

Local anesthetics and Lumbar Puncture



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Andrew Macdonald for slide contributions



Global Health
Emergency Medicine

This Session Will Be Recorded

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If you would prefer that this recording **not** be shared with your em colleagues, please email amcknight@ghem.ca within 24 hours of the session.

We will share the presentation slides and other materials (journal articles, etc.) by email; you will have access to all materials regardless of whether the recording is shared.



Please Also Note:

The information in this presentation and the video recording is up to date as of the date it was recorded (October 22, 2020)

It has not been updated to include any subsequent advances in practice, and the information presented in this video does not replace hospital, health centre, or governmental guidelines.



Disclosure Statement

I have not received any financial or in-kind support from any commercial organization and have no conflicts of interest to declare.



Preparation

- Tintinalli 9th edition, chpt 36 Local and Regional Anesthesia (local anesthesia section)
- NEJM Videos in Clinical Medicine, Lumbar Puncture: <https://www.nejm.org/doi/full/10.1056/nejmvcm054952>
- US Assisted LP: <https://www.acepnow.com/article/perform-ultrasound-assisted-lumbar-puncture/2/>
- Video: US Assisted LP: <https://www.coreultrasound.com/lp/>
- Optional:
- Roberts & Hedges Clinical Procedures in Emergency Medicine, 6th edition, chpt 60 Spinal puncture and cerebrospinal fluid examination



Learning Objectives

- Importance of local anesthesia
- Local anesthesia toxicity
- Indications for lumbar puncture
- How a lumbar puncture is safely performed
- Possible complications of lumbar punctures
- How can we interpret the results of csf testing



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Session outline

- Brief didactic review
- Local anesthesia demonstration
 - Lumbar puncture ultrasound landmarking demonstration
- **Lumbar puncture procedure teaching**
 - Modeling
 - Your LP avatar!
 - Troubleshooting
- Wrap-up and summary



New procedure? LOAD

Learn

Observe

Assist

Direct feedback during attempt



Procedure note: TIRU

Type of procedure

Informed consent

Report of procedure and complications

Update on next steps



Procedure note: TIRU

Lumbar puncture to r/o meningitis

Verbal consent from patient's sister (patient altered LOC)

Sterile prep, local lidocaine 1% 2cc, uncomplicated, cloudy fluid obtained on first attempt at L4-L5 space

Patient well post procedure, duty team informed, antibiotics ordered empirically pending CSF results



Local anesthetic in LP



Local anesthetic in LP

Increase patient comfort

Increased success rate

Baxter, Amy L., et al. "Local anesthetic and stylet styles: factors associated with resident lumbar puncture success." *Pediatrics* 117.3 (2006): 876-881.

Nigrovic, Lise E., Nathan Kuppermann, and Mark I. Neuman. "Risk factors for traumatic or unsuccessful lumbar punctures in children." *Annals of emergency medicine* 49.6 (2007): 762-771.



Risks of local anesthetic

Allergy

Local anesthetic systemic toxicity (LAST)

Appropriate dosing

Slow injection

Aspiration



Local anesthetic toxicity

Less than 4mg/kg without epinephrine

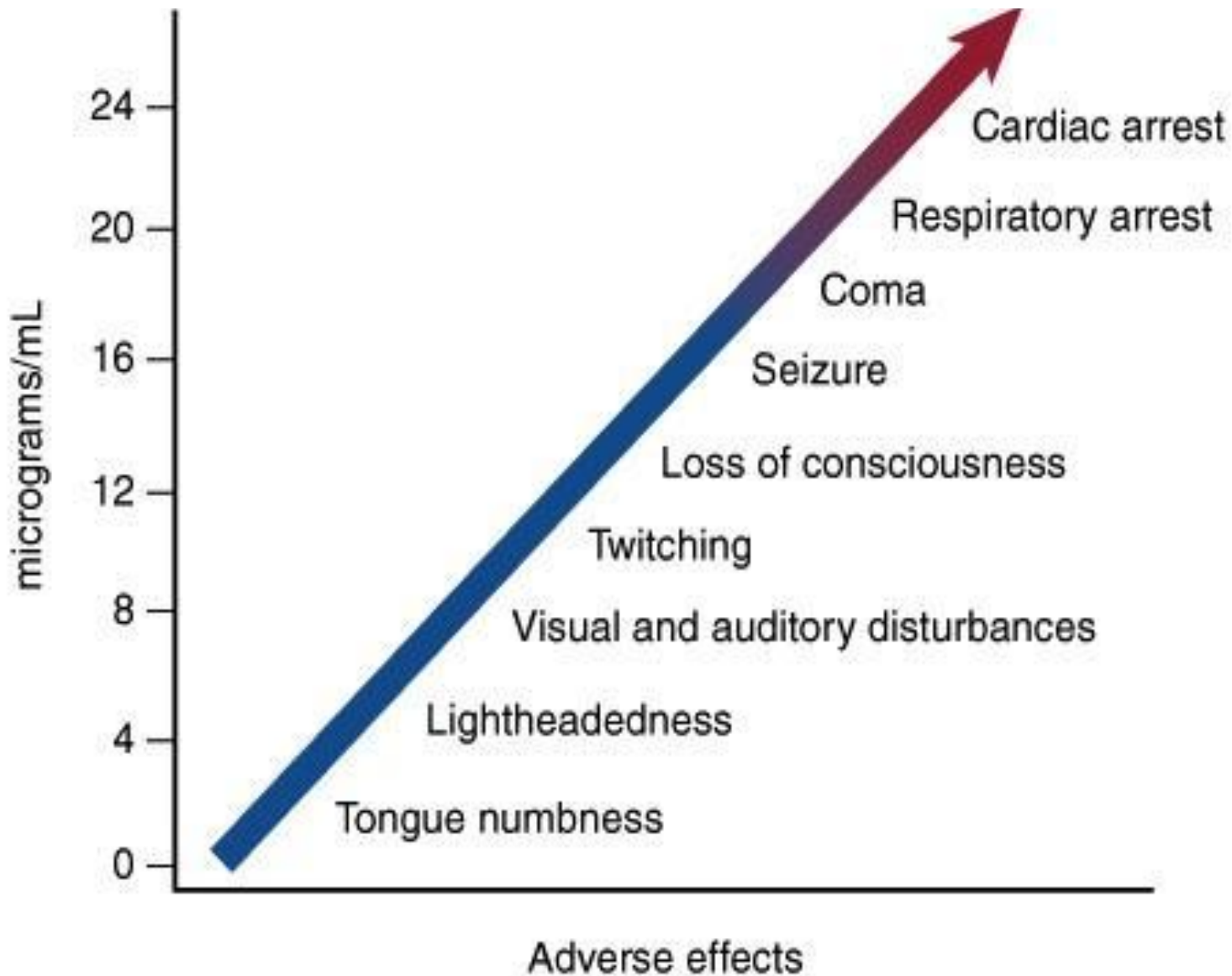
Less than 7mg/kg with epinephrine

e.g., 60kg patient, 1% lidocaine (10mg/mL)

Max $60 \times 4 = 240\text{mg} = 24\text{mL}$ of 1%



Anesthetic Toxicity:



Bottom line

- Local anesthetics increase patient comfort and success of your procedure
- Important to be aware of risks and how to manage toxicity



Lumbar puncture



Indications for the procedure

- Suspected meningitis/encephalitis
- Suspected subarachnoid hemorrhage



Contraindication to lumbar puncture

- Local skin infection or tattoo at puncture
- Increased ICP or spinal mass
 - Previous spinal surgery
- Bleeding disorder
 - Platelets < 50,000
 - INR > 1.5
 - Heparin use
 - Other untreated coagulopathy



Consent, what do patients need to know?



Consent, what do patients need to know?

- Unable to obtain sample
- Post-LP headache
- Bleeding or epidural hematoma
- Transtentorial herniation
 - Infection



Positioning



Iliac crest

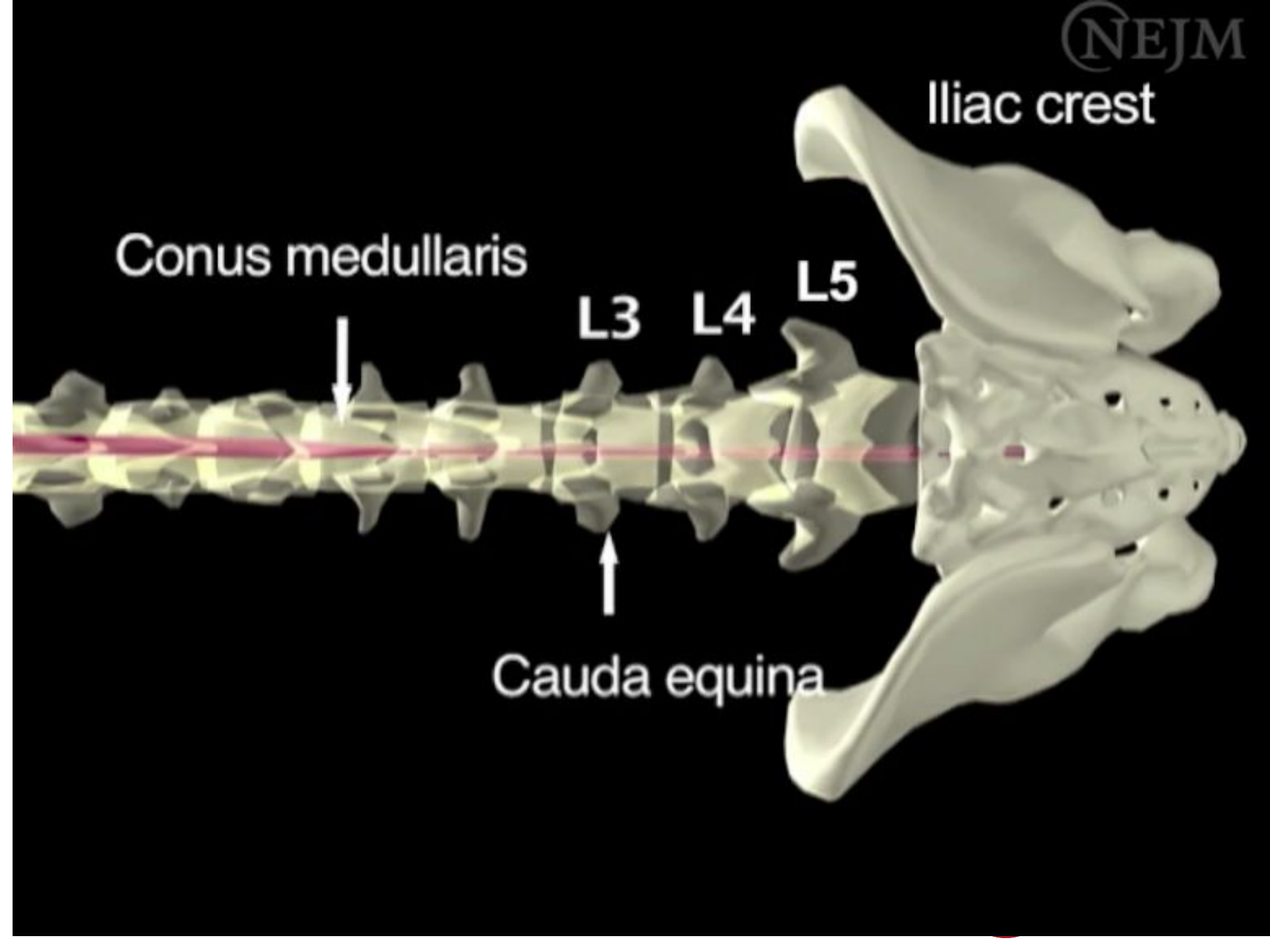
Conus medullaris

L3

L4

L5

Cauda equina



Key equipment



Equipment



**Stylet spinal needle
(20- or 22-gauge)**

Infant—1.5 in 3.8 cm

Child—2.5 in 6.3 cm

Adult—3.5 in 8.9 cm





Demonstration time!



Trouble shooting: no fluid

Return to the basics!

- **Poor patient positioning**
 - Are they in the **fetal position** (back fully flexed, spine parallel to bed)?
 - *Note: Do not force the patient to flex their neck. Focus on the rest of their back.*
 - Ask for assistance to help **hold the patient** in the correct position.
 - Try the **upright sitting position** to visualize the midline better. **Hip flexion** is key with this position. You can also place their feet on a stool.
- **Poor needle positioning**
 - Is the needle **parallel** to the bed, **aiming toward the umbilicus** and **midline**?
 - **Ask the patient** if the needle feels off midline. They are usually the best judge.
 - Try **rotating the needle** 90 degrees.
 - Are you hitting **bone**? This is likely the spinous process of the **lower** vertebra. Try to pull the needle back an inch, and then **redirect the tip of the needle toward the umbilicus**. Still hitting bone? Pull back again, and direct it slightly more cephalad.
- If all else fails, **try a different interspace** with a new needle.



Trouble shooting: Blood

You may have gone too far lateral or too deep, and hit a venous plexus, causing a traumatic tap. Or it is SAH. Or even meningitis. Send the fluid to the lab.

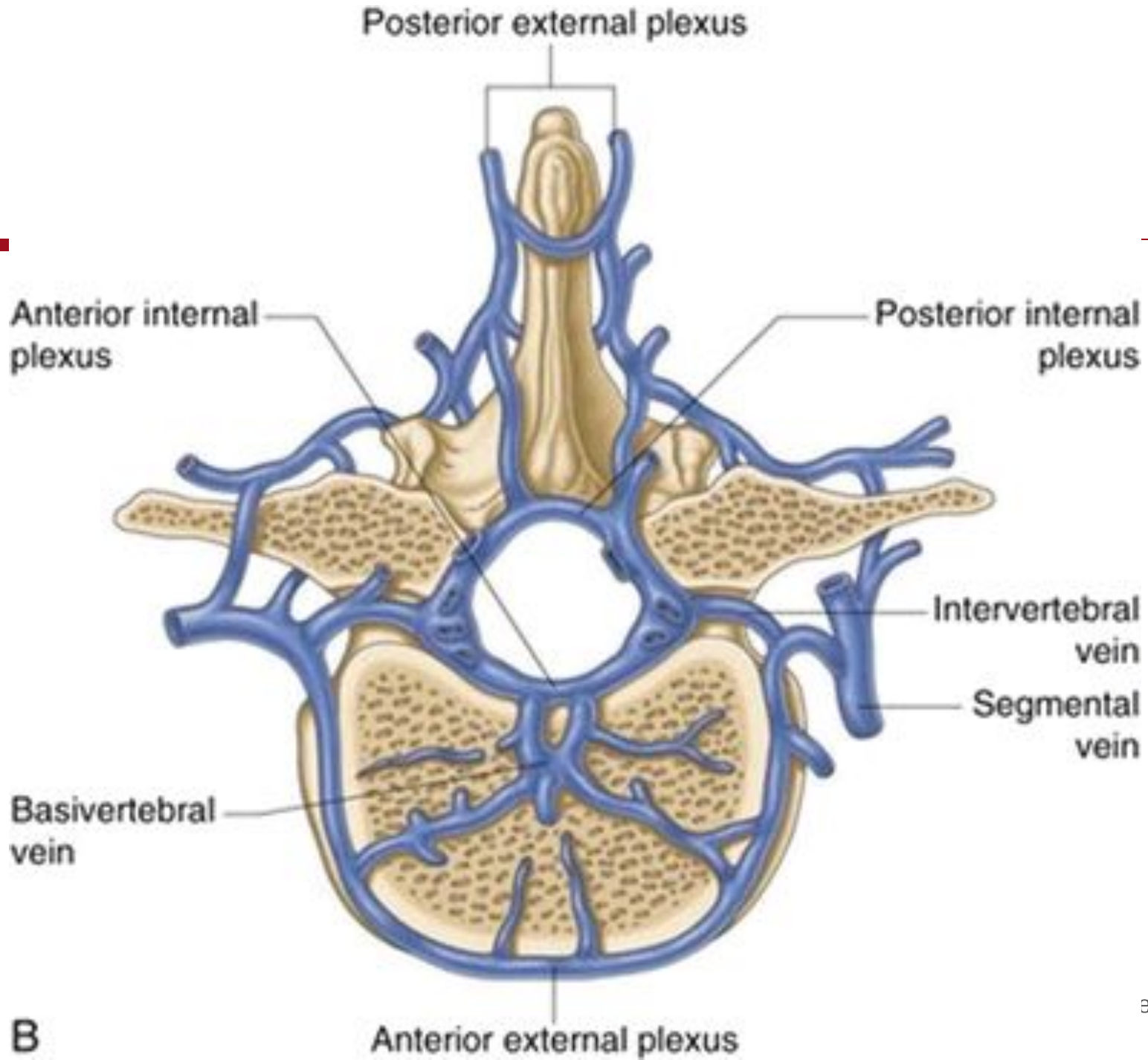
Signs of a **traumatic** tap (2, 3, 4):

- Absence of xanthochromia (shows up within 12 hours and persists 2-4 weeks)
- RBC count < 2000
- RBC count that diminishes from tube 1 to 4. This is not fully reliable unless it is completely clear by the 4th tube, but classically, the RBC count decreases by 30%

Examining the 4th tube as a separate entity can also help rule out SAH

- <100 RBC: almost certainly traumatic
- <500 RBC: probably traumatic
- >10K RBC: likely SAH.





B

Preventing post LP headache

Needle size

Bevel direction

Stylet replacement

IV fluid may make a difference to duration of headache

Bed rest makes no difference, position during LP makes no difference



Summary

Approach to learning new procedures and documenting

Review of using local anesthetic in LP

Ultrasound landmarking for LP

LP technique and trouble-shooting



General References

- Tintinalli 9th edition, chpt 36 Local and Regional Anesthesia (local anesthesia)
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- Baxter, Amy L., et al. "Local anesthetic and stylet styles: factors associated with resident lumbar puncture success." *Pediatrics* 117.3 (2006): 876-881.
- Nigrovic, Lise E., Nathan Kuppermann, and Mark I. Neuman. "Risk factors for traumatic or unsuccessful lumbar punctures in children." *Annals of emergency medicine* 49.6 (2007): 762-771.
- Smith, Jonathan H., et al. "CSF Pressure, Volume, and Post-Dural Puncture Headache: A Case-Control Study and Systematic Review." *Headache: The Journal of Head and Face Pain* 59.8 (2019): 1324-1338.
- <https://rebelem.com/post-lumbar-puncture-headaches/>



Questions?

