Other CSF Sampling Procedures

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**External Ventricular Drainage (EVD)** → [see p. Op6 >>](http://www.neurosurgeryresident.net/Op.%20Operative%20Techniques\001-020.%20CSF-related%20procedures\Op6.%20External%20Ventricular%20Drainage.pdf)

Indicated when lumbar puncture cannot be done.

Cisternal (s. suboccipital) Puncture

- puncture to cisterna magna

* neck is shaved from external occipital protuberance to mastoid process laterally.
* patient in lateral decubitus position (sitting position can be used).
  + neck is flexed to chest.
  + pillow under head (to keep neck and vertebral axis in same plane).
* patient is cleaned and anesthetized similar to LP.
* **spinal needle** is placed *in midline halfway* between **C2 spinous process** and **inferior occiput**.
* needle is angled cephalad through subcutaneous tissue until it comes in contact with bony occiput.
* needle is then withdrawn and subsequently advanced at less acute angle with horizontal plane of cervical spine.
* this is repeated until dural "pop" is felt.

N.B. *stylet is removed frequently* so that dura is not punctured unknowingly!

* CSF is removed in usual manner.
* ***contrast material*** may be injected into cisterna magna (to identify rostral extent of obstructing lesion identified by lumbar myelography).

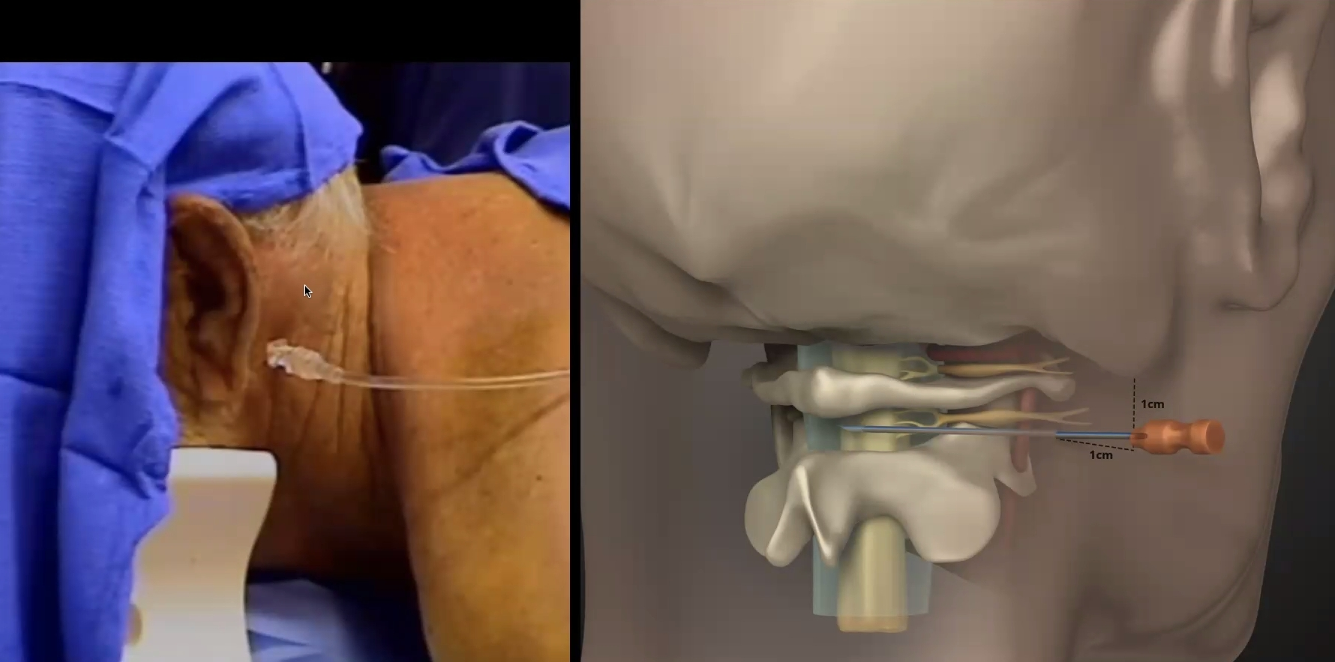
Complications

* **brain stem** puncture (vomiting, apnea).
* **upper cervical cord** damage.
* cisterna magna **hematoma**.
* dural veins are less extensive - *bloody taps* are less common.
* subarachnoid pressure is lower and dural tear can heal faster - *low-pressure headaches* are less common.

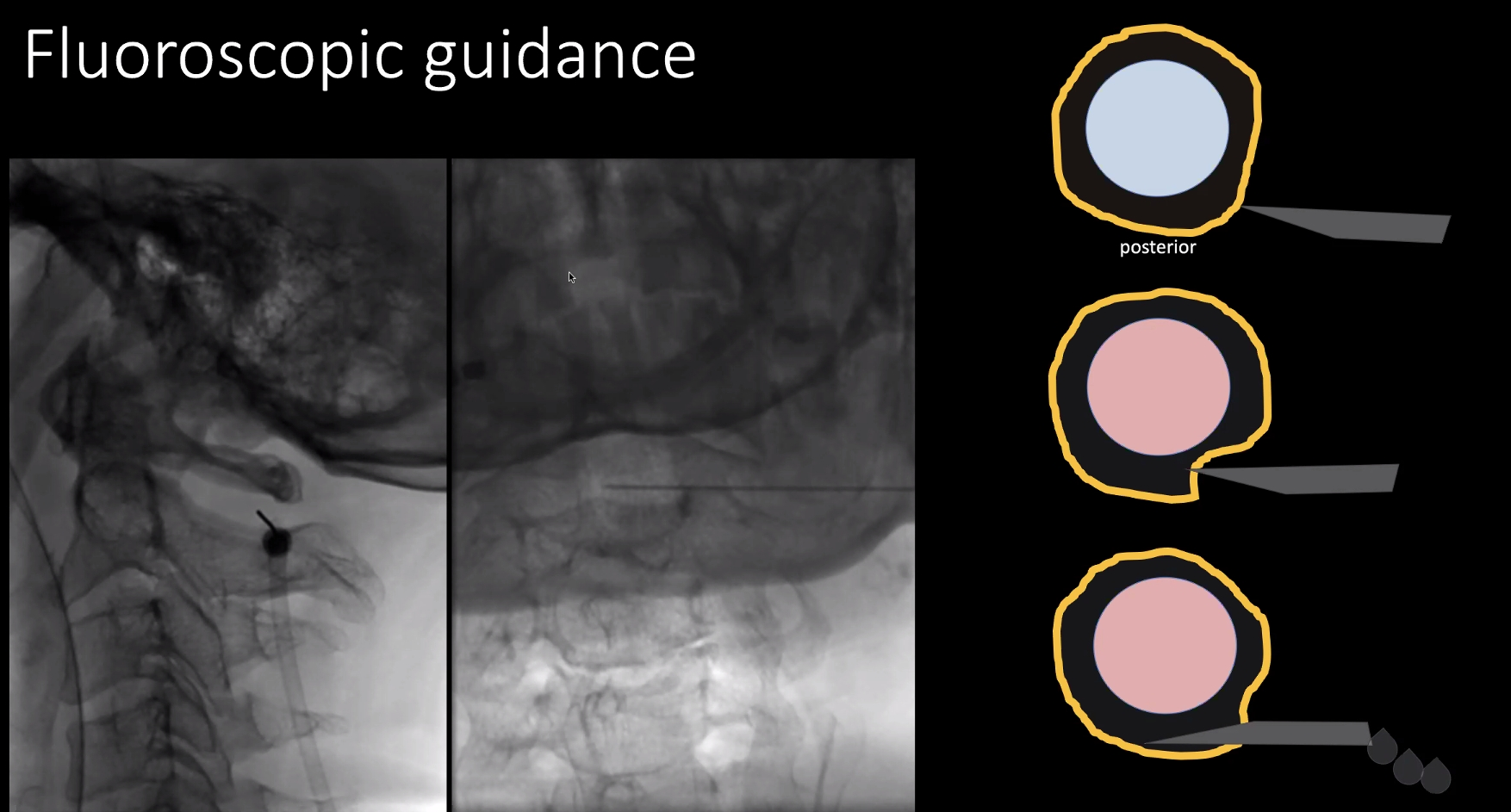
Lateral Cervical (C1-2) Puncture

- puncture in C1-2 interspace from posterolateral approach:

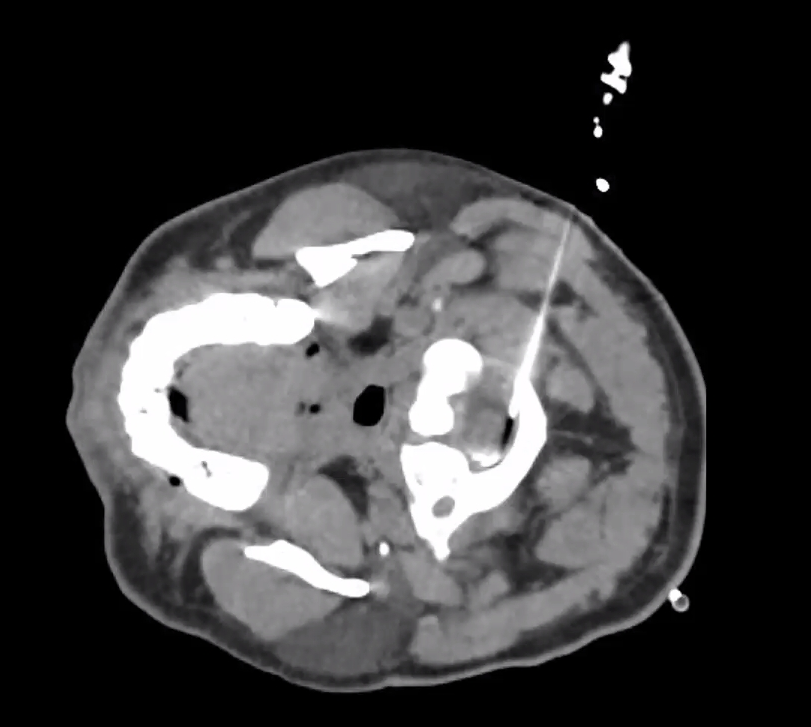




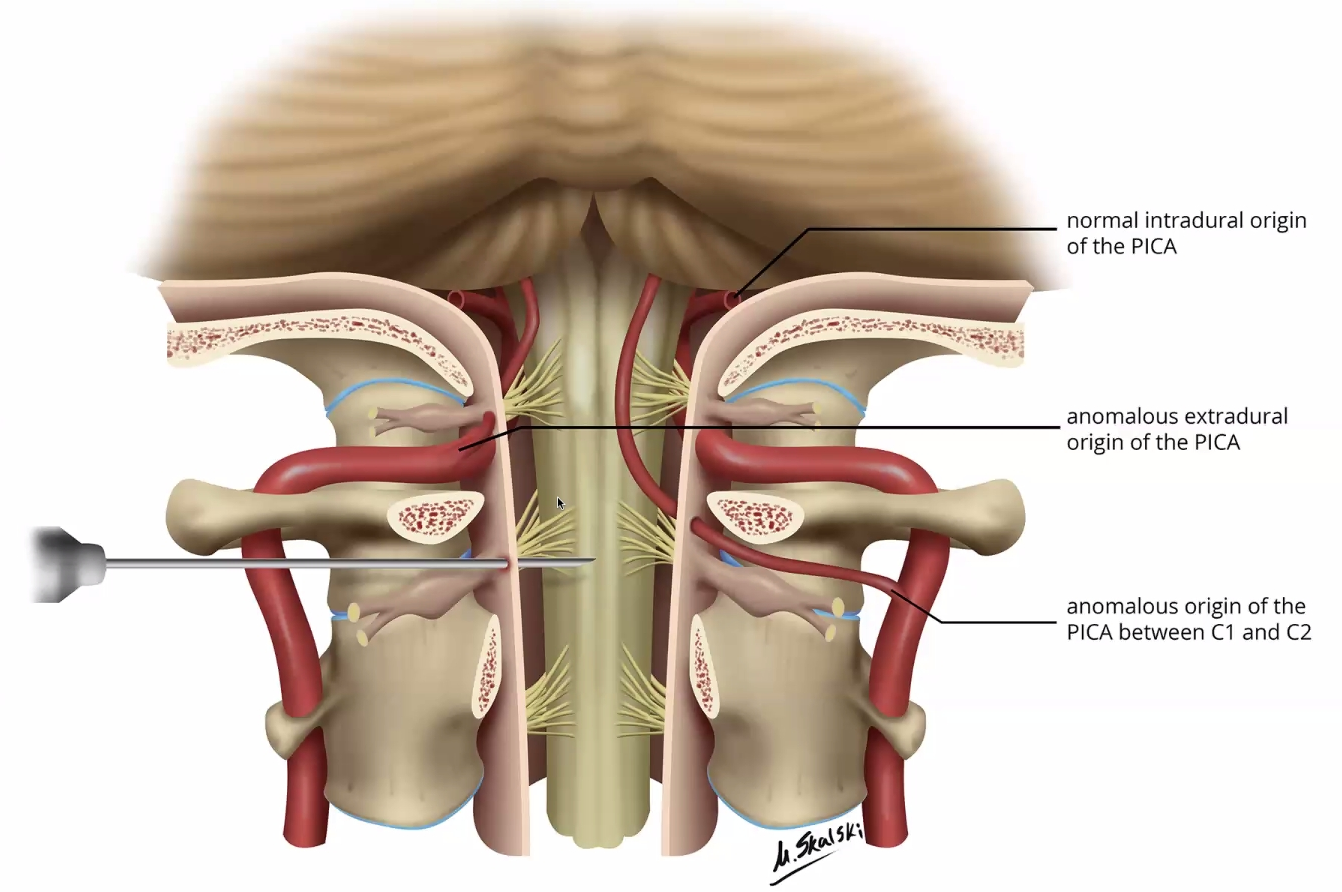
1. Fluoroscopic guidance:

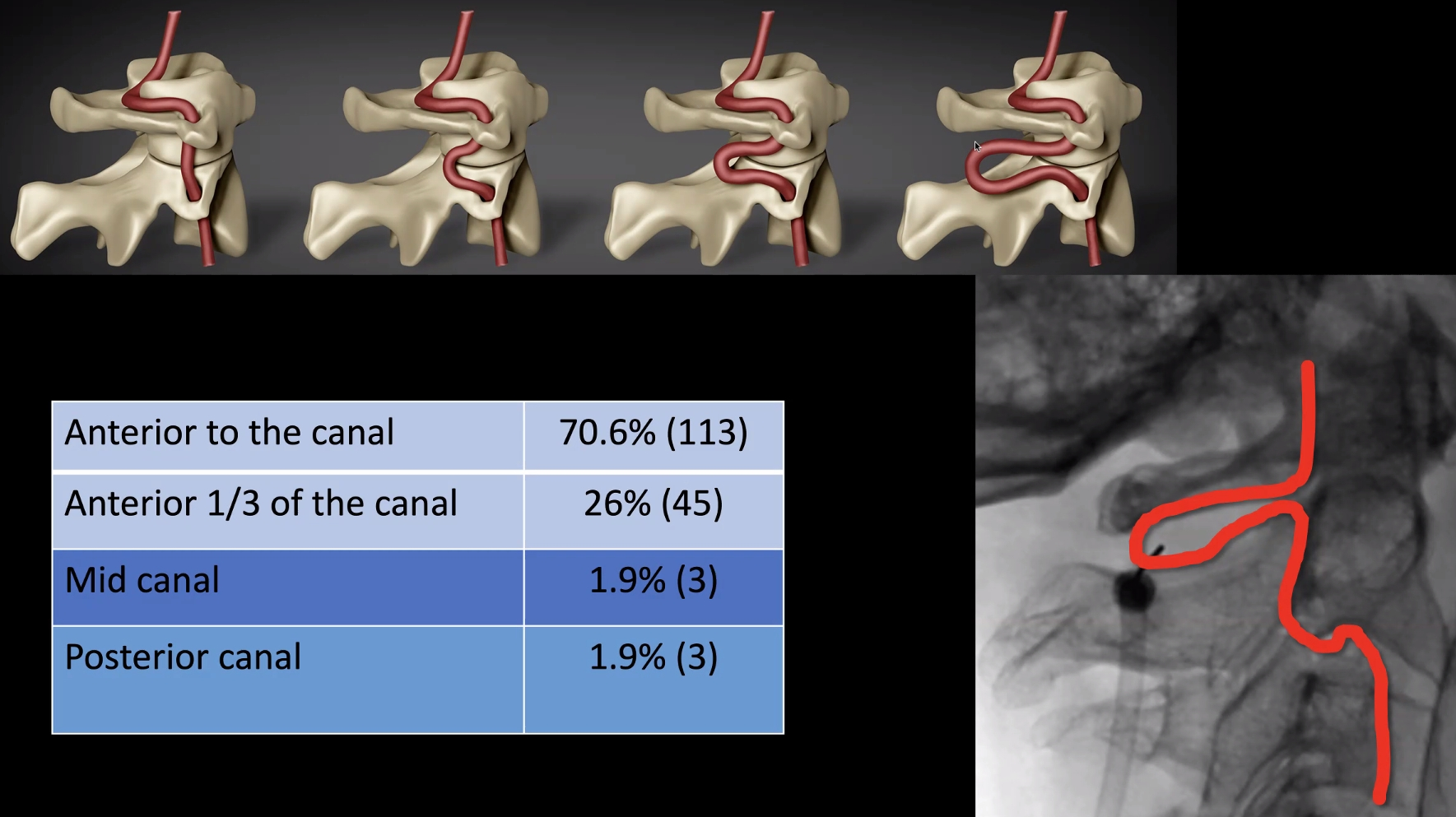


1. CT-guidance:



* prone or supine position, fully sterilized and anesthetized.
* 20-22G **spinal needle** is inserted perpendicular to neck and parallel to bed under ***lateral fluoroscopy***.
* point for insertion: 5-10 mm inferior and up to 5 mm anterior or posterior to tip of mastoid process.
* physician advances needle slowly and frequently removes stylet to check for fluid return.
  + if needle goes too deeply and encounters paraspinous muscles, it is probably too deep posteriorly and should be repositioned more anteriorly.
  + if bone is encountered, more dorsal placement is needed.
* pressure and fluid samples are collected, as in other sites.
* contraindications: lesion at foramen magnum (e.g. cerebellar ectopia), unreduced atlanto-axial subluxation.
* complications: cervical cord damage, vertebral artery injury, anomalous PICA injury





Ventricular Puncture

- similar to subdural tap: [see p. TrH13 >>](http://www.neurosurgeryresident.net/TrH.%20Head%20trauma\TrH13.%20Subdural%20Hematoma.pdf#SUBDURAL_TAP)

* 23-25G ventricular needle with stylet (or AngioCath with automatically retractable needle) is placed in lateral border of anterior fontanel and is directed toward ***inner canthus of ipsilateral eye***.
* needle is advanced slowly, and stylet is removed frequently to determine presence of CSF.
* ventricle is usually encountered ≈ 4 cm from skin surface.
* aspirate **10 mL/kg** of CSF.

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