

The Importance of CT Cisternogram in Directing Surgical Management for CSF Leaks

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The case:

*Persistent rhinorrhea
following a motor
vehicle accident*

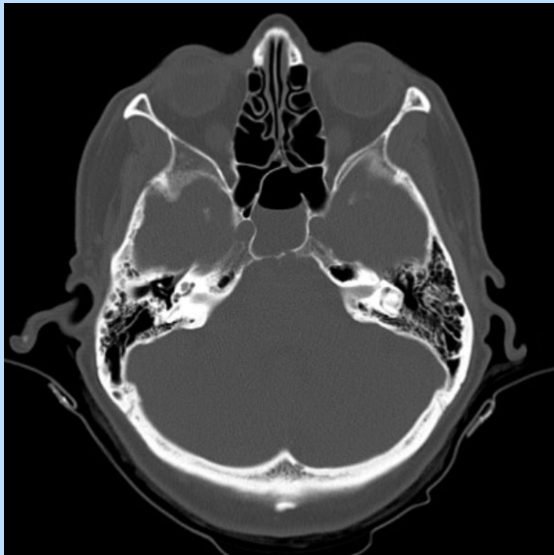


Fig 1. Initial CT w/o contrast

Day 1

A 56 yo woman presents to the ED following MVA, involving head trauma w/o loss of consciousness. She denies blurry vision, weakness, nausea. She endorses a headache.

Physical Exam:

- 4 cm posterior scalp laceration
- Negative trauma evaluation

Initial CT Brain w/o contrast:

- No bony abnormalities or evidence of hemorrhage
- Retention cyst in L sphenoid sinus

Her laceration is sutured, and she is discharged.

Day 2

Patient returns to the ED with rhinorrhea. She states that it is now tinged with blood. Her headache has persisted since yesterday, and is now dizzy.

Physical Exam:

- ***Continuous rhinorrhea that worsens with Valsalva***

Imaging: CT Cisternogram

Imaging procedure that involves injection of contrast into the subarachnoid space to allow for visualization of CSF and potential leakage at any anatomical defects.

Procedure:

1

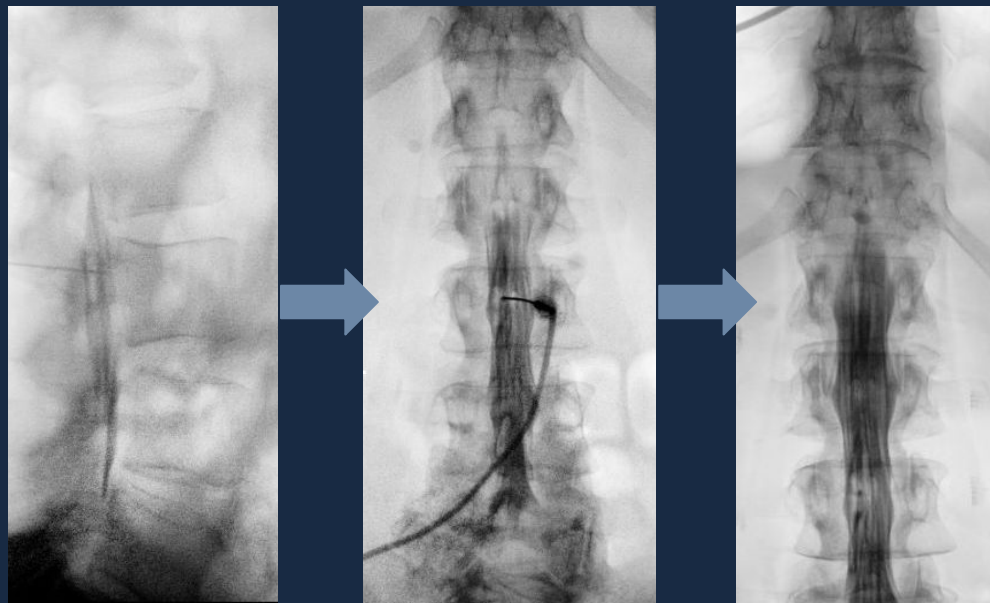
Contrast is injected into the patient's thecal sac under fluoroscopy

2

Patient is placed in Trendelenburg position to help distribute contrast

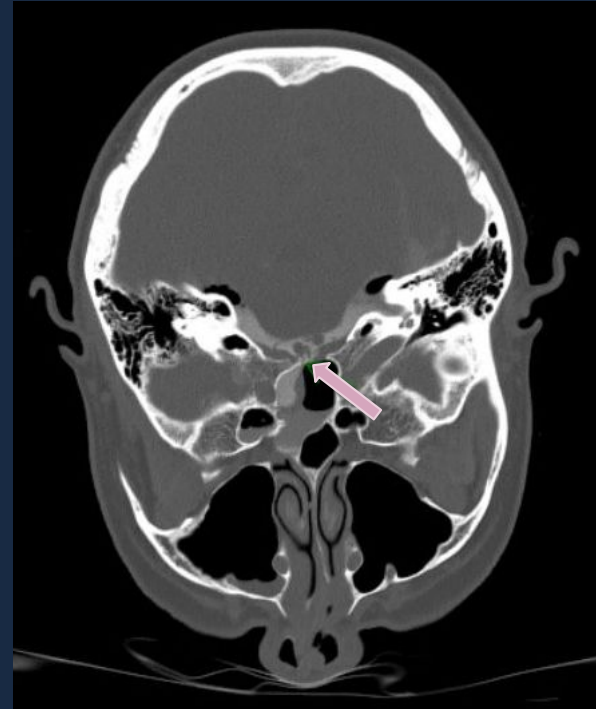
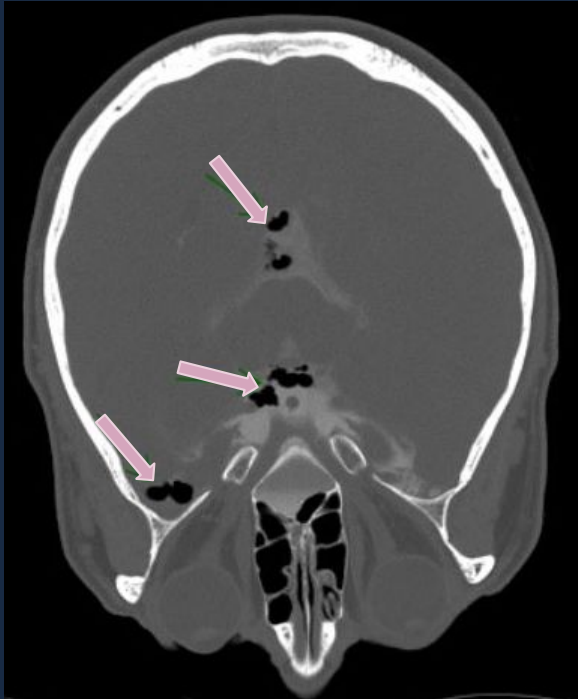
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Patient undergoes CT



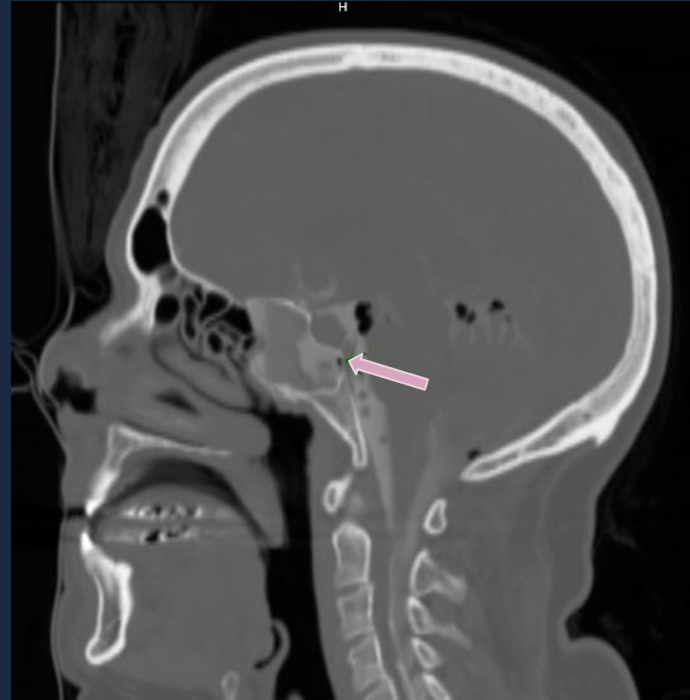
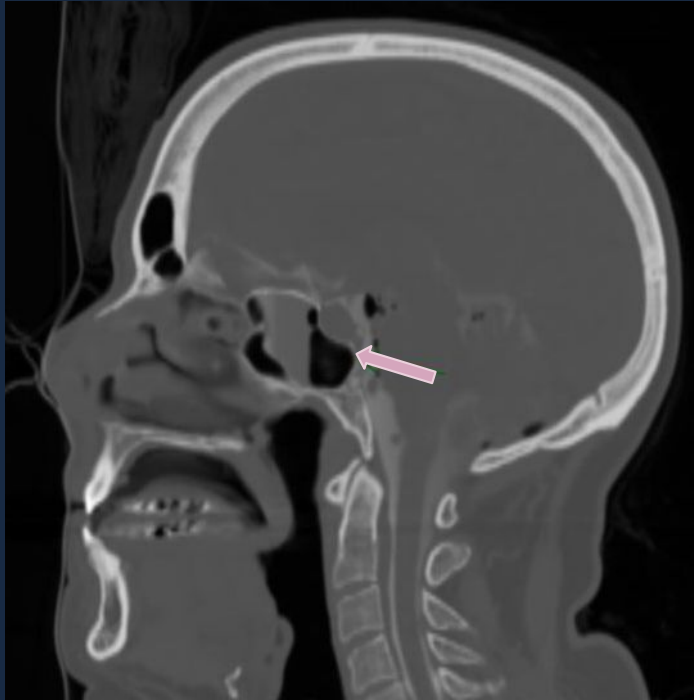
Results: CT Cisternogram

- Moderate pneumocephalus within basal cisterns
 - Commonly seen following cranial trauma
- Midline clival defect along pontine cistern (6.1 x 3.9 mm)
 - From which CSF is flowing into L sphenoid sinus

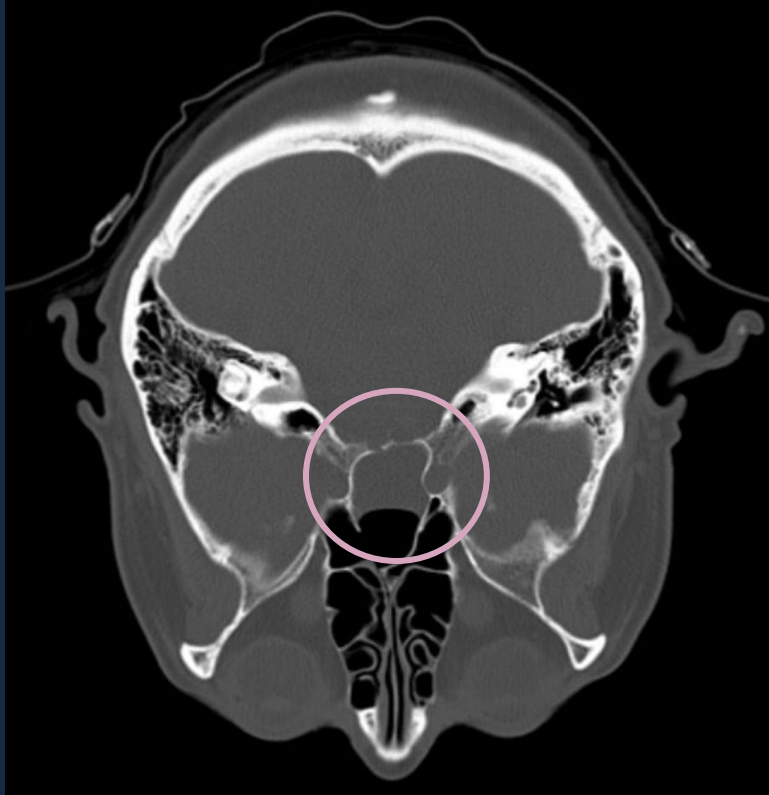


Results: CT Cisternogram

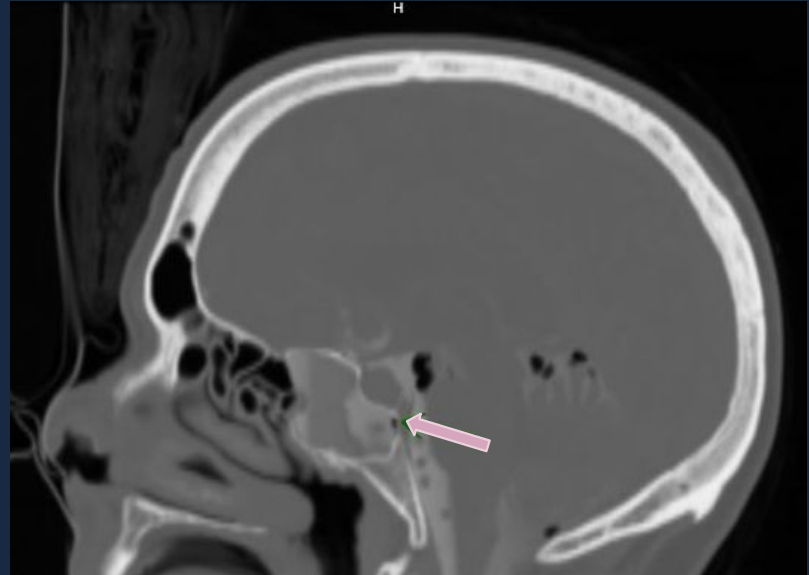
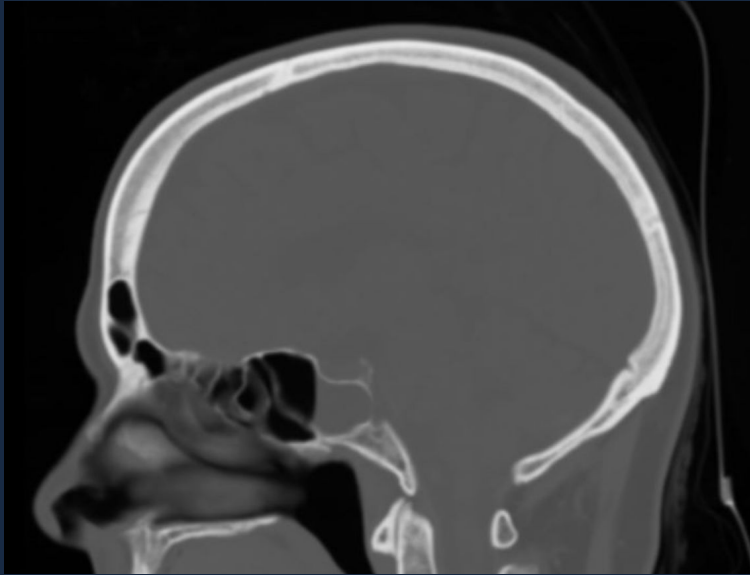
- Contrast in the left sphenoid sinus, with a loculated component (1.6 x 0.9cm) seen on the left lateral margin



Comparison: CT w/o C vs CT Cisternogram



Comparison: CT w/o C vs CT Cisternogram



Operative Course:

1. Patient is admitted and evaluated by ENT and Neurosurgery
2. ENT: FESS (functional endoscopic sinus surgery)
 - a. Right total ethmoidectomy
 - b. Bilateral sphenoidotomy
3. Neurosurgery: lumbar drain placement
 - a. *Purpose: prevention of postoperative CSF leak*
4. Cefazolin administered throughout duration of admission
5. 5 days post-op: drain removed, patient is discharged

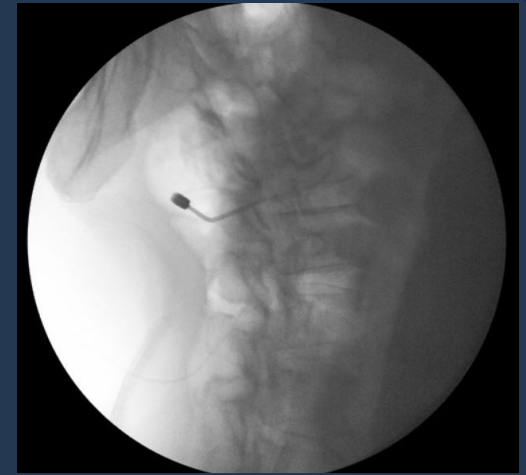


Fig. 1 (above) & Fig. 2 (below): lumbar drain placement



The Concern: Traumatic CSF Leak

What is it?

- A physical defect in the bone or meninges that leads to leakage of cerebrospinal fluid from the subarachnoid space into the nasal cavity/ear canal
- Commonly caused by head trauma following MVA
- Presenting Sx: rhinorrhea, otorrhea, headache, neck pain, dizziness

Why is it concerning?

- Post-traumatic bacterial meningitis

How can we diagnose?

- CT Cisternogram
- Radionuclide Cisternogram, MR Cisternography

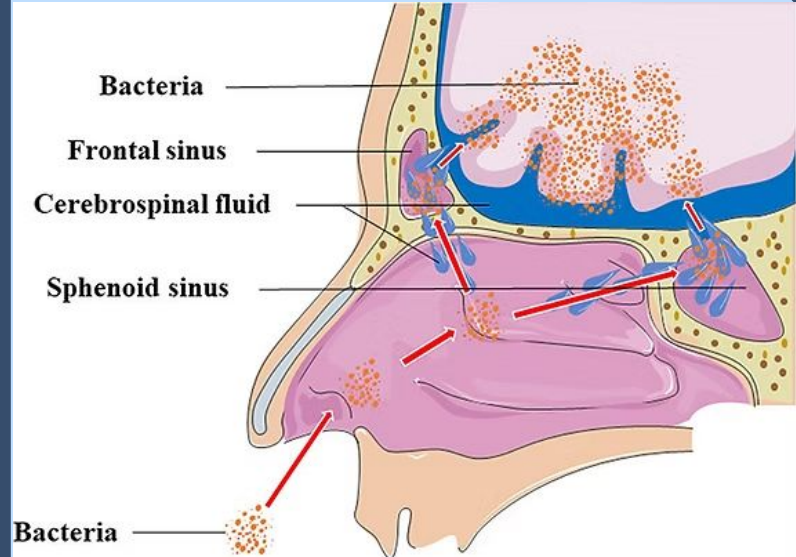


Figure 3. Mohanty, S. (2025)

Discussion:

Utility of CT cisternogram in this patient

HIGH SENSITIVITY

- High diagnostic accuracy due to direct contact of contrast and CSF in subarachnoid space
- Contrast in CSF enhances signal: noise ratio

SURGICAL MANAGEMENT

- Provides clear imaging for directing surgical management, especially for functional endoscopic sinus surgery (FESS)
- Clear bony detail that is useful for operating surgeons
- Localizes site and visualizes defect

ACTIVE LEAK

- Specifically useful for patients presenting with active leaks, seen as persistent rhinorrhea

Discussion:

Decision for CTC over other imaging modalities

MR Cisternography:

- Poorer at visualizing bony detail
- In the setting of trauma, it is important to visualize bony defects to determine treatment

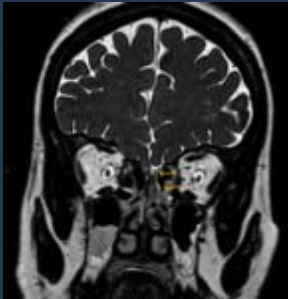


Figure 4. agadi, Anita & Murthy, S. & Patwari, Sriram & Gopalan, S. & Chadaga, Harsha. (2017).

Radionuclide Cisternogram:

- Lower spatial resolution, difficult to localize the defect for surgical repair
- Difficult to utilize with large CSF leaks
- Higher sensitivity with spontaneous CSF leaks, rather than trauma

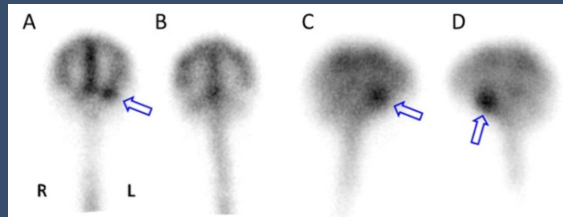


Figure 5. Bulman, J. C., Wachsmann, J., & Peng, F. (2016).

High Resolution CT:

- Cannot effectively differentiate mucosal sinus secretions from CSF fluid leakage



Figure 6. Nagadi, Anita & Murthy, S. & Patwari, Sriram & Gopalan, S. & Chadaga, Harsha. (2017).

Conclusion:

1

When suspecting a CSF leak, effective diagnosis should be made to prevent delay in treatment.

2

Accurate imaging of craniofacial structures is crucial for surgical management of traumatic CSF leaks.

3

CT Cisternogram is valuable for localizing the defect causing a traumatic CSF leak for accurate surgical management.

Citations:

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