

# Surgery for SIH:

Concepts, Techniques and Expectations

Peter J. Lennarson, MD  
Associate Professor, CU Dept. of Neurosurgery  
Director, CU CSF Dynamics Surgical Program



## Surgical Generalizations

- MIS (when no prior surgeries)
  - Most incisions 1-2 inches
  - Hemi-laminectomy
  - Visualization with Operative Microscope
  - Avg length 2-3 hours

# Surgical Generalizations

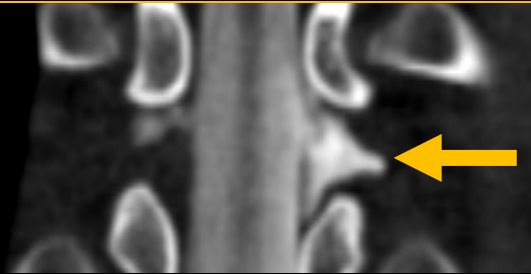
- Pain from incision sites easily managed
- LOS: 1-2 days
  - ICU care often not required
  - RIH may prolong stay
    - Medical management vs lumbar drain
- Risks of surgery
  - General anesthesia
  - Wound care
  - Neurological—dependent on surgery and location

# Leak Types

- Traumatic
  - Spine Fractures
- Iatrogenic
  - Post lumbar puncture
    - L+D Epidural, Pain Management ESI, Intrathecal Pumps
  - Spine Surgery (9%)
- Spontaneous
  - Ventral Leaks
  - Lateral Leaks/Ruptured Diverticula
  - CSF-Venous Fistulas

# SPONTANEOUS SPINAL CSF LEAKS: Types

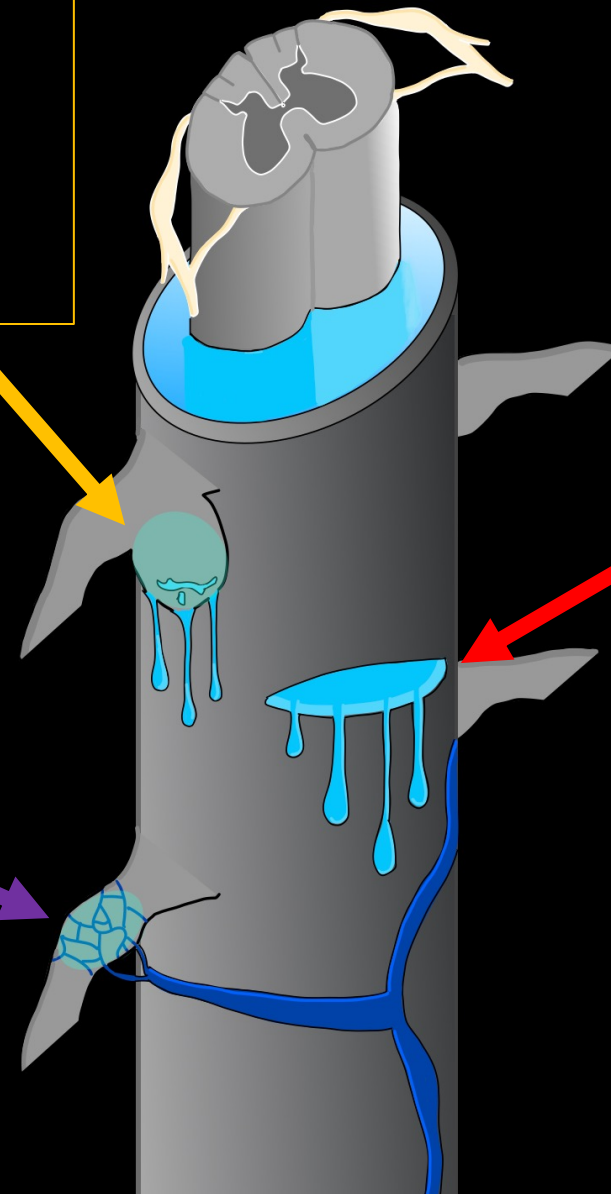
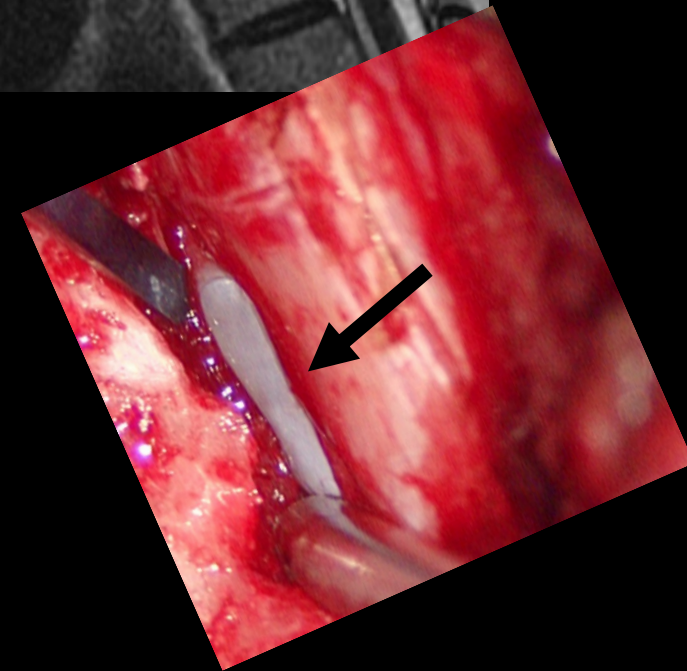
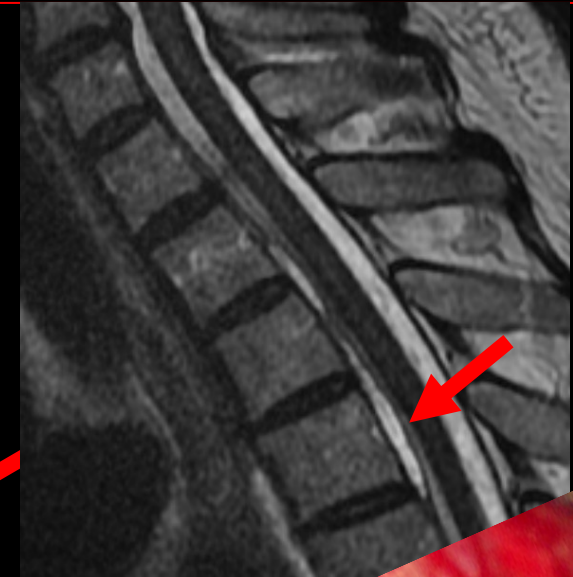
Ruptured meningeal diverticulum or nerve root sleeve



CSF-Venous Fistula



Dural defect

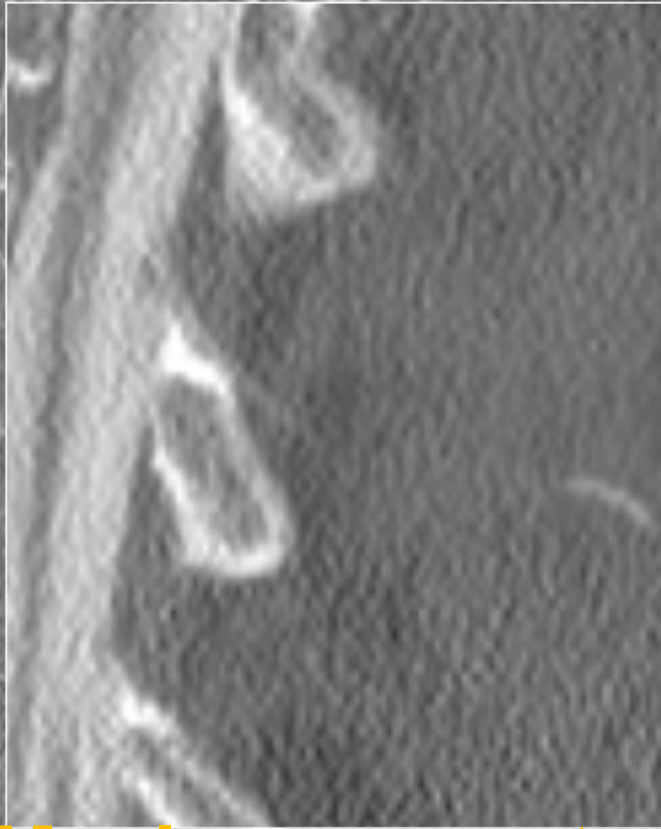


# Traumatic: L1-2 fracture/dislocation



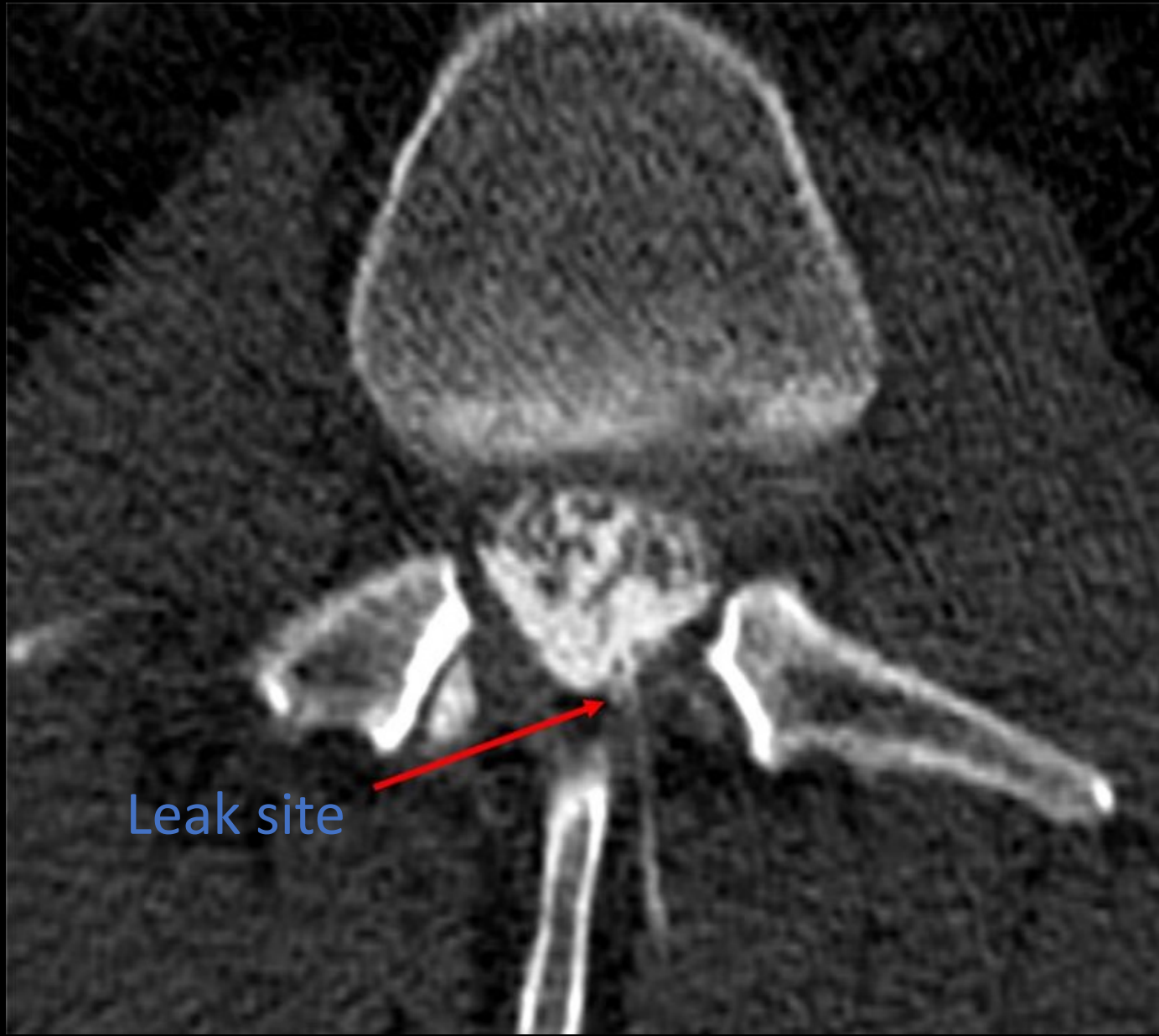
**Iatrogenic**

46 yo with tinnitus, blurry vision, light sensitivity, postural headache-- Intrathecal drug infusion pump for chronic pain.



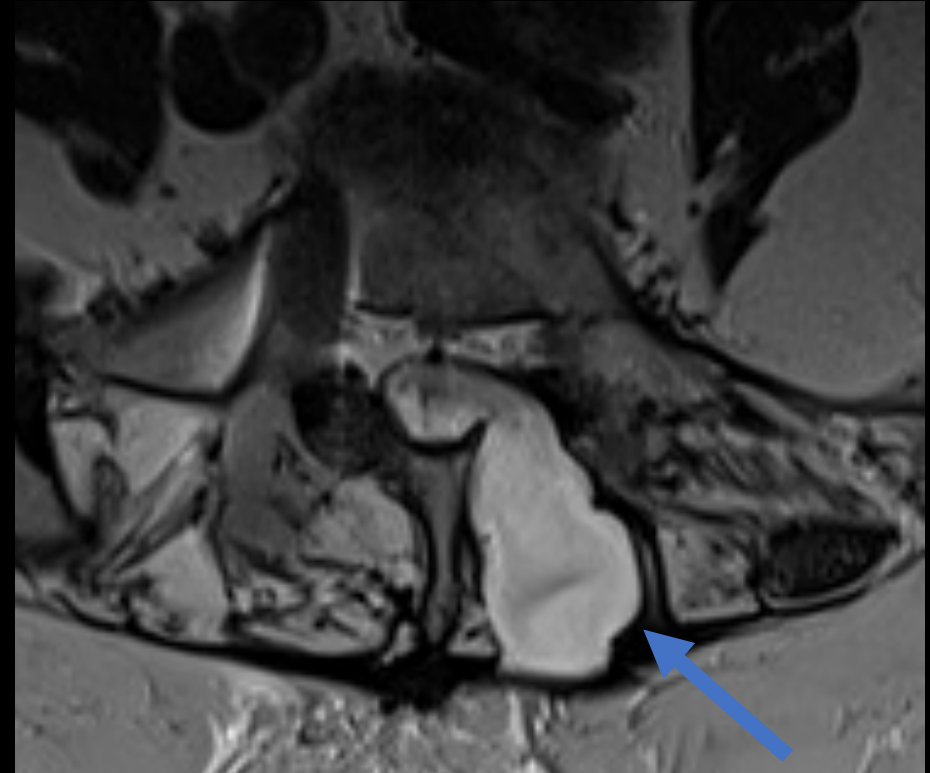
**Myelogram not conclusive**

**Empiric then targeted blood and fibrin patches with temporary relief.**

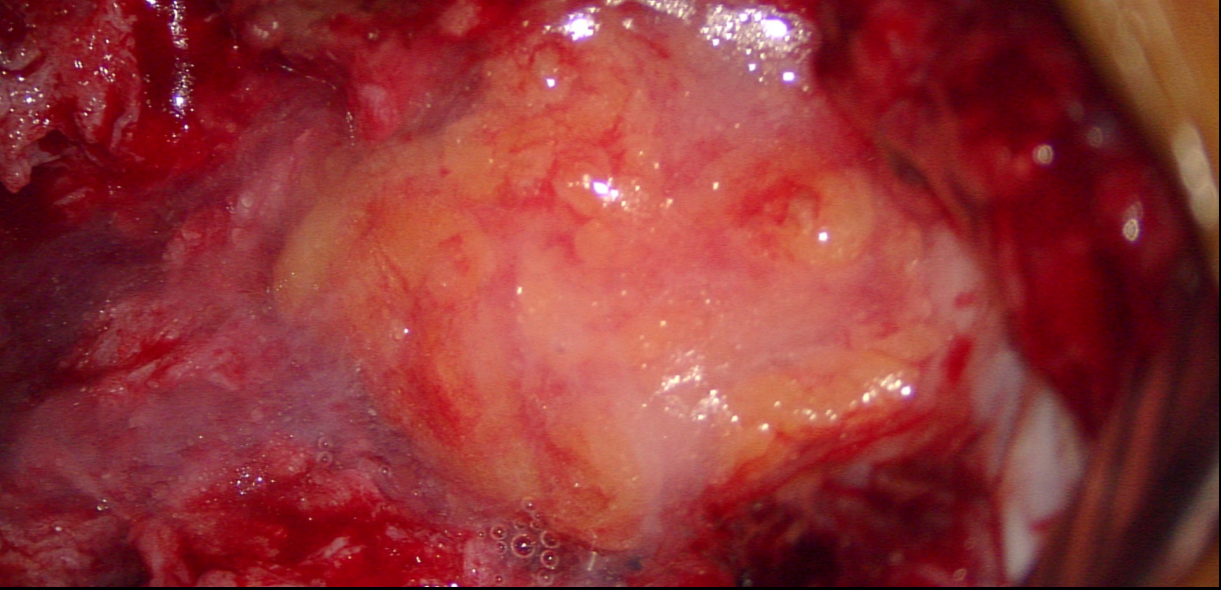
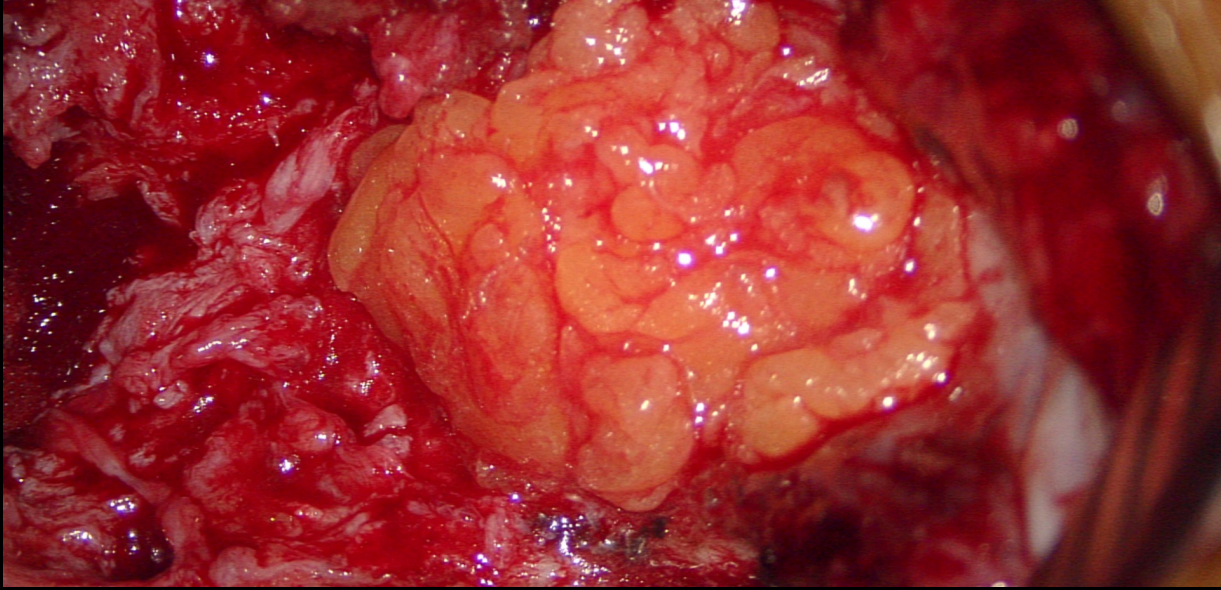
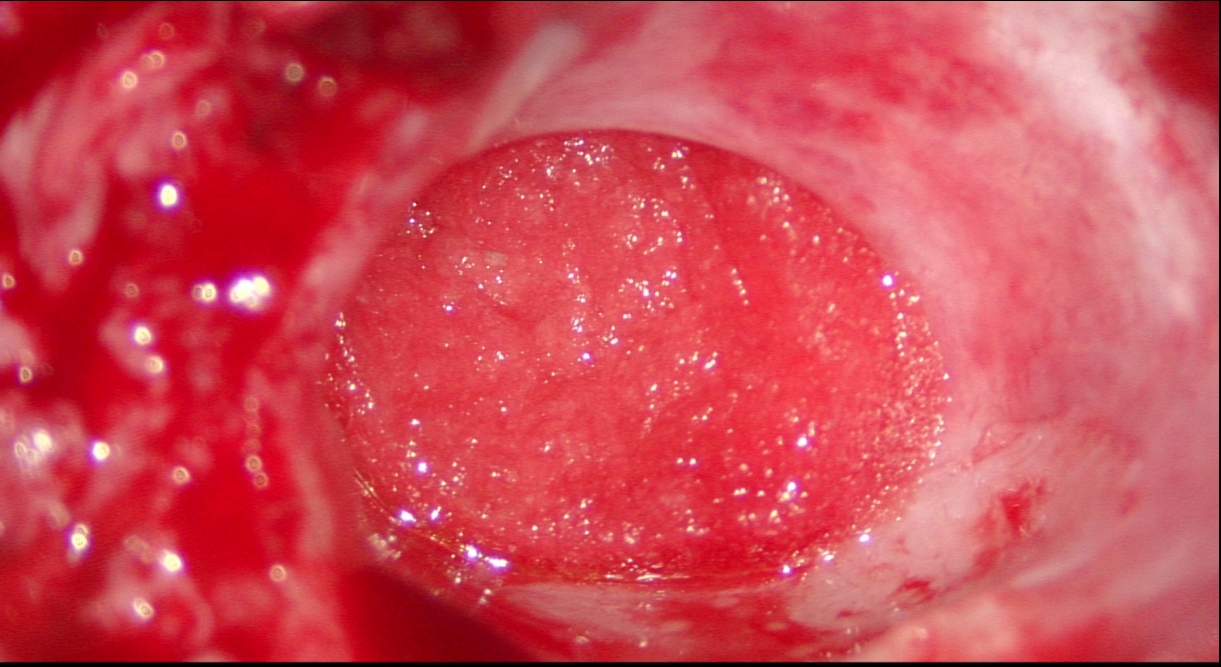
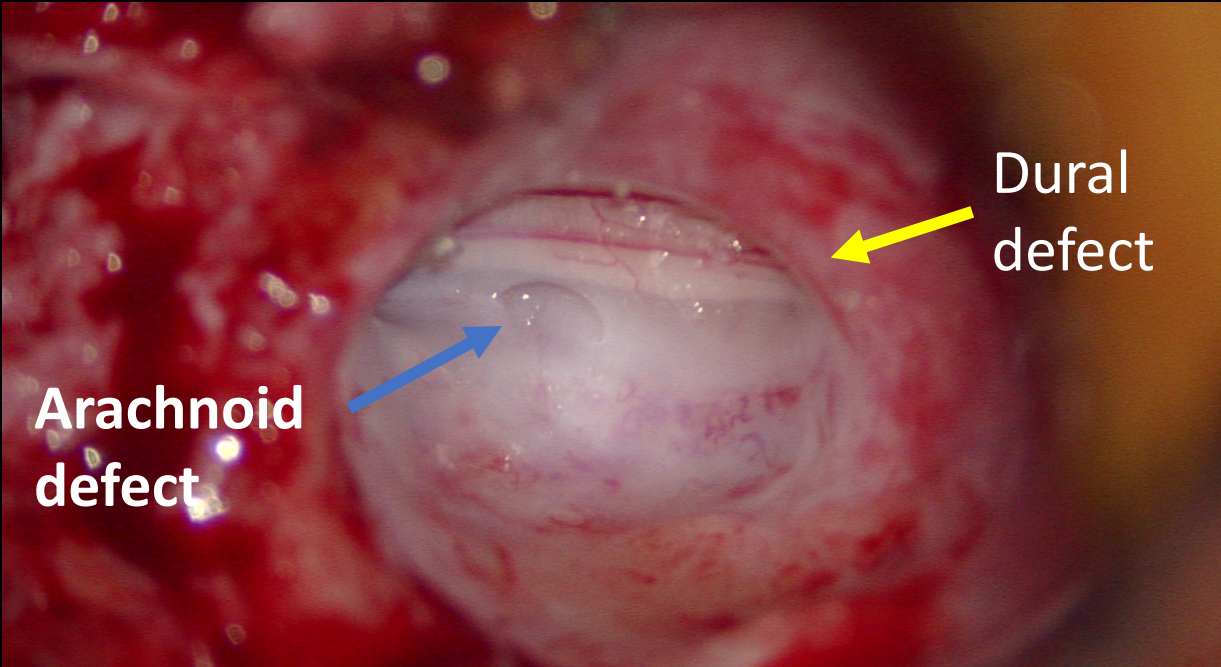




## Iatrogenic: spinal surgery



76 yo s/p lumbar surgery complicated by csf leak and multiple attempted repairs.

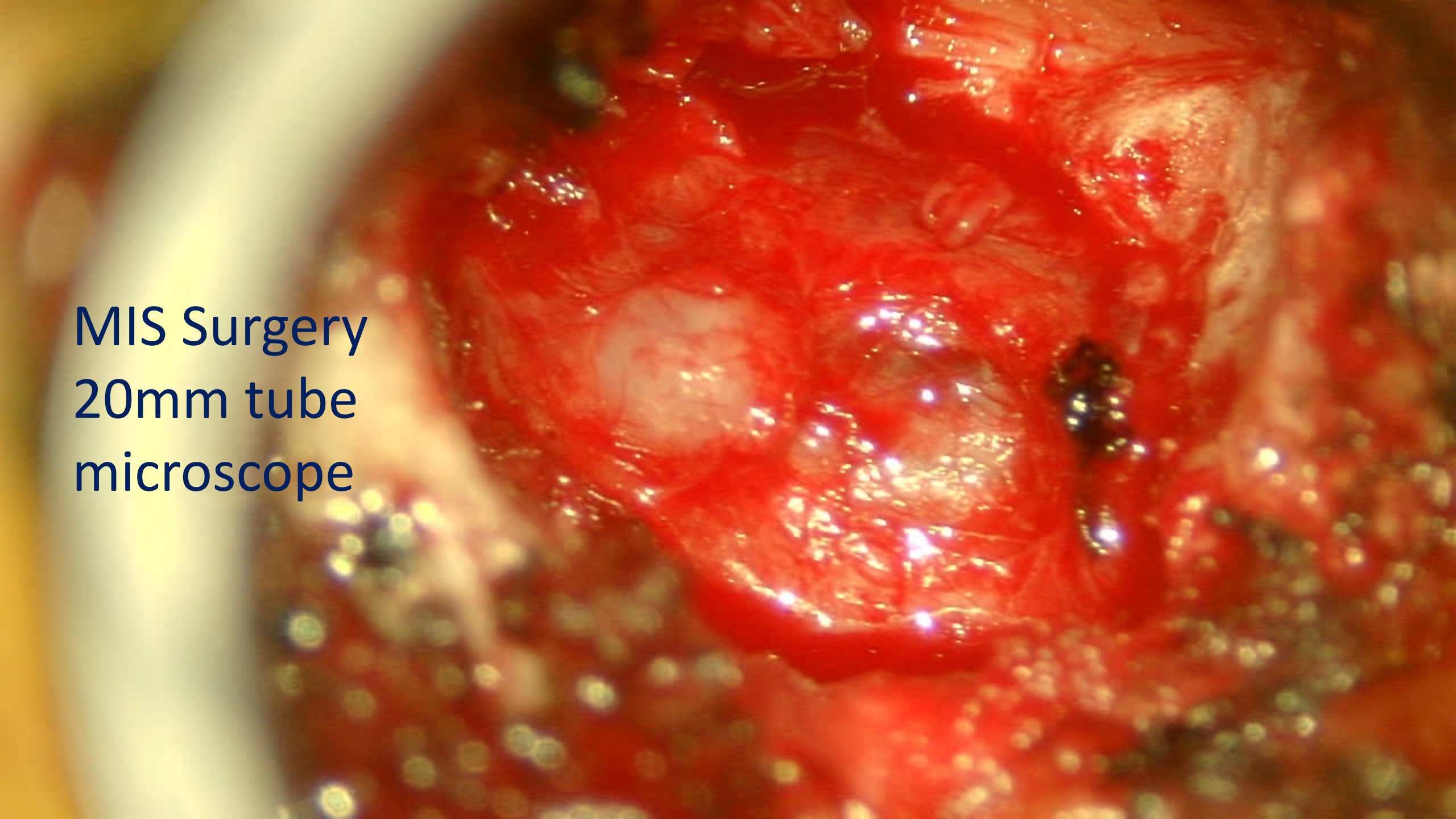


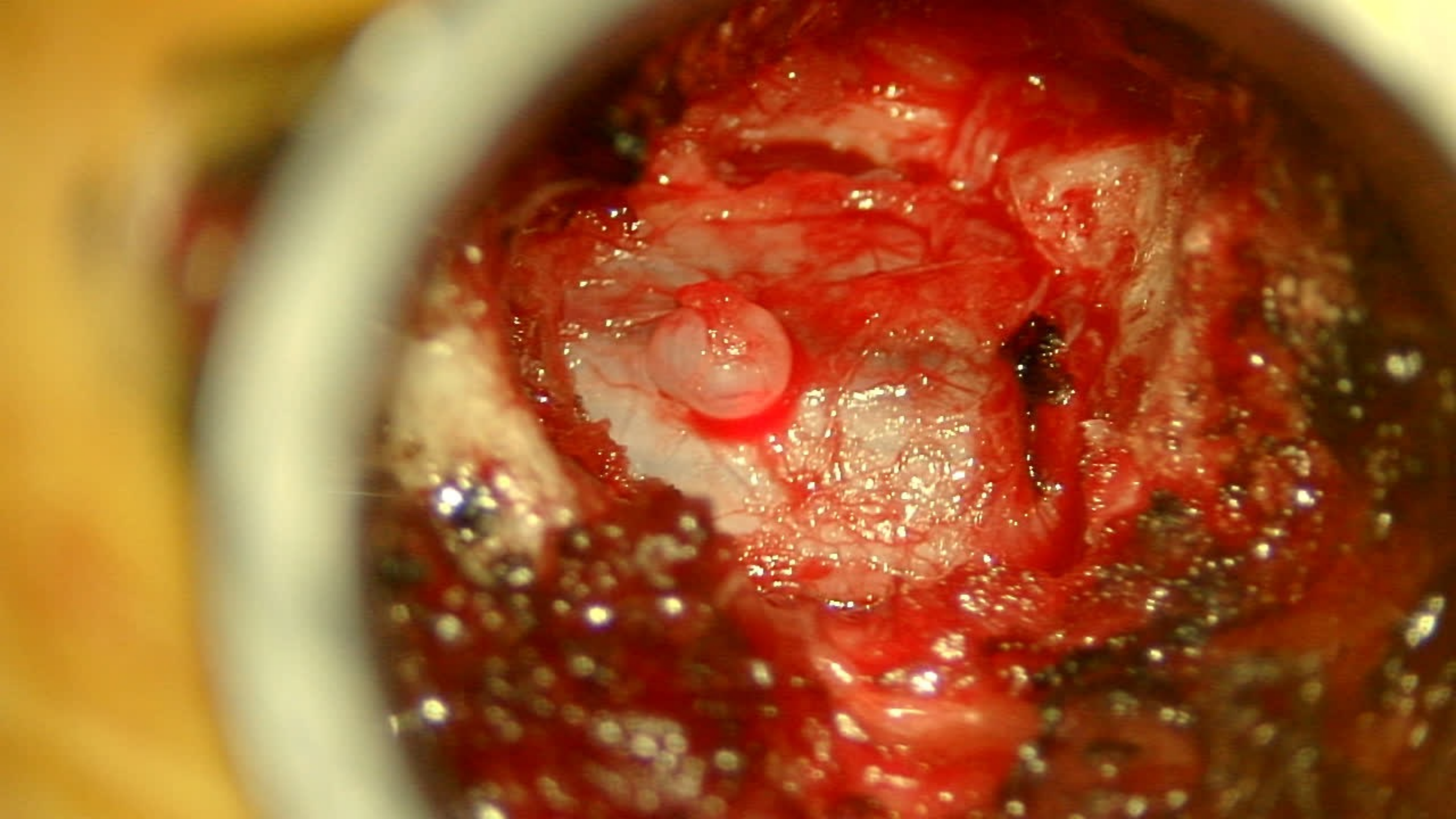
# Iatrogenic: unintended dural puncture

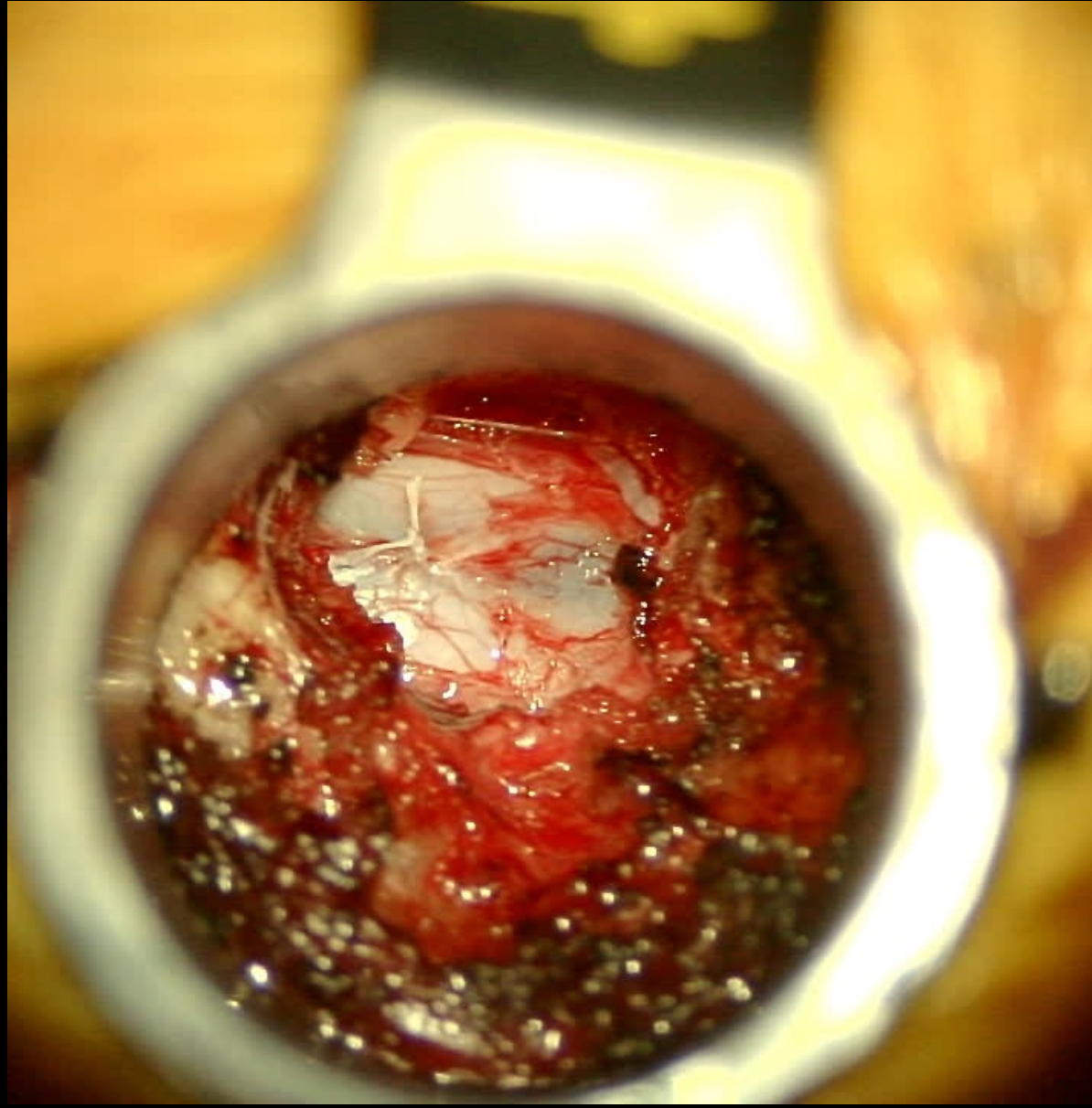
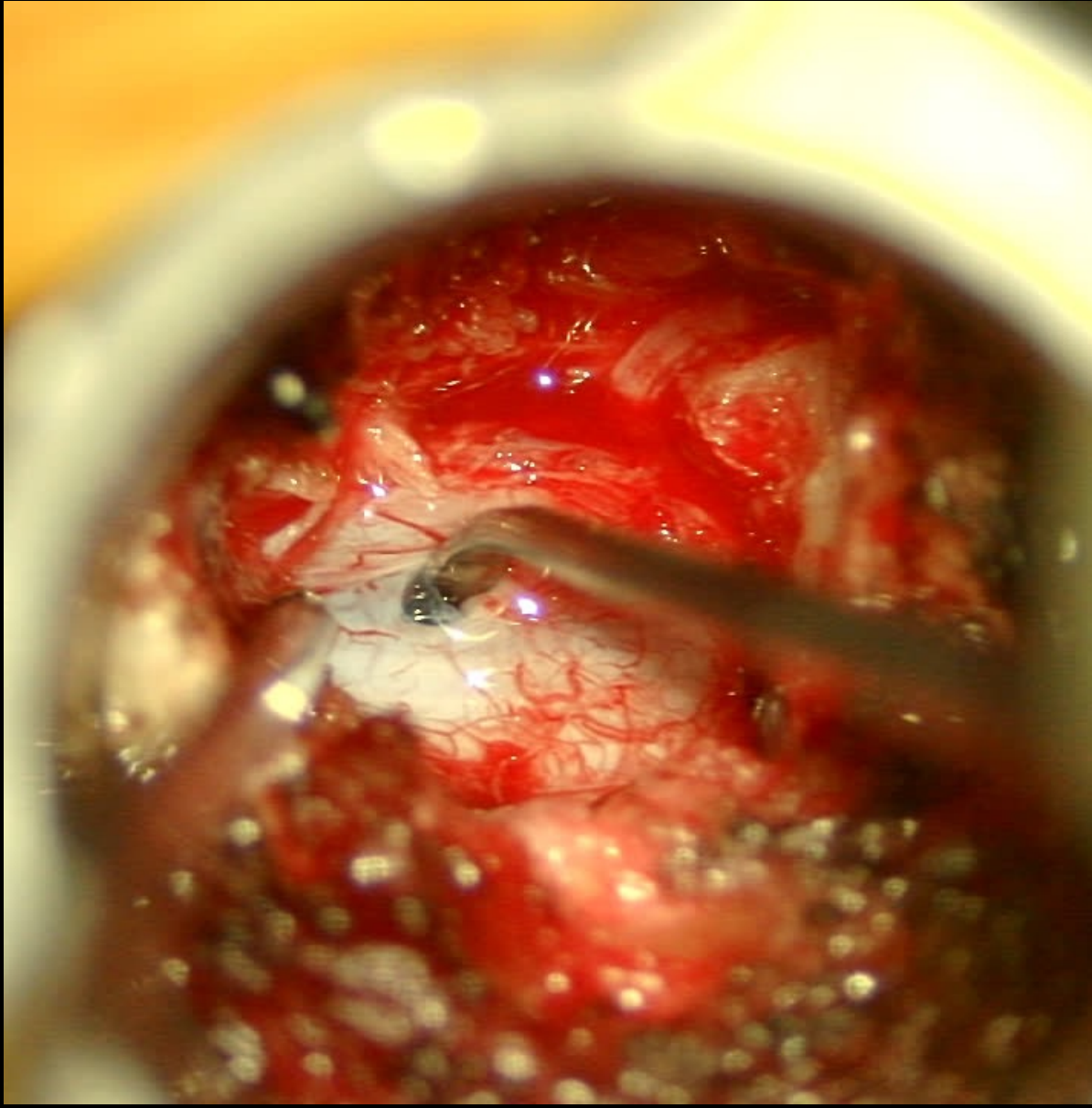
- “Epidural” for child-birth
- Short lived postural headache followed by years without symptoms
- Subsequent sudden onset of SIH
- Additional testing including LP lead to finding dorsal bleb at puncture site.



MIS Surgery  
20mm tube  
microscope

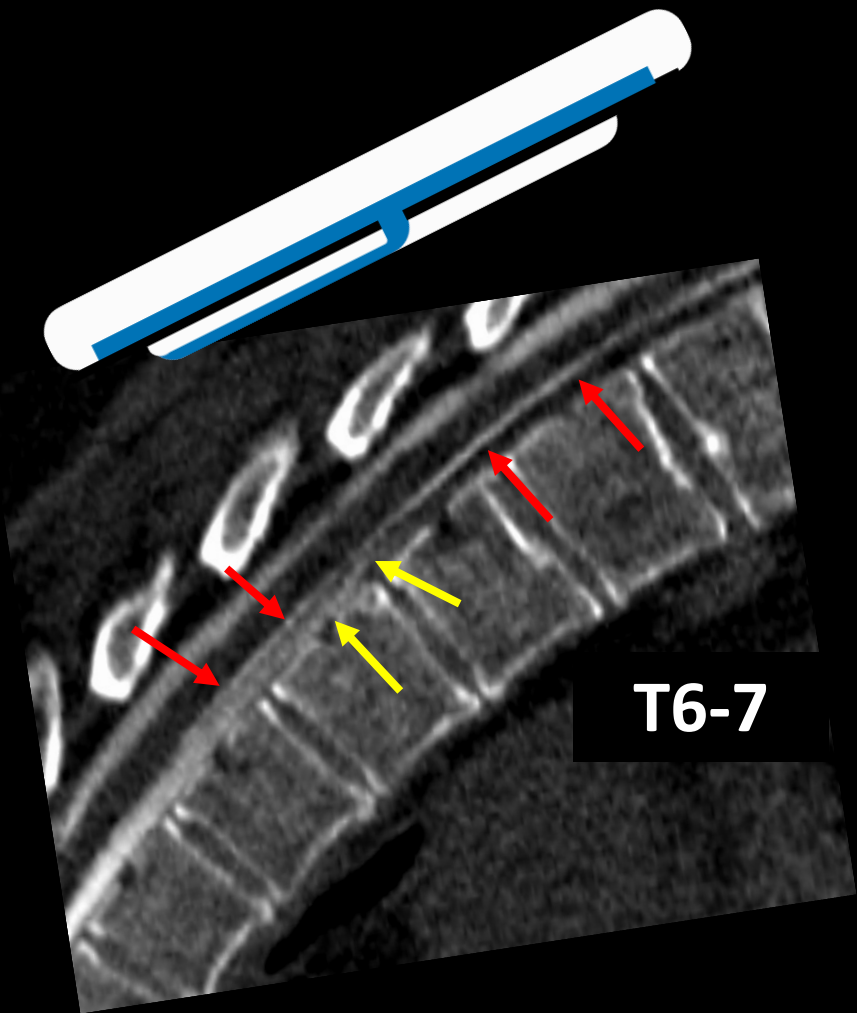
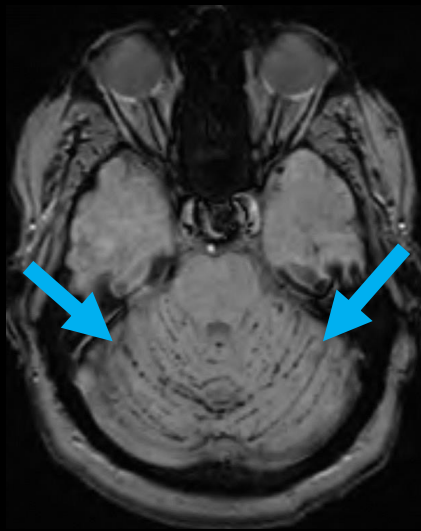




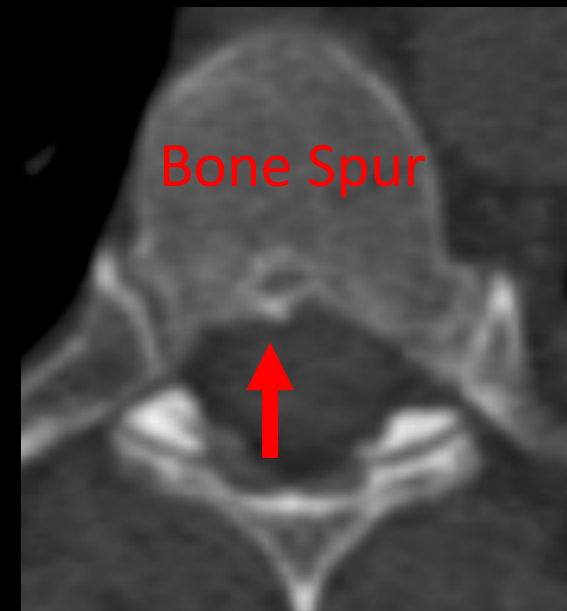


# Spontaneous Ventral CSF Leak

- 49 yo male with 1 year of tinnitus and exertional headaches, worse with coughing, sneezing and exercise. Worse over the day.
- Initially diagnosed with migraines vs “long Covid”
- MRI Brain showed signs of SIH (Bern 5)
  - Cerebellar hemosiderosis
- MRI Spine: ventral CSF collection
- Dynamic CT myelogram localized ventral Leak to T6-7



Fiducial marker

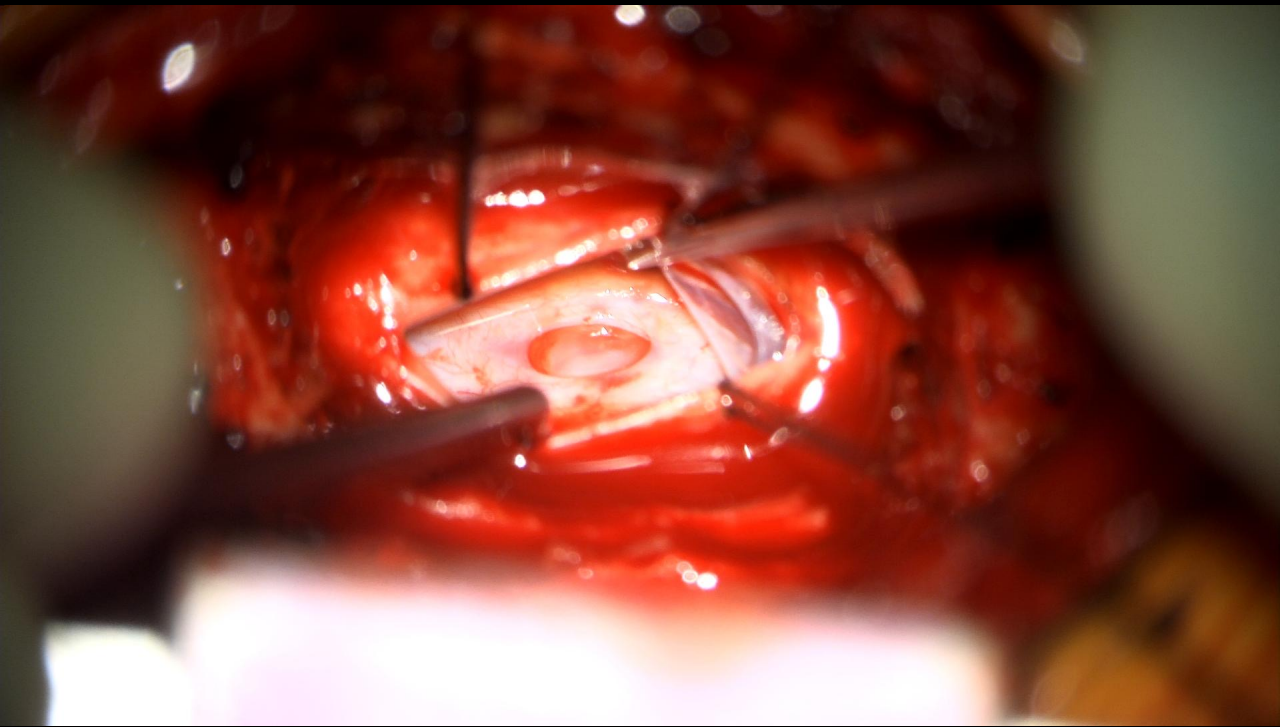
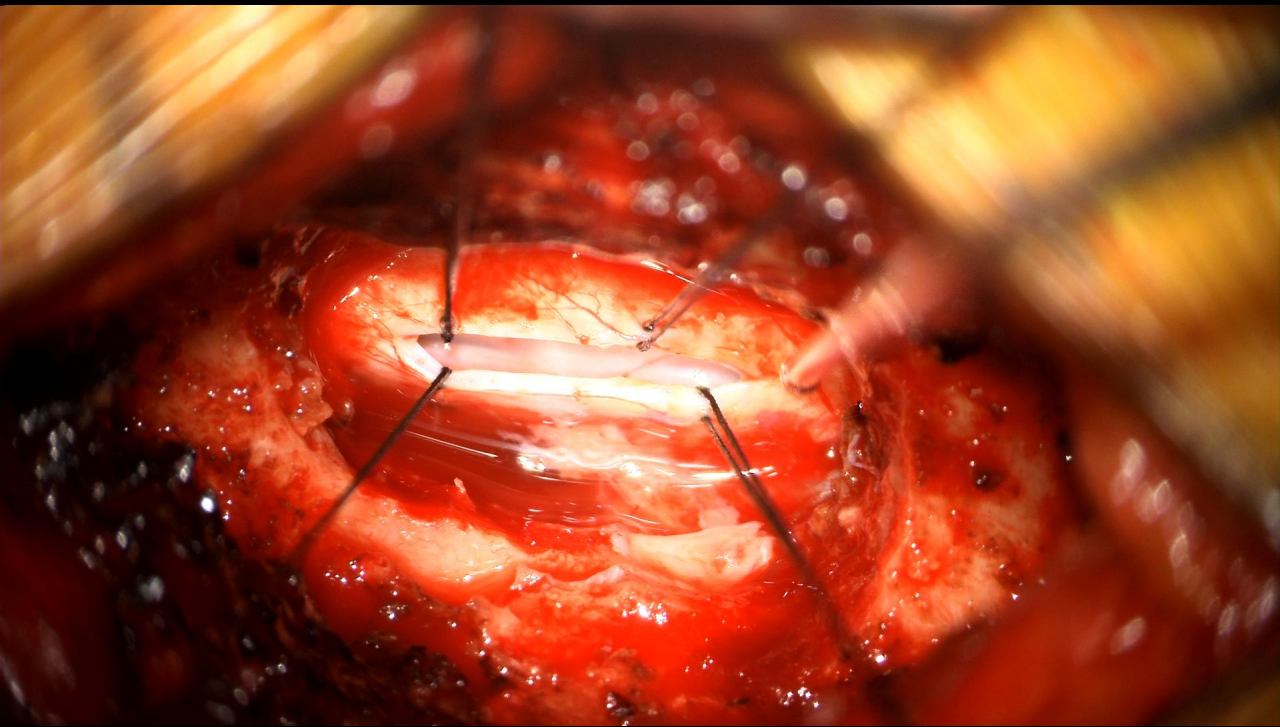


Images courtesy of Dr Andrew Callen, MD

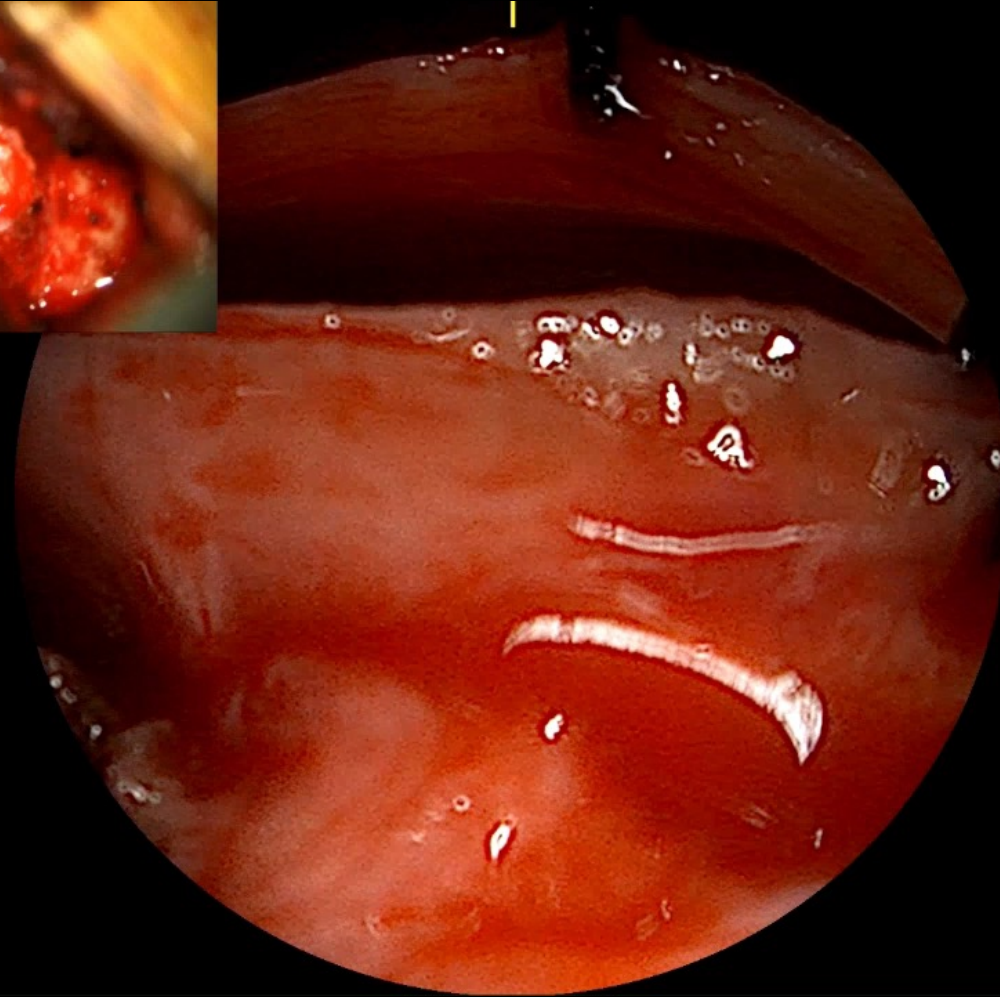
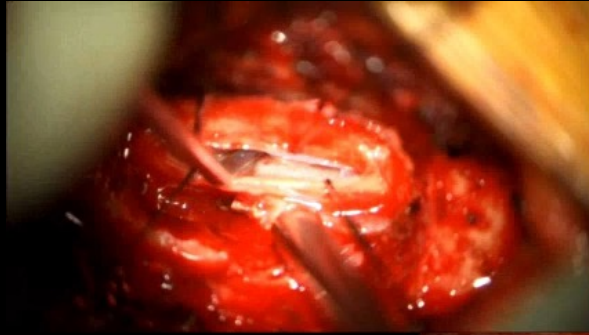


# Surgical Procedure

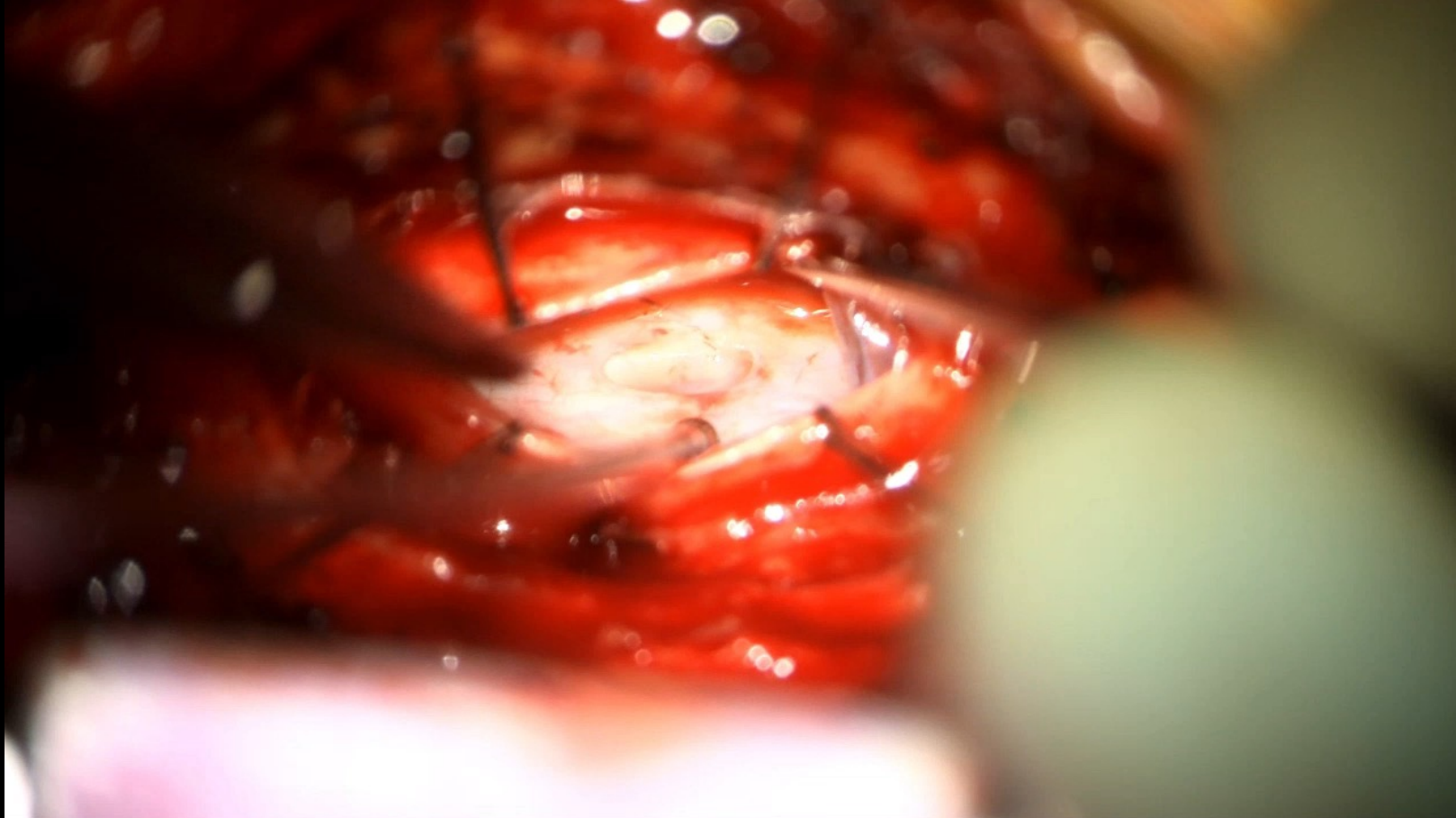
- T6 Hemilaminectomy and direct suture repair of ventral leak



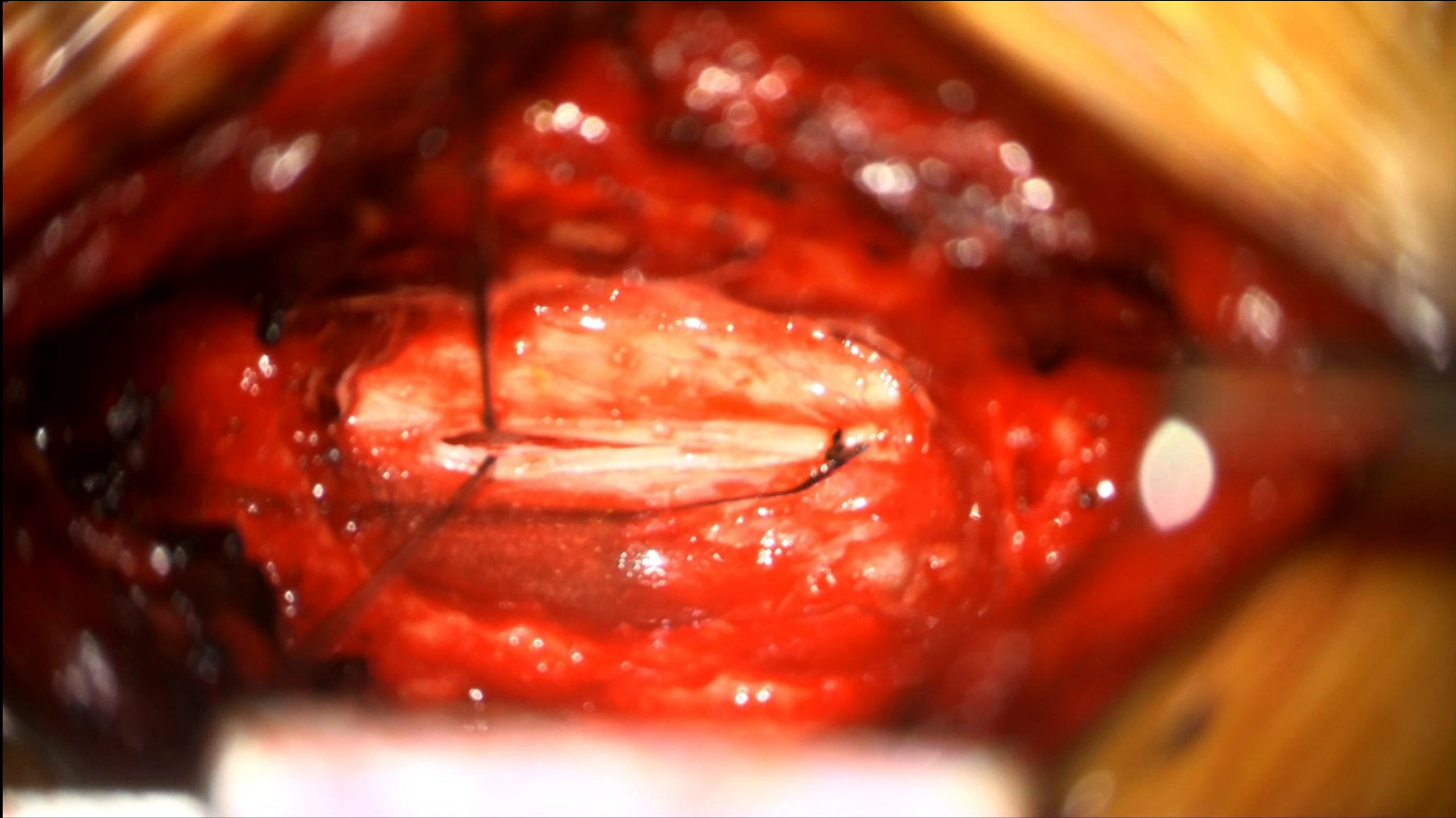
# Endoscopic view



# Microscopic view: suture repair

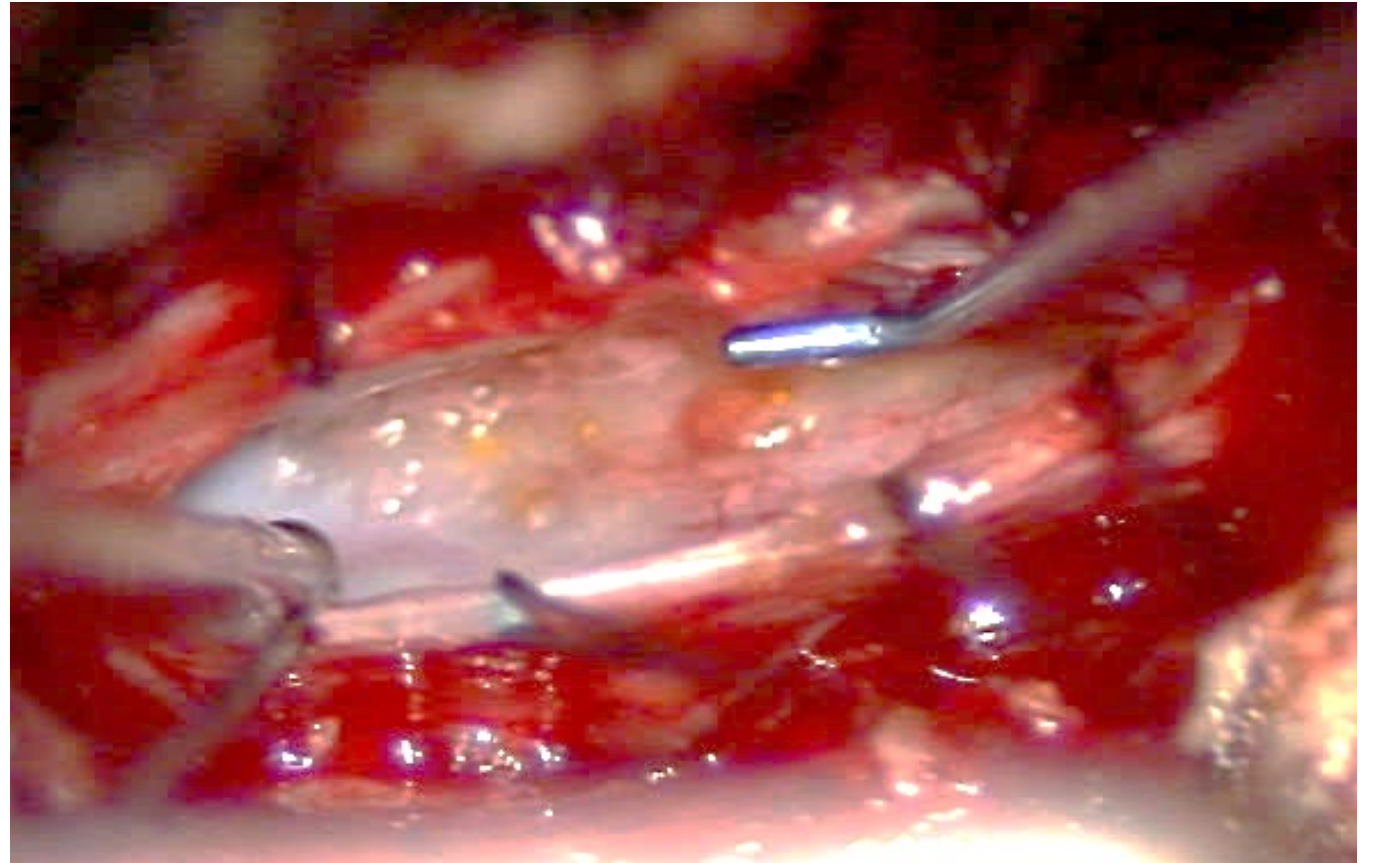
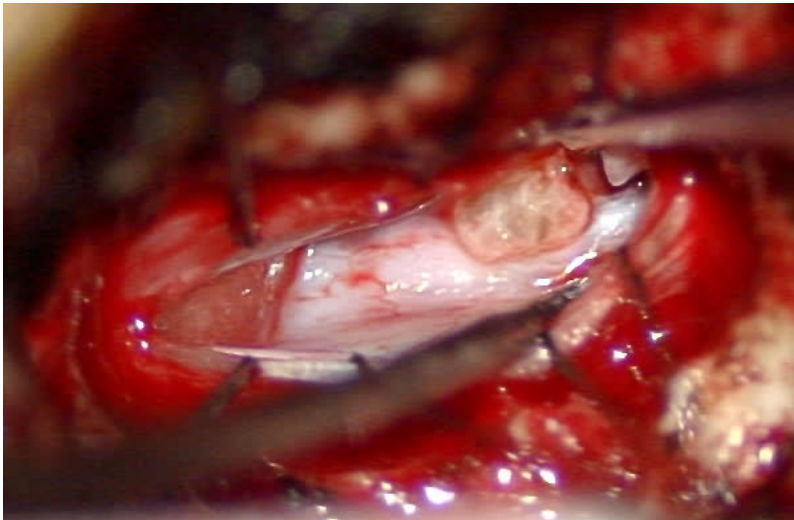


closure



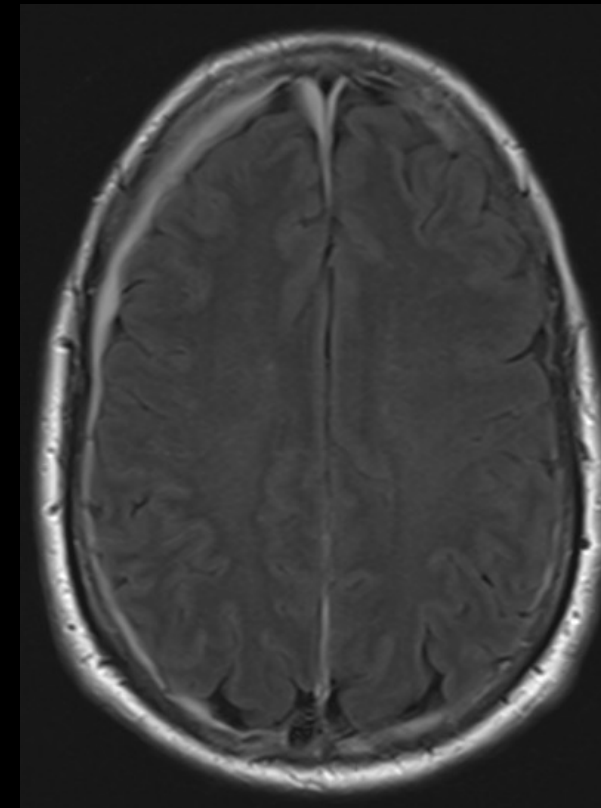
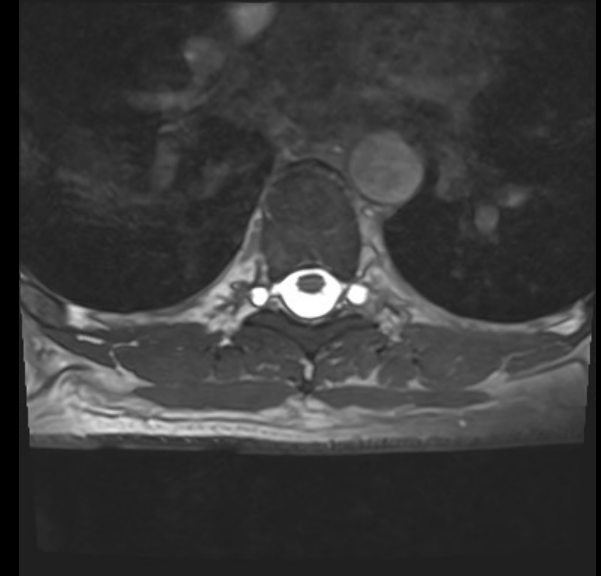
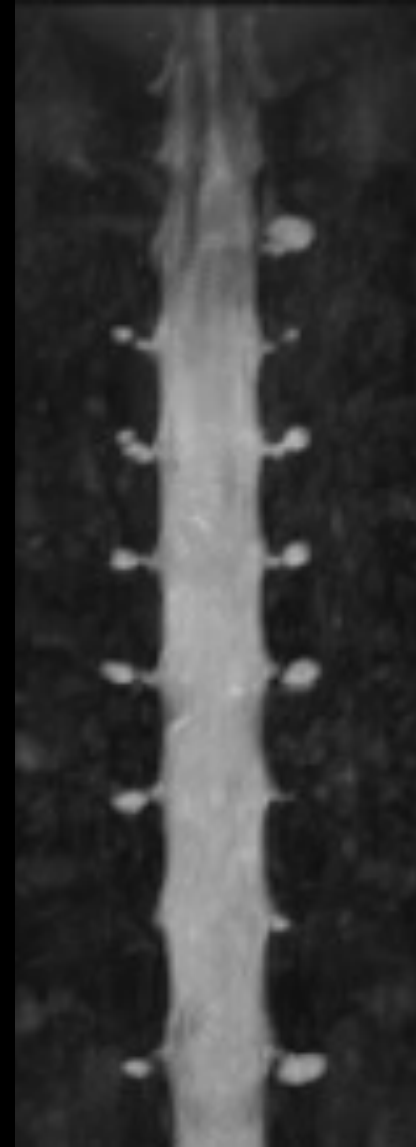


Ventral Leak: Double Patch Repair



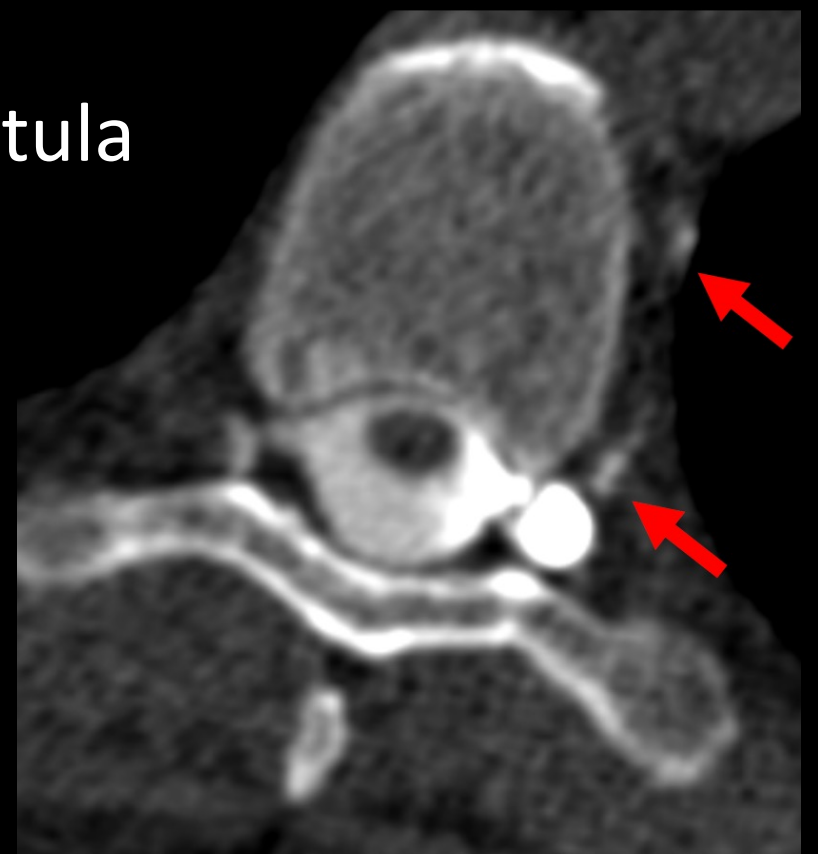
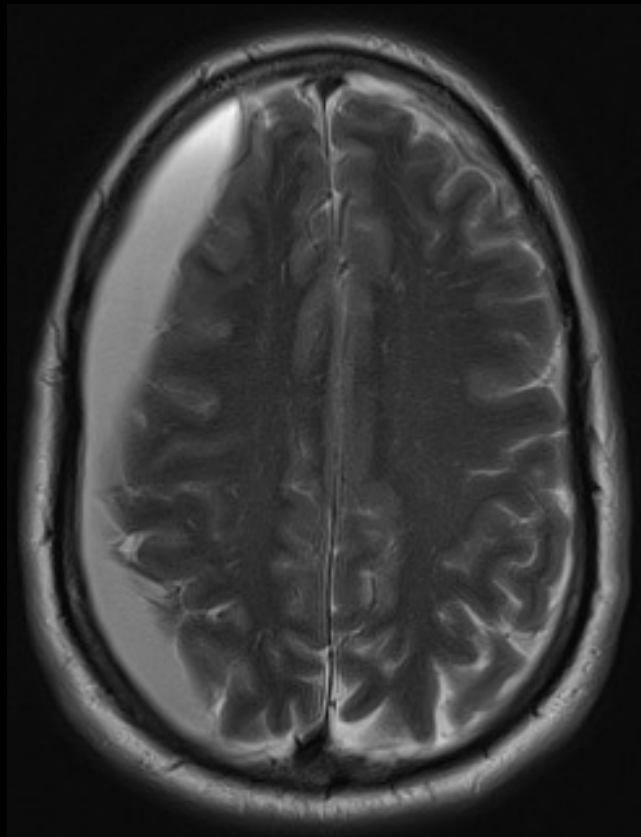
# Spontaneous, CSF-Venous Fistula

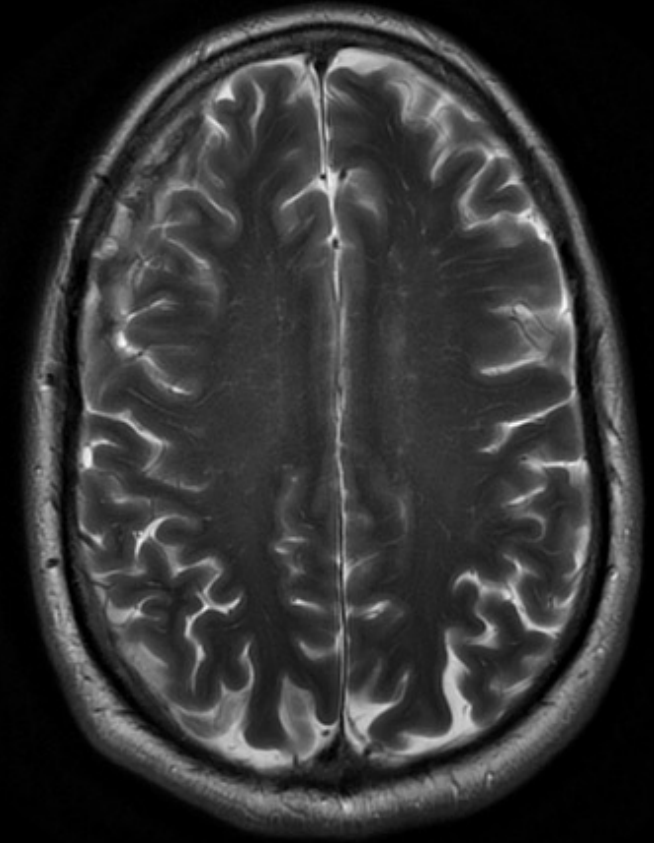
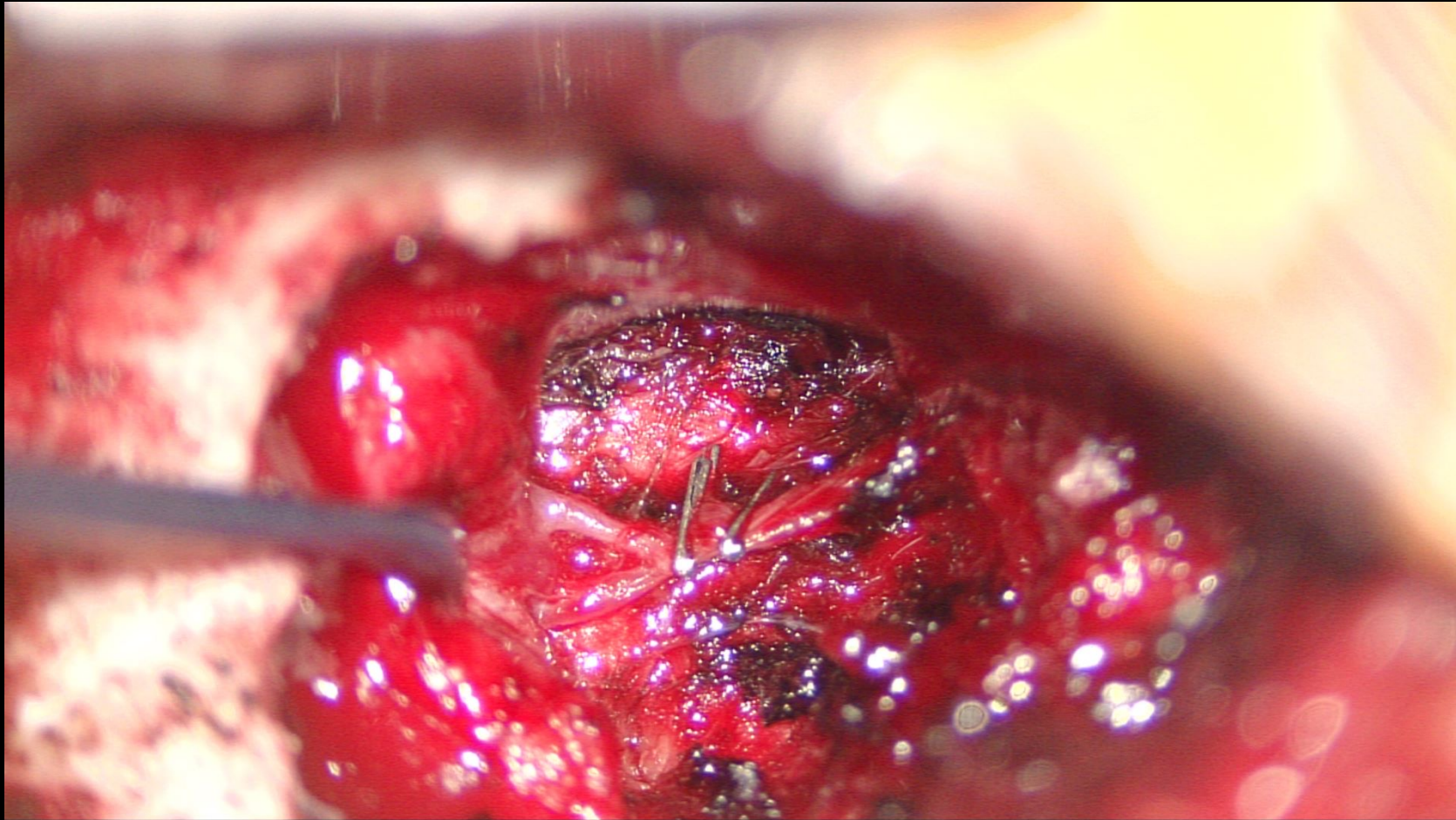
- 54 yo male, 9-months positional headache, neck pain, tinnitus, dizziness and blurred vision.
- Treated for sinus infection
- Mri scans showed concerns for SIH including subdural hematoma and numerous nerve root cysts.



# Dynamic myelogram: left T7-8 csf-venous fistula

Enlarging SDH despite fibrin injections



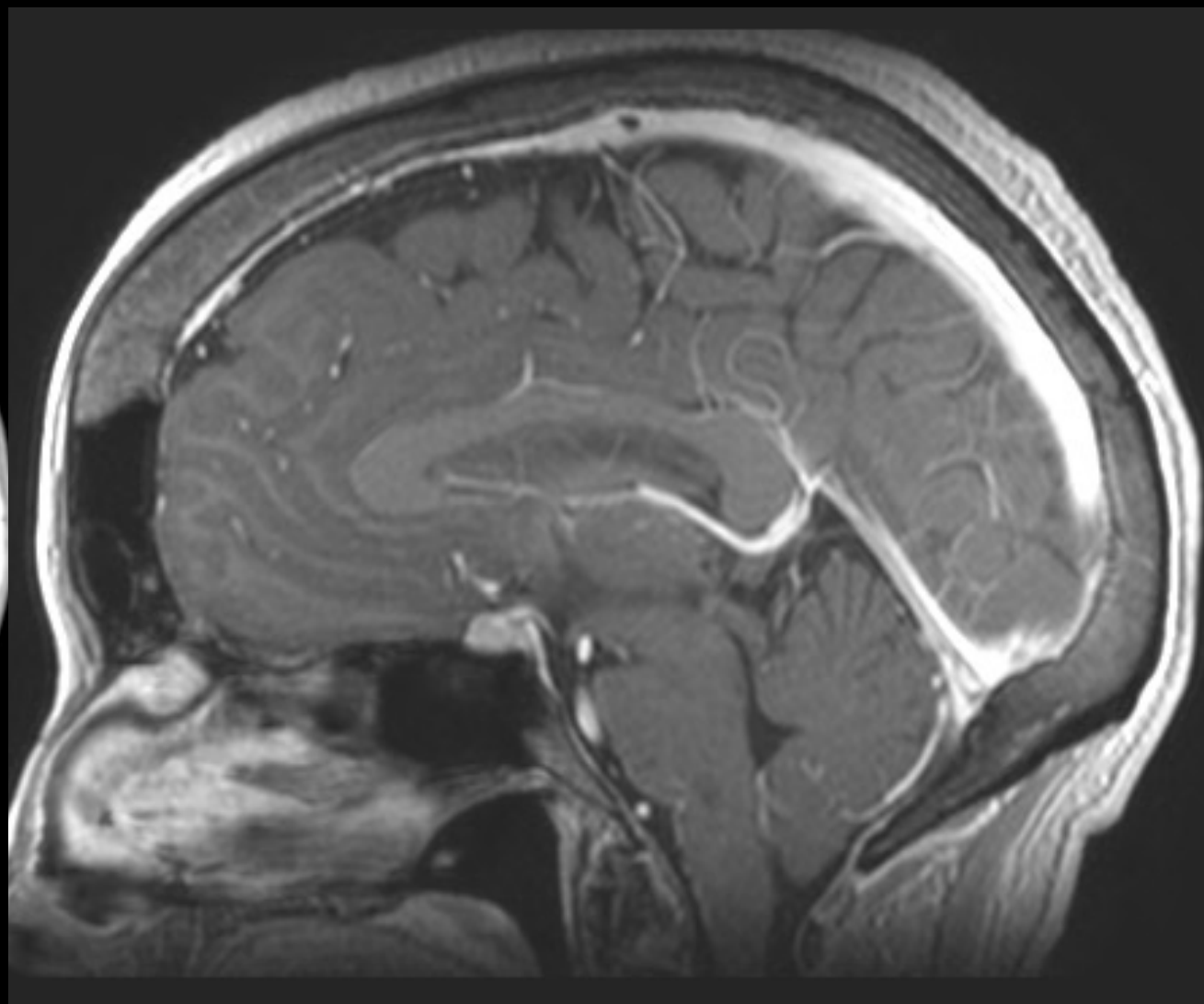
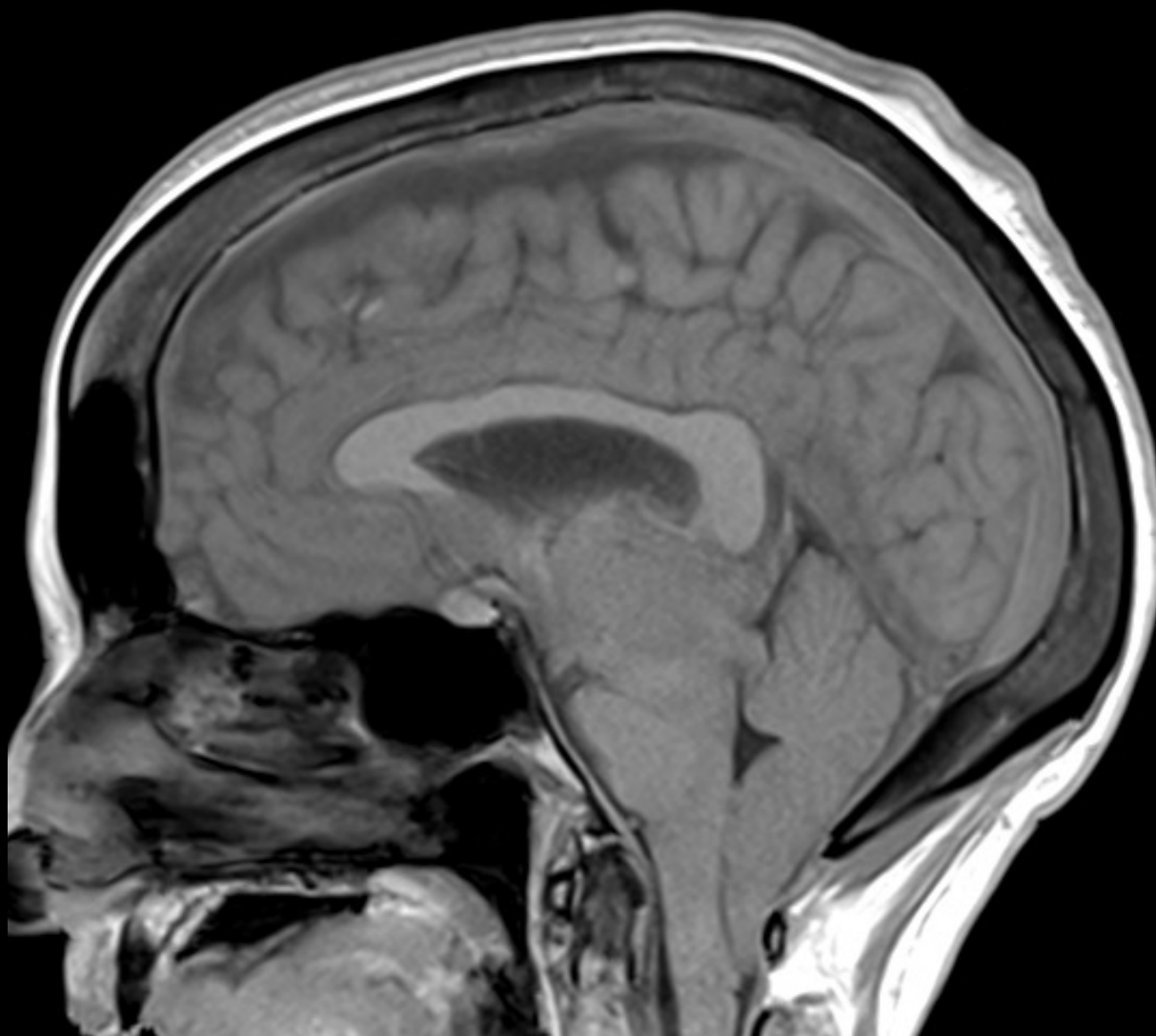


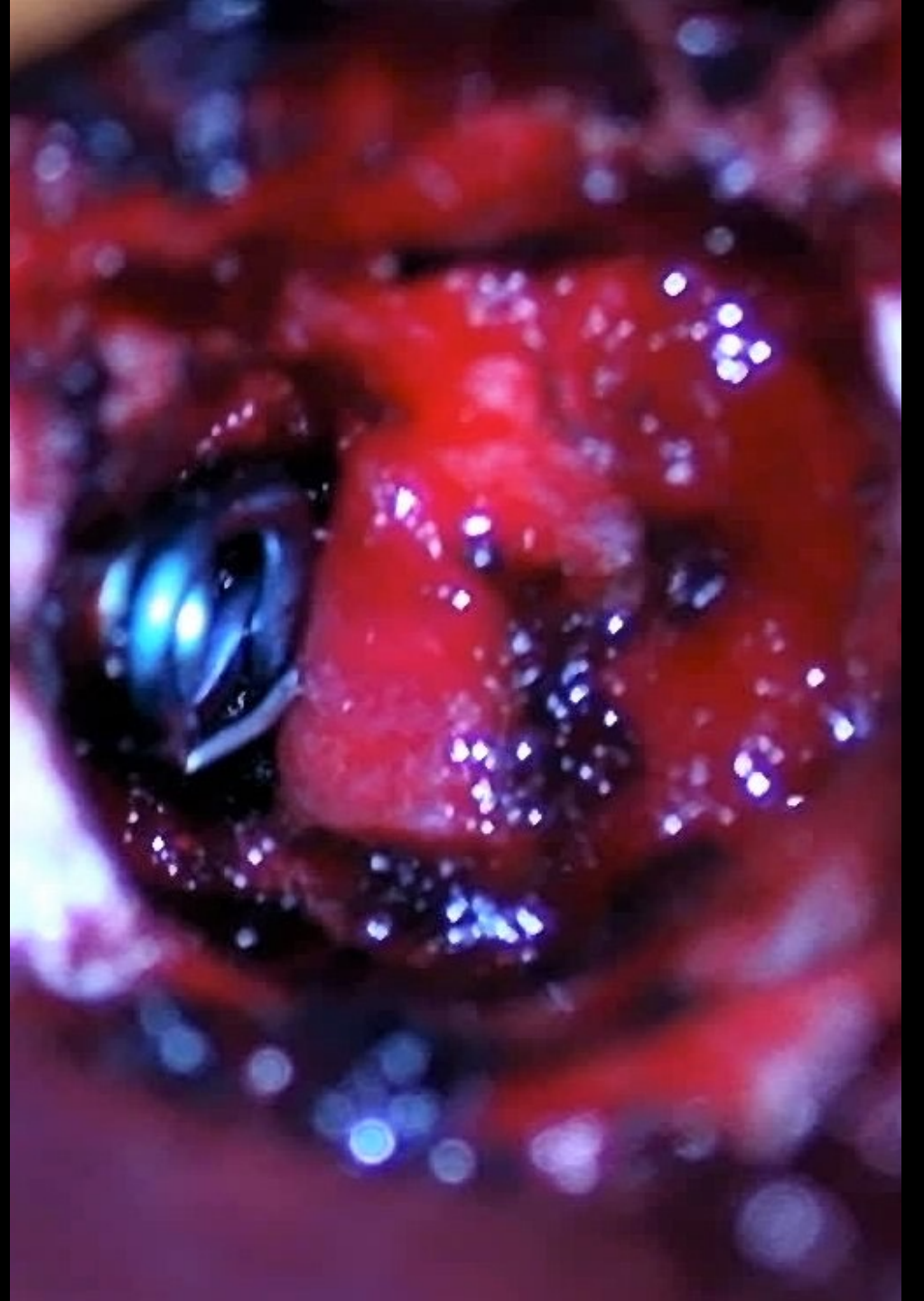
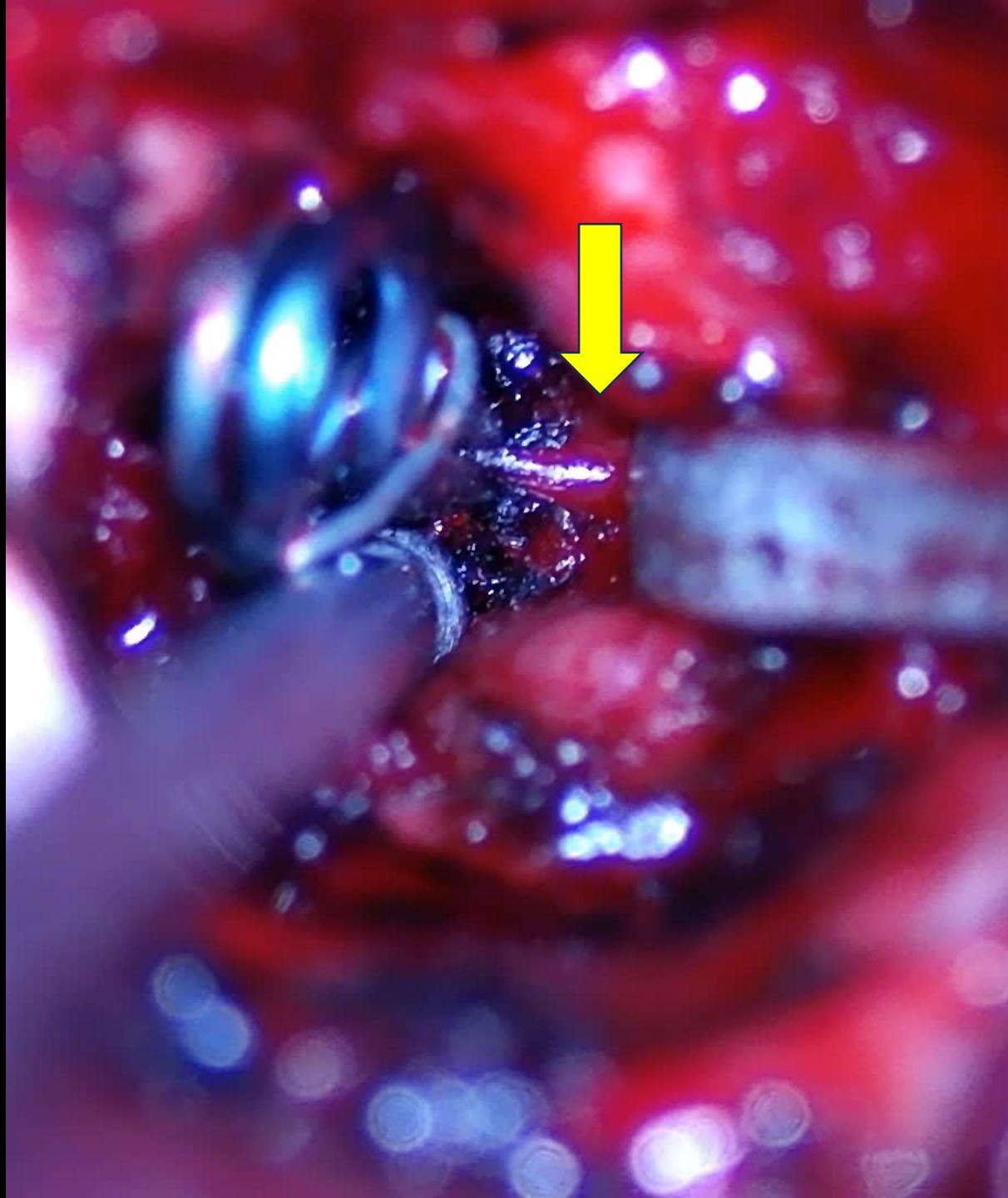
Surgical clip ligation of fistula with subsequent resolution of SDH



# Spontaneous CSF-Venous Fistula

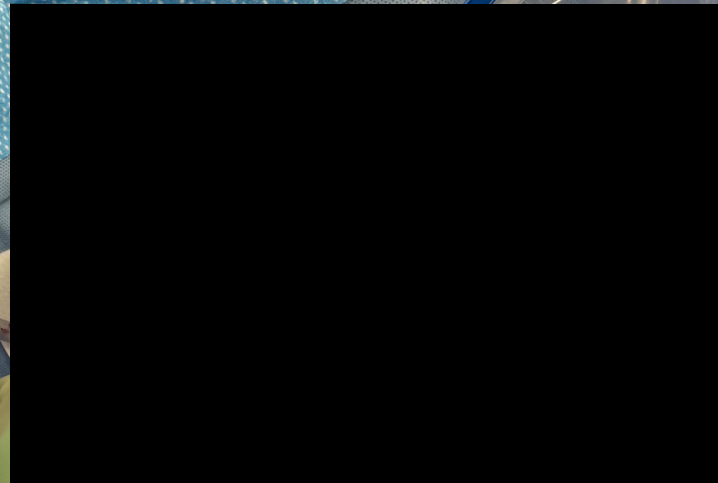
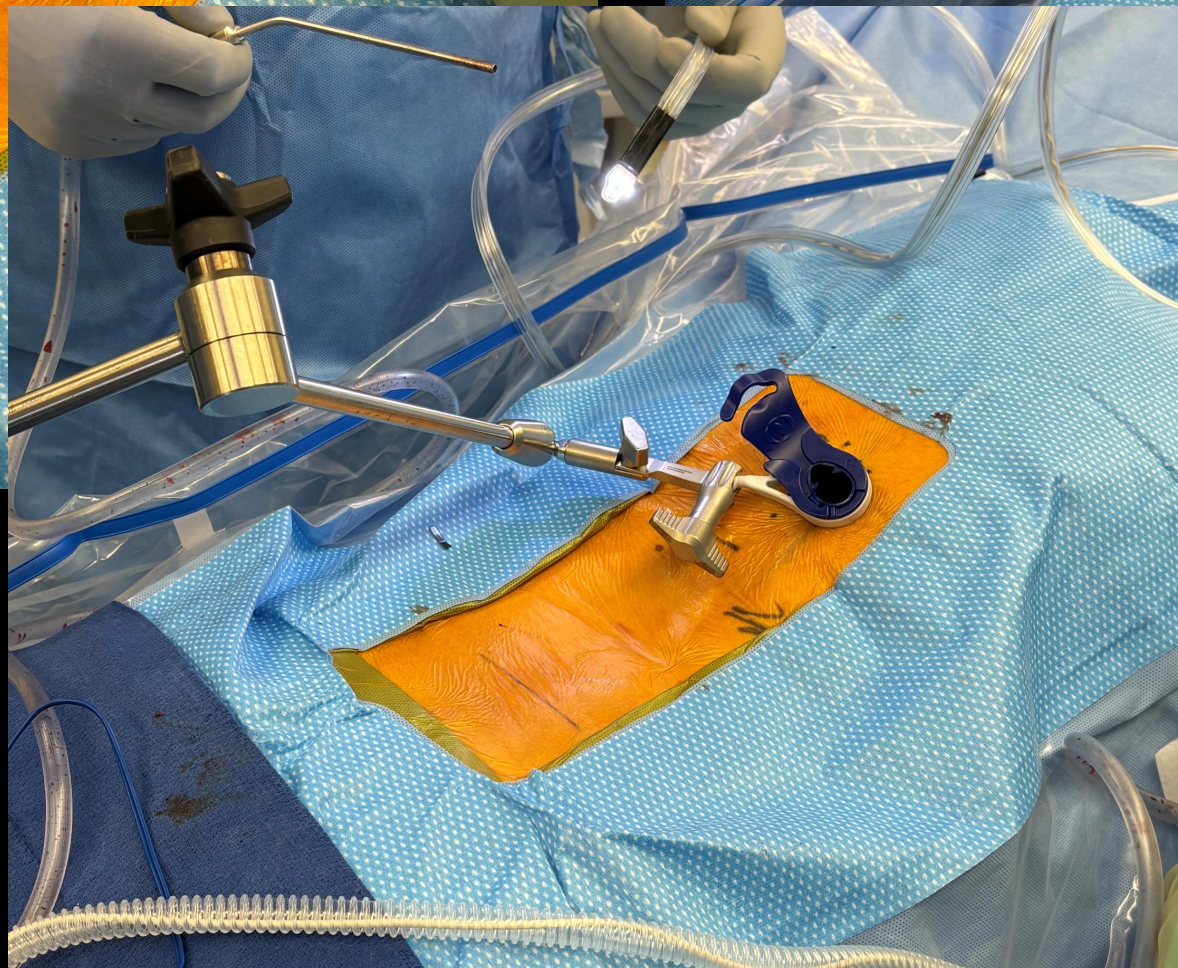
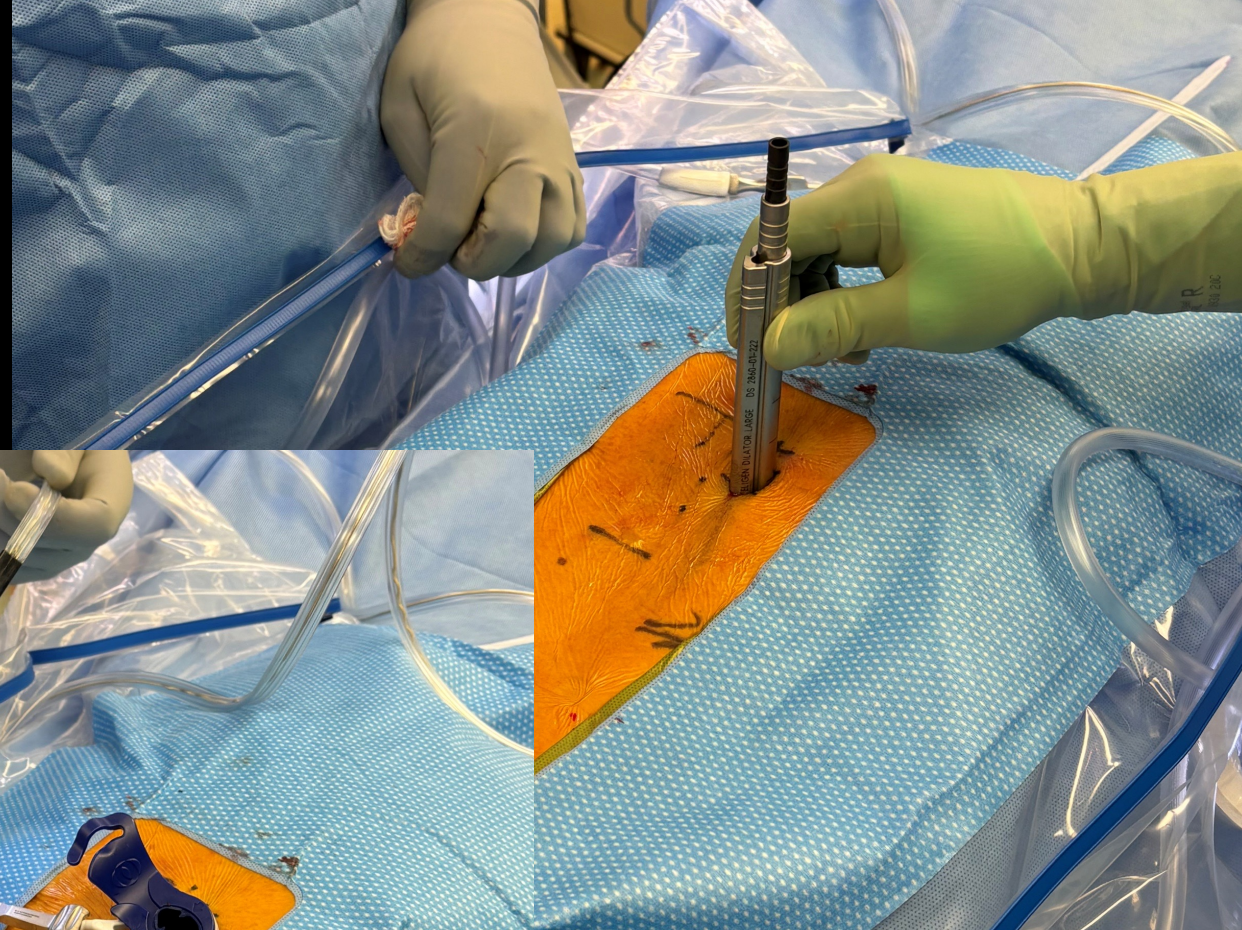
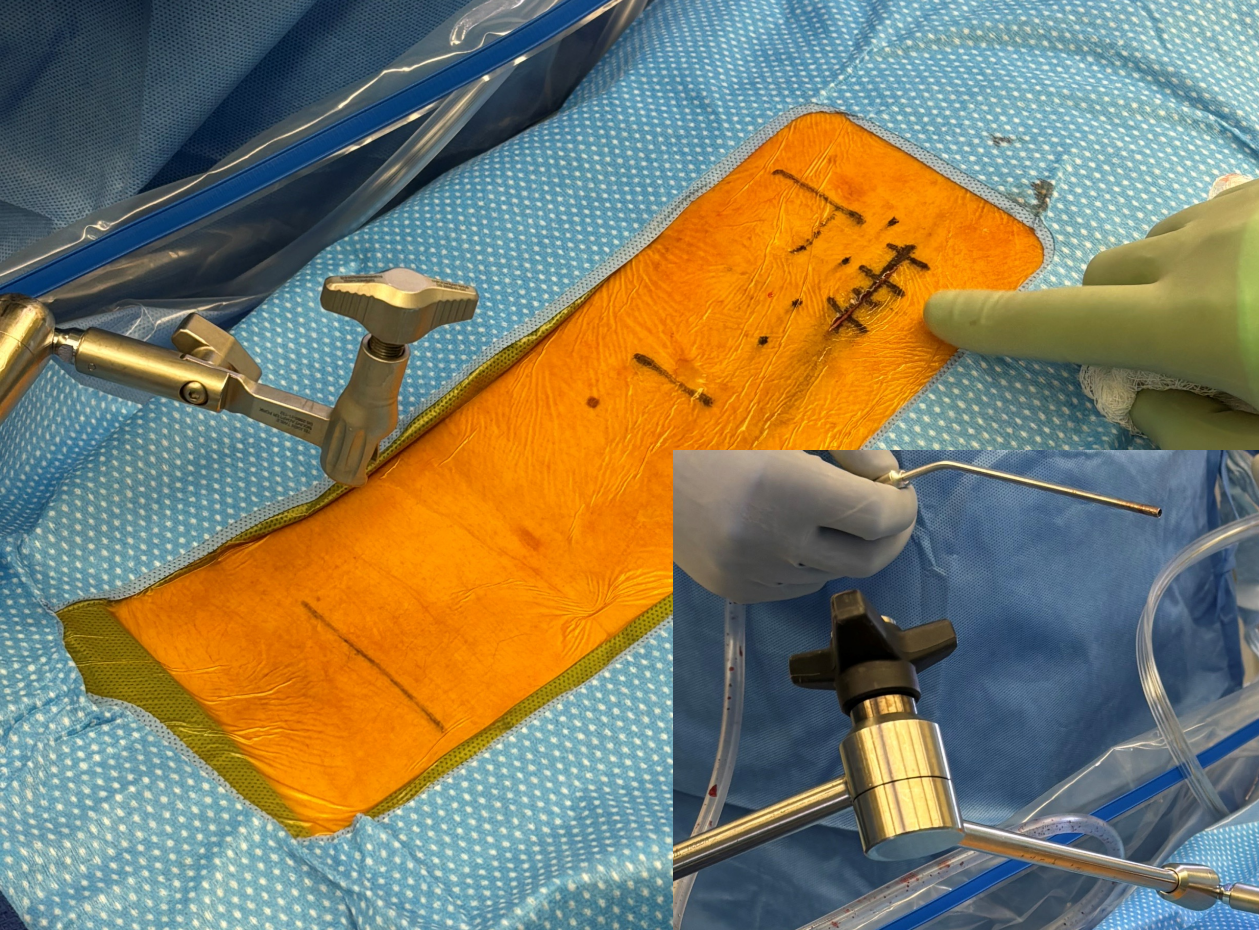
- 54 yo female with 9 yr history of headaches, tinnitus, taste changes, nausea with vomiting, balance issues, frequent falls, numbness in her fingers, and difficulties modulating her temperature.
- SIH diagnosed and had “exploratory surgery” at T1 without finding a csf leak.
- CSF-Venous fistula at T1 later diagnosed
  - Endovascular embolization failed to fully occlude
  - Surgical ligation of fistula with preservation of nerve root.

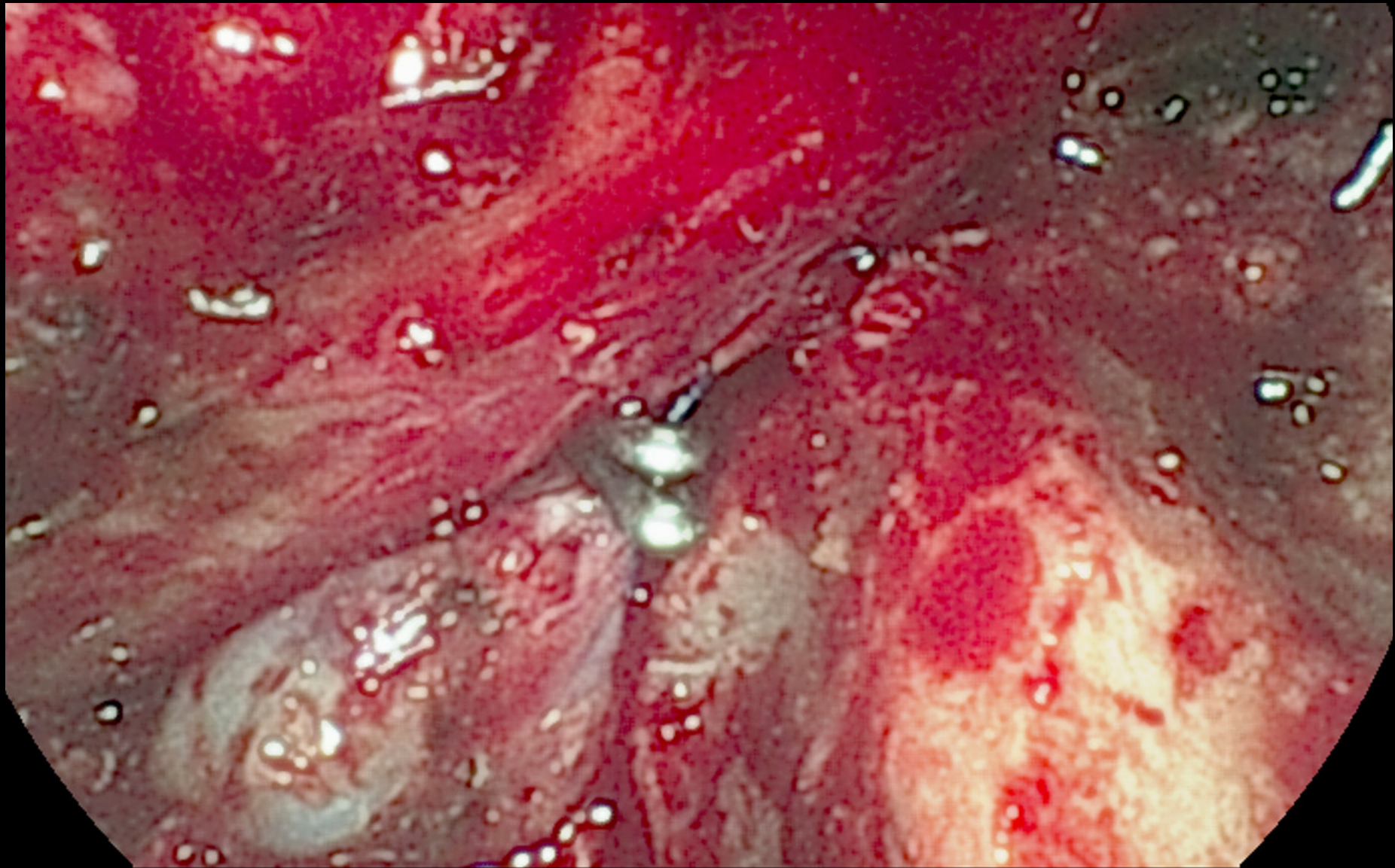


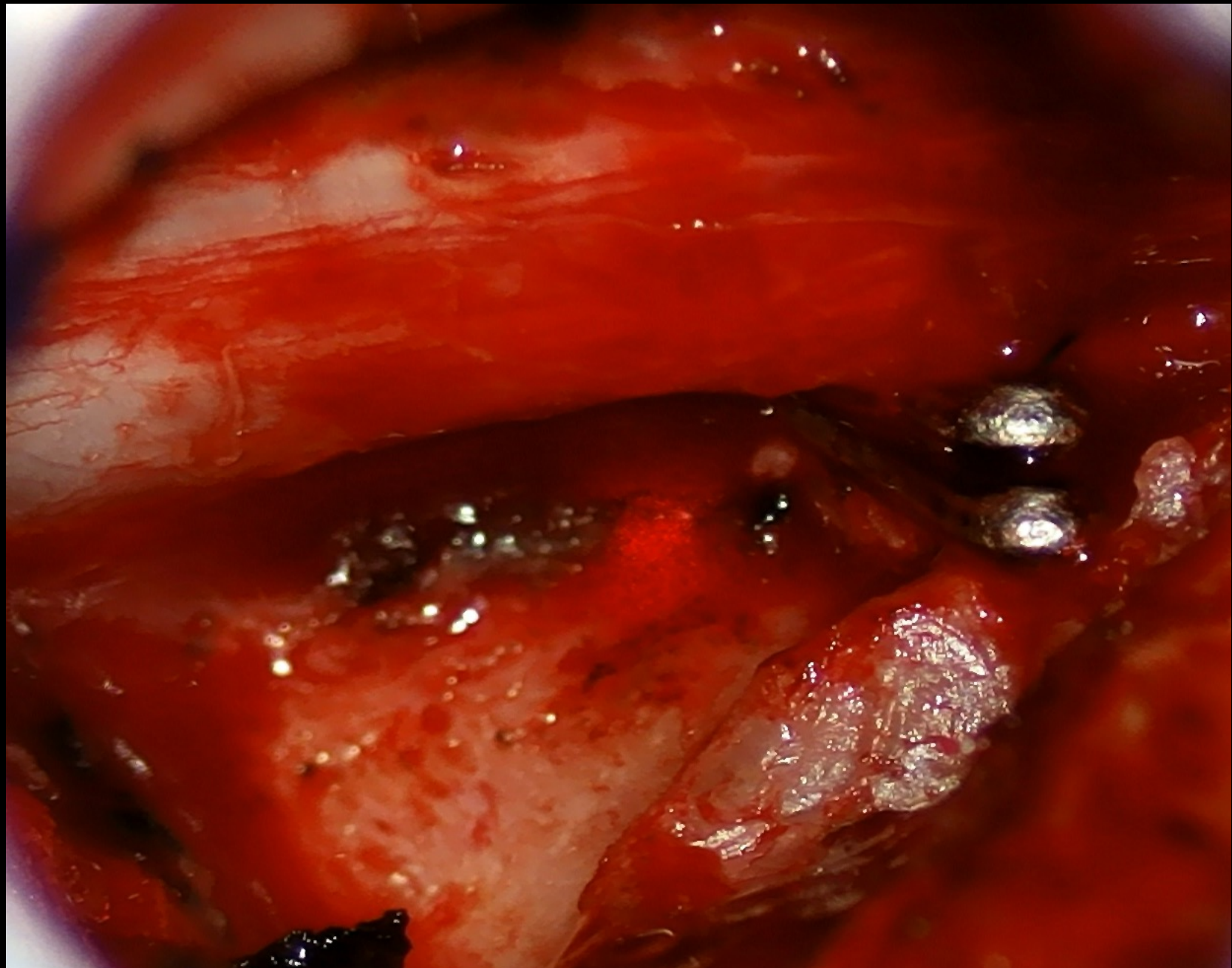


# Spontaneous CSF-Venous Fistula

- 69 yo female with onset of SIH symptoms in 2015 and diagnosed with fistula in 2021.
- Complex fistula T10-11 with extensive venous drainage to a adjacent levels
- Treated with targeted fibrin injection with good relief.
- Recurred and failed to get full relief with additional fibrin injections
- Severe rebound hypertension with patches



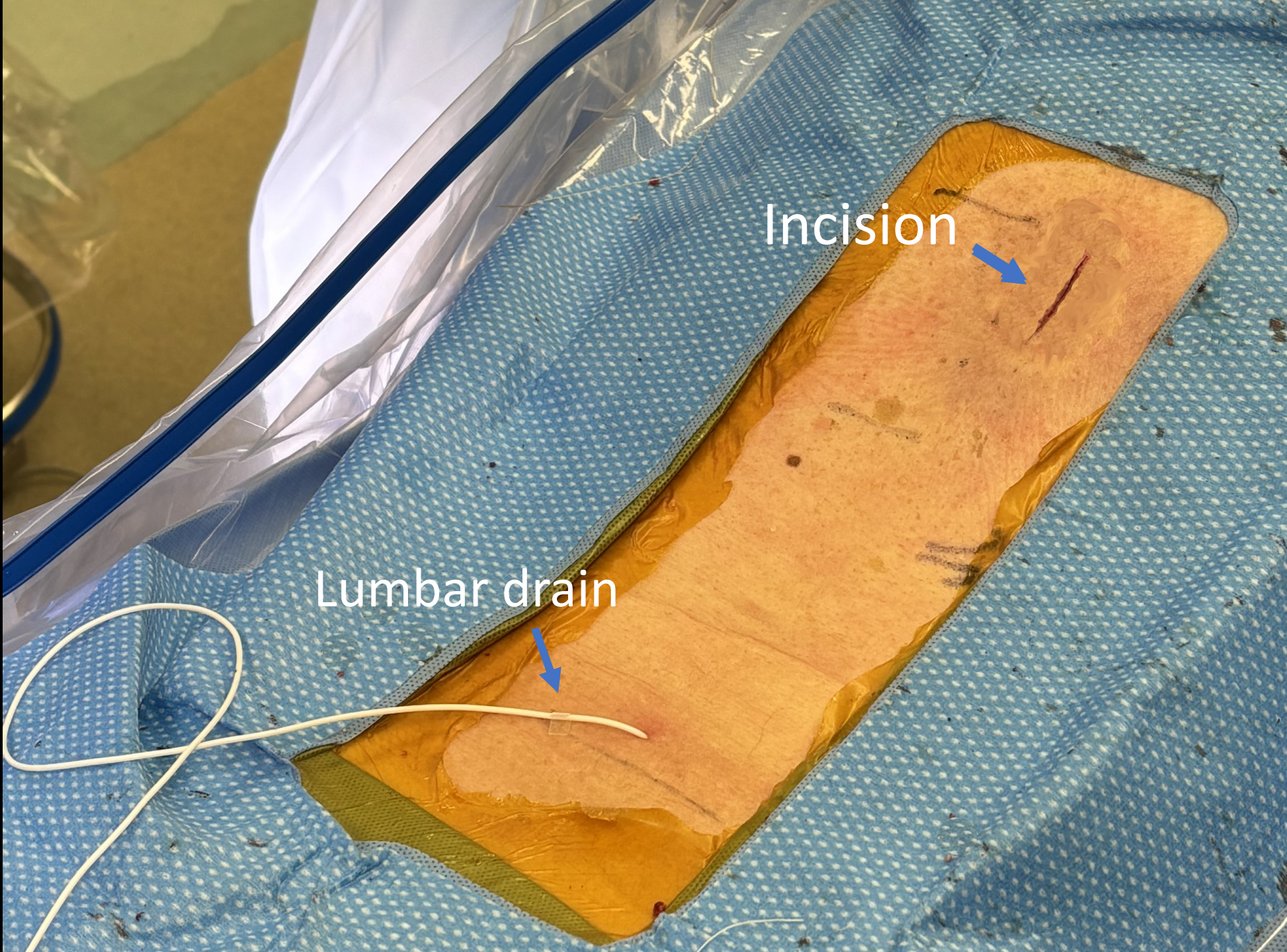




Incision



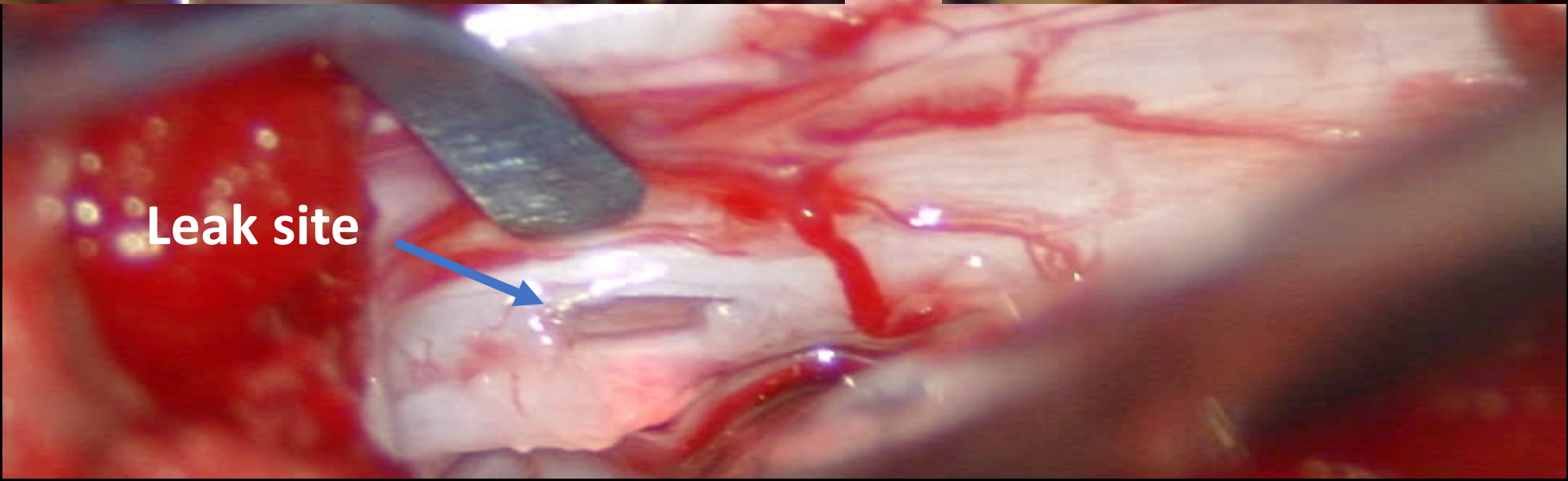
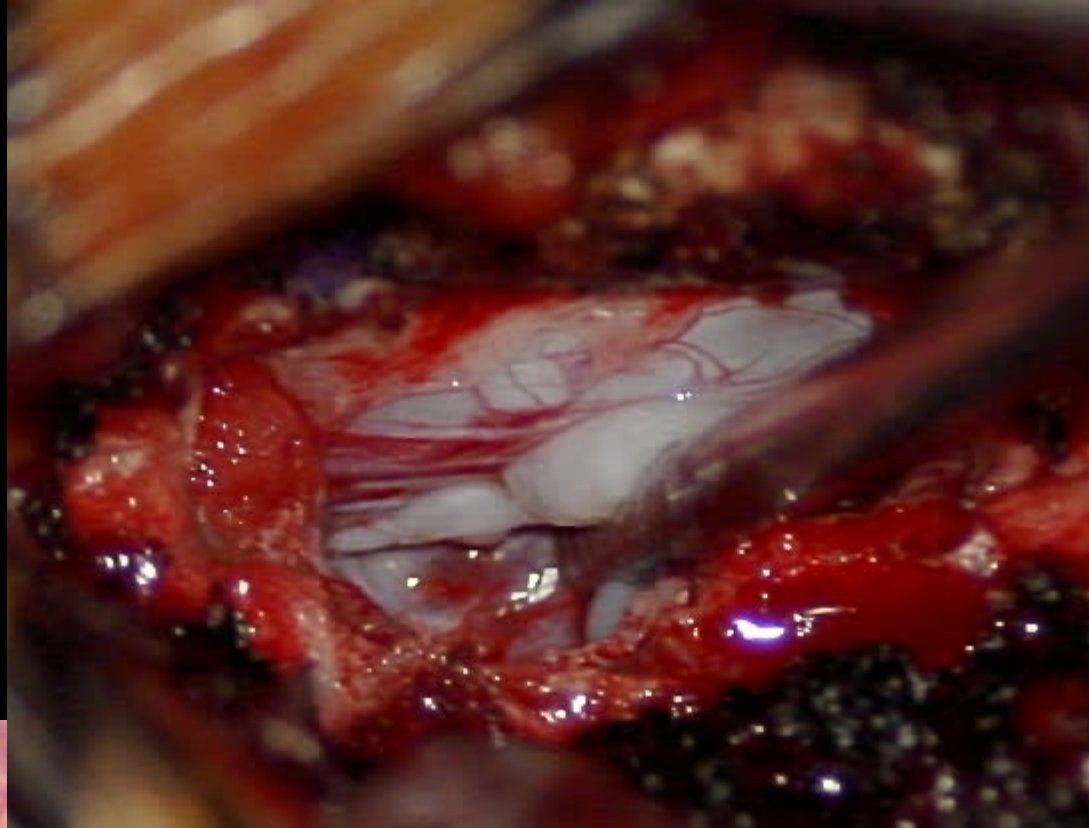
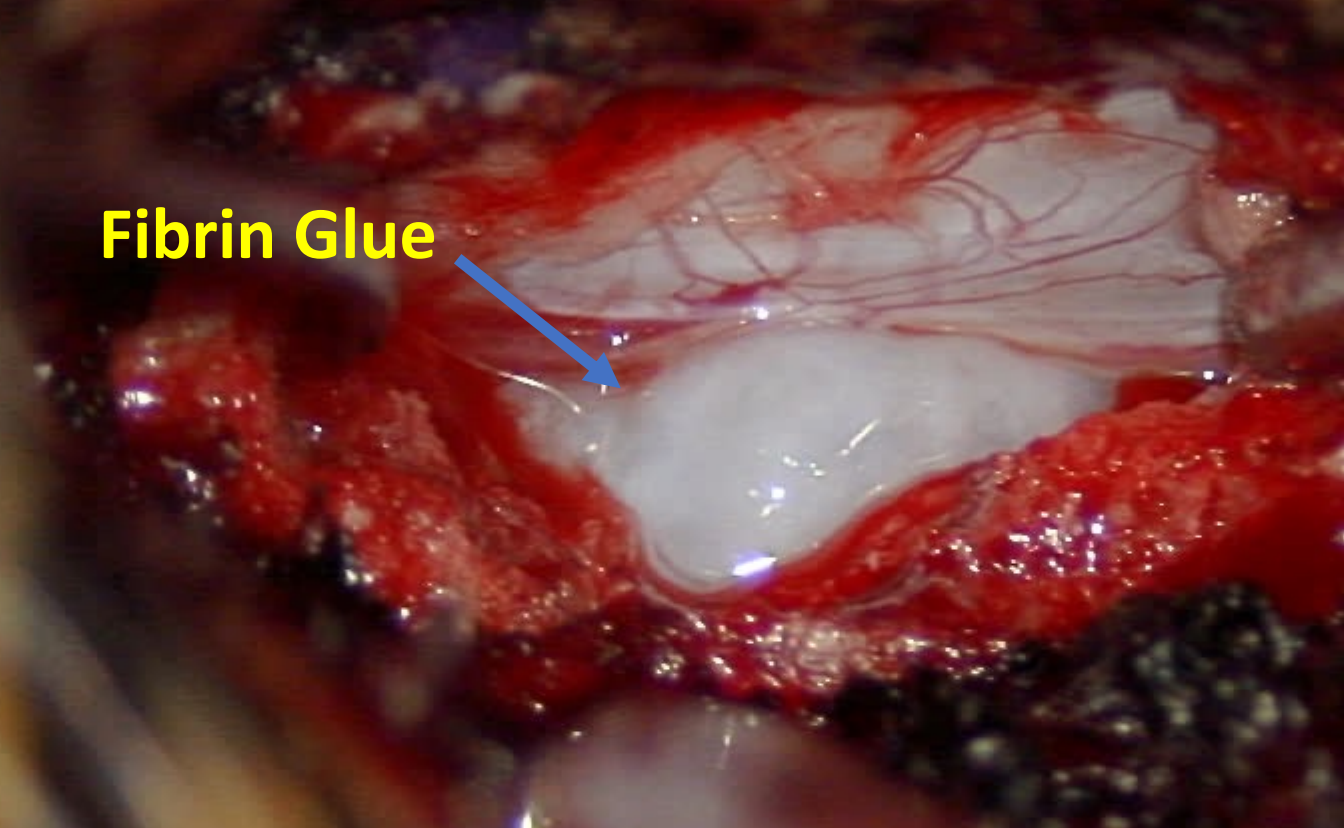
Lumbar drain





# Spontaneous: Lateral leak

- 50 yo female with h/o viral meningitis subsequently developed SIH
- Ruptured meningeal diverticulum initially treated with targeted fibrin patching.



**MIS Direct suture repair**



**Patch over repair**



# Final Thoughts

- Team Approach
  - Collaborative effort
    - Local and distant partners in a small community
    - Much progress and yet much still to learn
- “Exploratory” surgery
- Gratitude to:
  - Pioneers in the field like Dr Schievink
  - Patients who are really our partners in this endeavor