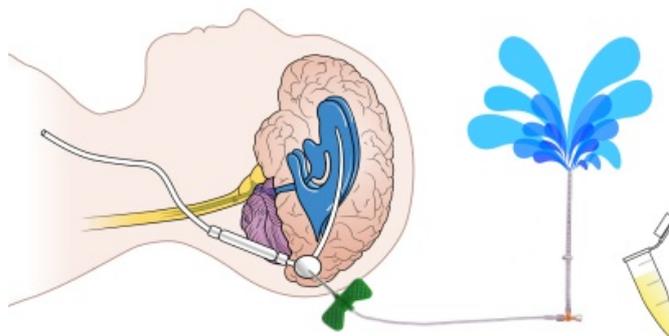
**DATE RECEIVED:**

June 10, 2015

**KEYWORDS:**

pediatrics, resuscitation, vp shunt, neurology

© Morgenstern This article is distributed under the terms of the [Creative Commons Attribution 4.0 International License](#), which permits unrestricted use, distribution, and redistribution in any medium, provided that the original author and source are credited.



A 4 year old presented to the ED with a mild headache, nausea, and vomiting, and was triaged to the sub-acute area of the department. You are called to the room stat, as the child is now unresponsive with a HR of 55, a BP of 167/65, and a sat of 96% on room air. His mom mentions that he had a VP shunt placed when he was younger, but now has no medical problems. The closest neurosurgeon is 45 minutes away, if everything goes perfectly...

### MY APPROACH

**Call for help:** neurosurgery needs to be involved ASAP.

Elevate the head of the bed.

Manage the airway as required. If intubation is required:

- You can pretreat with lidocaine 1 mg/kg and fentanyl 1 mcg/kg, but this will take at least 5 minutes to work, so you may not have time
- My RSI drugs of choice here are propofol and rocuronium

Palpate to identify the VP shunt and the reservoir chamber. Compress the chamber. Difficulty compressing indicates distal obstruction. Slow refill (more than 3-5 seconds) indicates proximal obstruction. (This test is not perfect. If you are in the community without a neurosurgeon and the patient is coning, I would tap the shunt either way.)

### Tap the shunt

- Palpate for the location of the shunt reservoir
- Use strict aseptic technique
- Ideally, attach a 25 gauge needle to a 3 way stopcock to allow for manometer attachment. If measuring opening pressure, patient must be in the lateral decubitus position with the reservoir side

up, head at the level of the heart. Measure the pressure at the level of the ear

- Insert the needle at approximately 45 degrees towards the centre of the reservoir
- Drain CSF off slowly (never aspirate) until pressure is less than 15 cm H<sub>2</sub>O
- (Gather tubes for lab assessment, like a normal LP, as infection is a major cause of obstruction)

Unfortunately, most obstructions are proximal and the tap will not help. If the tap did not help, you need to get to a neurosurgeon ASAP. Use medical management to temporize:

- Head of the bed up, loosen any compression on the neck
- Good pain control
- Mannitol 0.25-1gram/kg IV
- Or hypertonic saline (3%) 3-5ml/kg IV
- Ventilate to a target PaCO<sub>2</sub> of 30-35mmHg
- Sedation with propofol

The most common etiology of obstruction is infectious. However, cultures are paramount for long term management. Empiric antibiotics may be required, but I would talk to the neurosurgeon about this.

### NOTES

In a small infant with life threatening proximal obstruction (shunt tap failed), it is possible to do a direct ventricular puncture via the fontanelle. Sources seem to vary on this, so it is not in my main algorithm until I have the chance to talk with some pediatric neurosurgeons. I would go ultrasound guided, about 1cm from the mid line, using a spinal needle (should be easy to hit, as the ventricles are huge.)

Causes of malfunction:

- Proximal: Debris, choroid plexus, fibrosis, infection, catheter migration into parenchyma
- Distal: kinking, infection, migration of catheter, pseudocyst

You must drain the CSF slowly to prevent a ventricular bleed.

Head CT only has a sensitivity of 83% for shunt obstruction, so if the story fits, get neurosurgery involved no matter what the CT shows.

Images from [Wikimedia commons](#)

### OTHER FOAMED RESOURCES

[Tapping a VP Shunt on Pediatric EM Morsels](#)

[Ventriculoperitoneal Shunts on Don't forget the bubbles](#)

[My child has a headache and a VP shunt at freemergencytalks.net](#)

### REFERENCES

Osterman JL and Rischall ML. Chapter 59. Management of Increased Intracranial Pressure and Intracranial Shunts. In: Roberts JR et al (ed). Roberts and Hedges Clinical Procedures in Emergency Medicine, 6e. Philadelphia: Elsevier; 2014.

Reichman EF et al. Chapter 119. Ventricular Shunt Evaluation and Aspiration. In: Reichman EF (ed). Emergency Medicine Procedures, 2e. Toronto: McGraw-Hill; 2013.

Key CB et al. Cerebrospinal fluid shunt complications: an emergency medicine perspective. *Pediatr Emerg Care*. 1995 Oct; 11(5):265-73. PMID: [8570446](#)