HOW TO PERFORM A LUMBAR PUNCTURE

Jeremy Heinerich, PA-C
Clinical Director of Oncology PAs
Mount Sinai Hospital
New York, NY

DISCLOSURES

- Jeremy Heinerich, PA-C
  - No disclosures

OBJECTIVES

- Review procedural steps involved with performing a lumbar puncture
- Understand common intrathecal therapies used in hematology-oncology patients
- Identify common side effects and treatment options related to lumbar punctures and intrathecal therapy
- Perform a lumbar puncture!

WE KNOW THIS IS WHAT OUR PATIENTS ARE SAYING

LUMBAR PUNCTURE VIDEO

NEW ENGLAND JOURNAL OF MEDICINE

www.youtube.com/watch?v=weoY_9tOcJQ

www.nejm.org/doi/full/10.1056/NEJMvcm054952

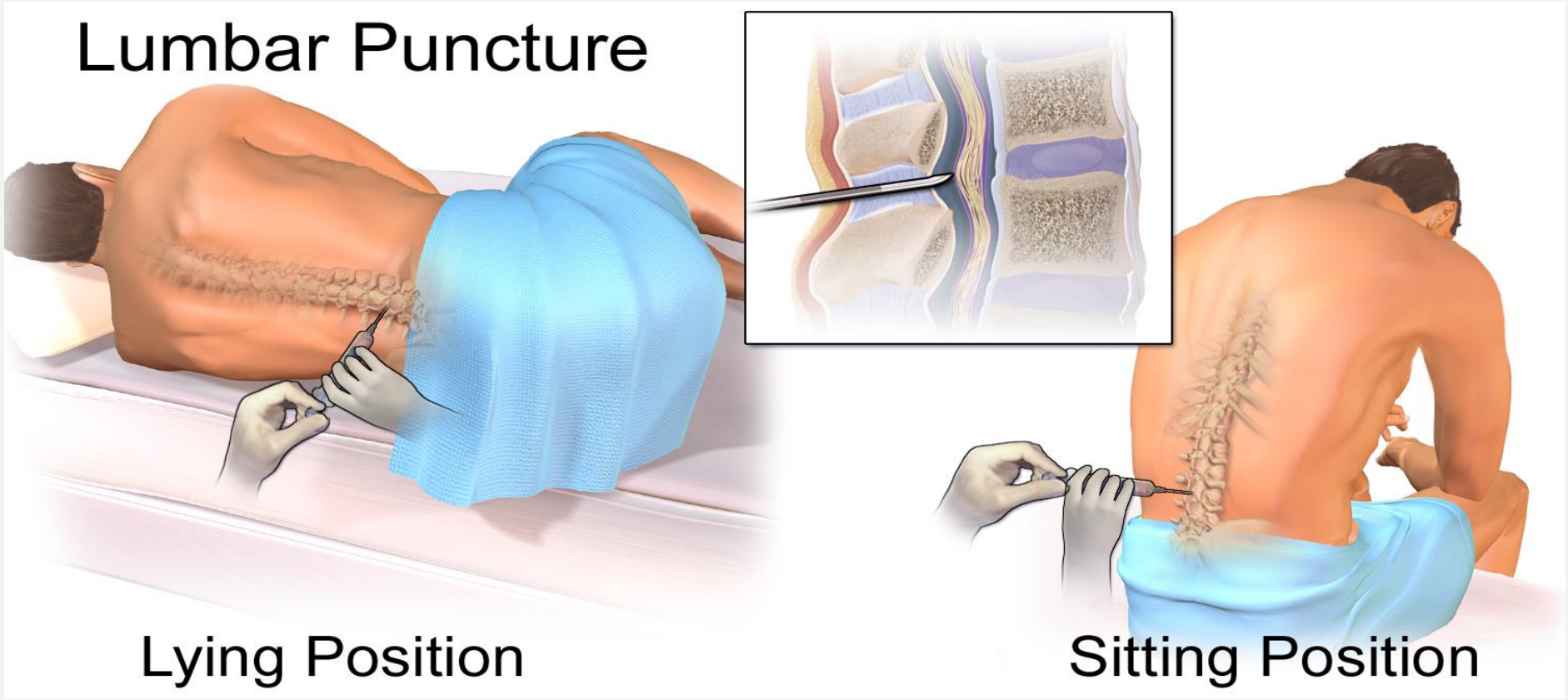
INDICATIONS FOR LUMBAR PUNCTURE NEJM

- Diagnostic Indications
  - Rule out CNS involvement of underlying malignancy
  - Infectious diseases in immunocompromised patients
- Therapeutic Indications
  - Antibiotic administration for ventriculitis/meningitis
  - Administer CNS directed therapy against malignancy

REVIEW CONTRAINDICATIONS FOR PROCEDURE

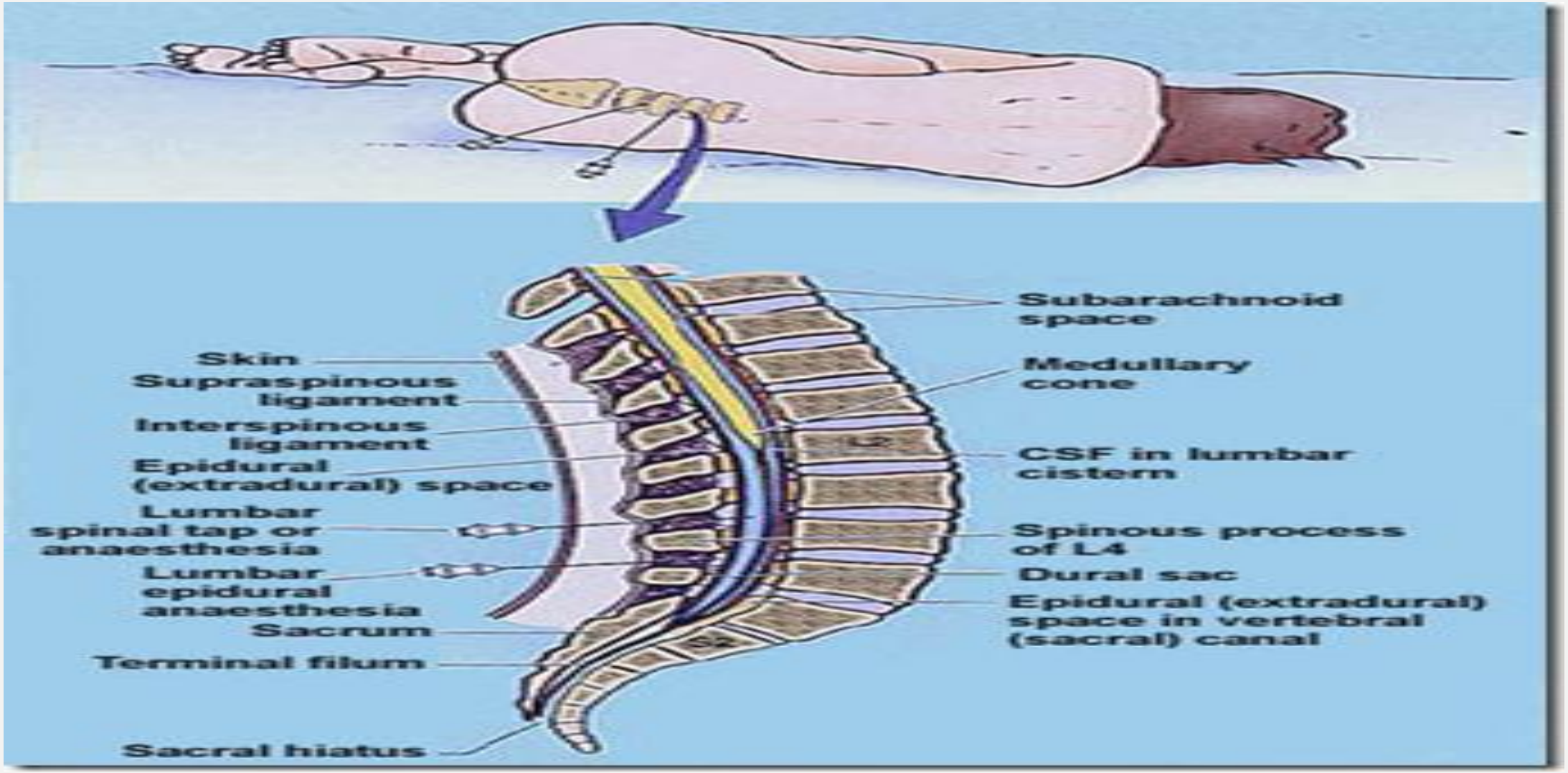
- Cardiorespiratory compromise given positioning
- Cerebral herniation or incipient herniation from increased pressure
- Correct coagulopathies
  - Check PT/INR, PTT, Fibriongen
- Platelets at least greater than 50,000 (Institutional dependent)
- If concerned about herniation/increased ICP
  - GET CT SCAN prior to LP if concerned

POSITION YOUR PATIENT



- **Patient**
http://patient.info/doctor/lumbar-puncture-pro

UNDERSTANDING YOUR LANDMARKS

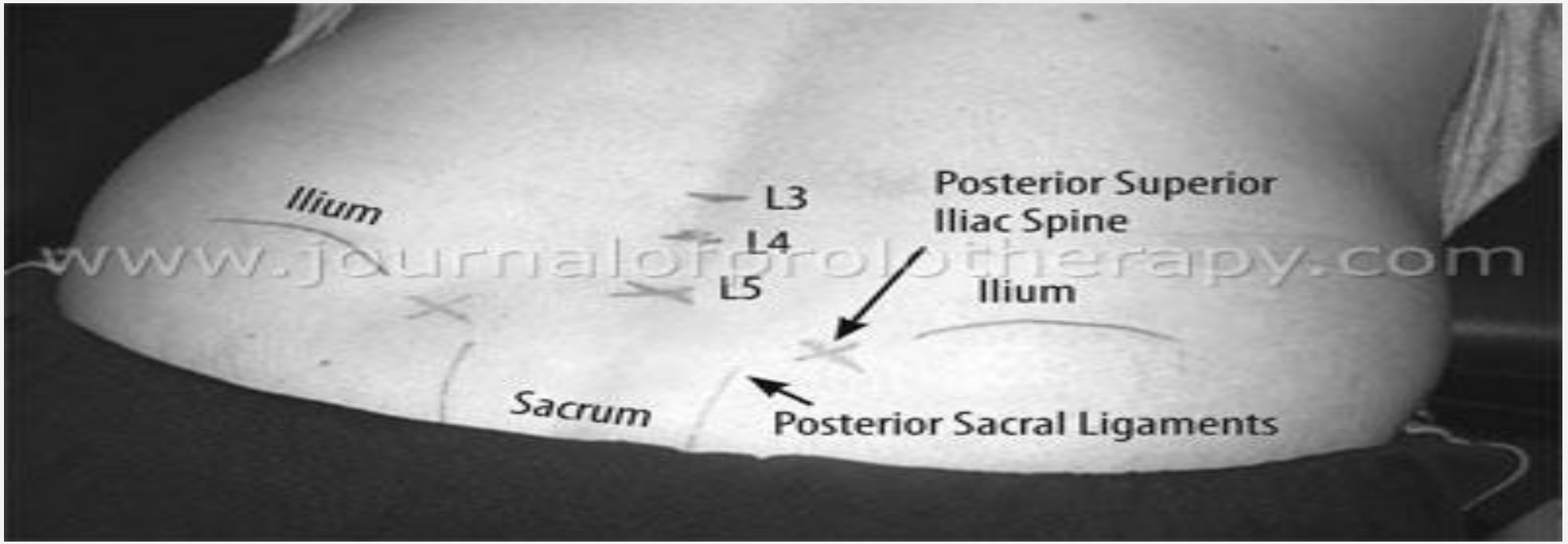


Related Keywords & Suggestions: Lumbar Puncture
http://www.keyword-suggestions.com/bHVtYmFyIHB1bmN0dXJlIGxhbmRtYXJrcw/

UNDERSTANDING YOUR LANDMARKS

Bonadio, W. (2014). Pediatric Lumbar Puncture Cerebrospinal Fluid Analysis. *Journal of Emergency Medicine, 46*(1), 141-150.

UNDERSTANDING YOUR LANDMARKS



www.journalofprolotherapy.com

- Draw a line visually between superior aspects of the iliac crests that intersects the midline at L4 spinous process
- Needle will be inserted between L3-L4 or L4-L5

Auburn, A., Benjamin, S., & Bechtel, R. (2009). Prolotherapy Agents: Functional Prolotherapy. *Journal of Prolotherapy, 1*(3), 181-183.

POSITIONING YOUR PATIENT

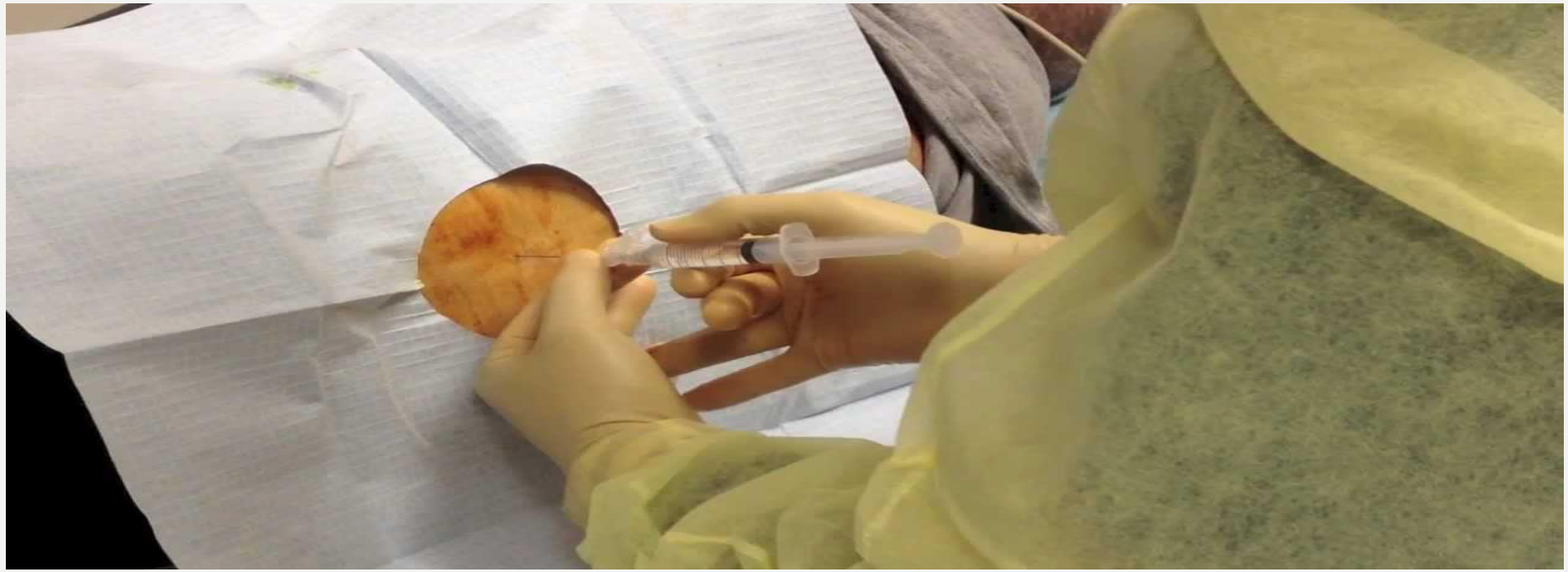
- Lateral recumbent, prone, or sitting upright
- Must be lateral recumbent to measure opening pressure
- Highest points of iliac crests should be identified visually and confirmed by palpation---direct line joining these is the fourth lumbar vertebral body
- This line may intersect ranging from L1-2 to L4-5 and tends to be higher in females and obese patients
- The L3-L5 spinous processes and the interspaces can usually be directly palpated and can safely be used since below termination of spinal cord
- Remain in fetal position with neck, back and limbs held in flexion

PREPARING THE STERILE FIELD APPLICATION OF LOCAL ANESTHETIC

- Use povidone-iodine or chlorhexidine to sterilize the field and allow to dry before the procedure
- Many product inserts of chlorhexidine containing solutions warn against use because of a risk of arachnoiditis, but evidence is limited and many experts believe chlorhexidine has an advantage (Amorim JA, Cephalagia 2012; 32:916)
- May need institutional policy to allow use of chlorhexidine

LWW
http://journals.lww.com/em-news/blog/theproceduralpause/Pages/post.aspx?PostID=22

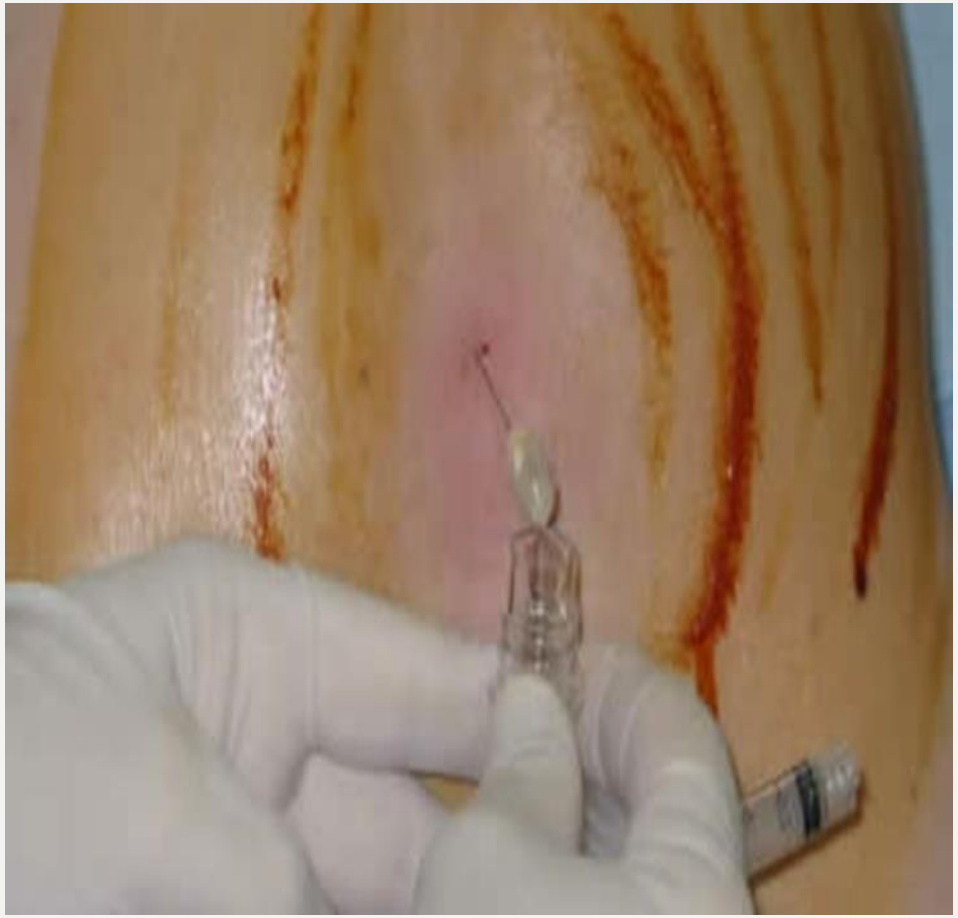
RECEIVING LOCAL ANESTHETIC



- Place sterile drape first then use local anesthesia(e.g. lidocaine) to infiltrate the previously identified lumbar intervertebral space.

YouTube
theedexitvideo - https://www.youtube.com/watch?v=yYZxNsnf18Y

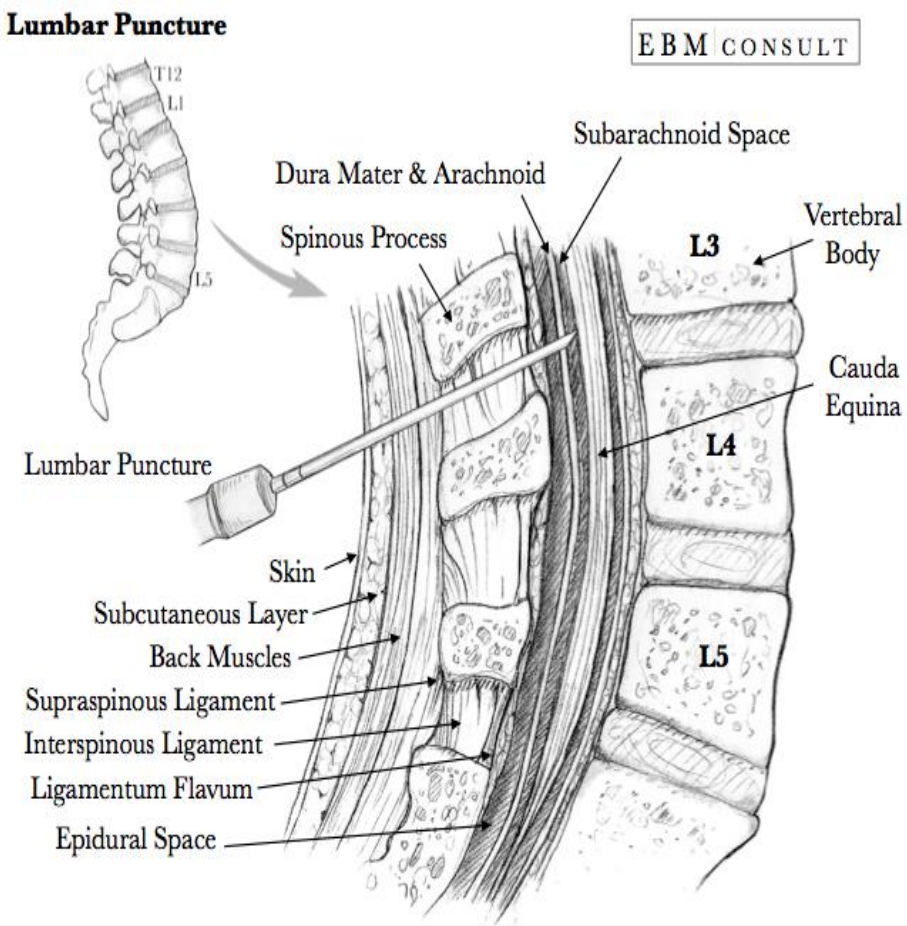
INSERTING THE NEEDLE



- A 20 to 22 gauge spinal needle containing a stylet is used
- Insert the needle with the stylet firmly in place at the superior aspect on the inferior spinous process in midline
- Angle should be about 15 degrees cephalad or toward the umbilicus
- If using beveled needle the bevel should be in sagittal plane (to avoid cutting dural sac)
- Two methods
  - Advance needle incrementally and remove stylet periodically
  - Remove stylet after skin puncture and advance until passed into subarachnoid space in order to observe flow

Brain Diagnostic Tests and Monitoring
http://www.lhsc.on.ca/Patients_Families_Visitors/ICU/Guide_to_Care/BrainDiagnosticTestsandMonitoring.htm

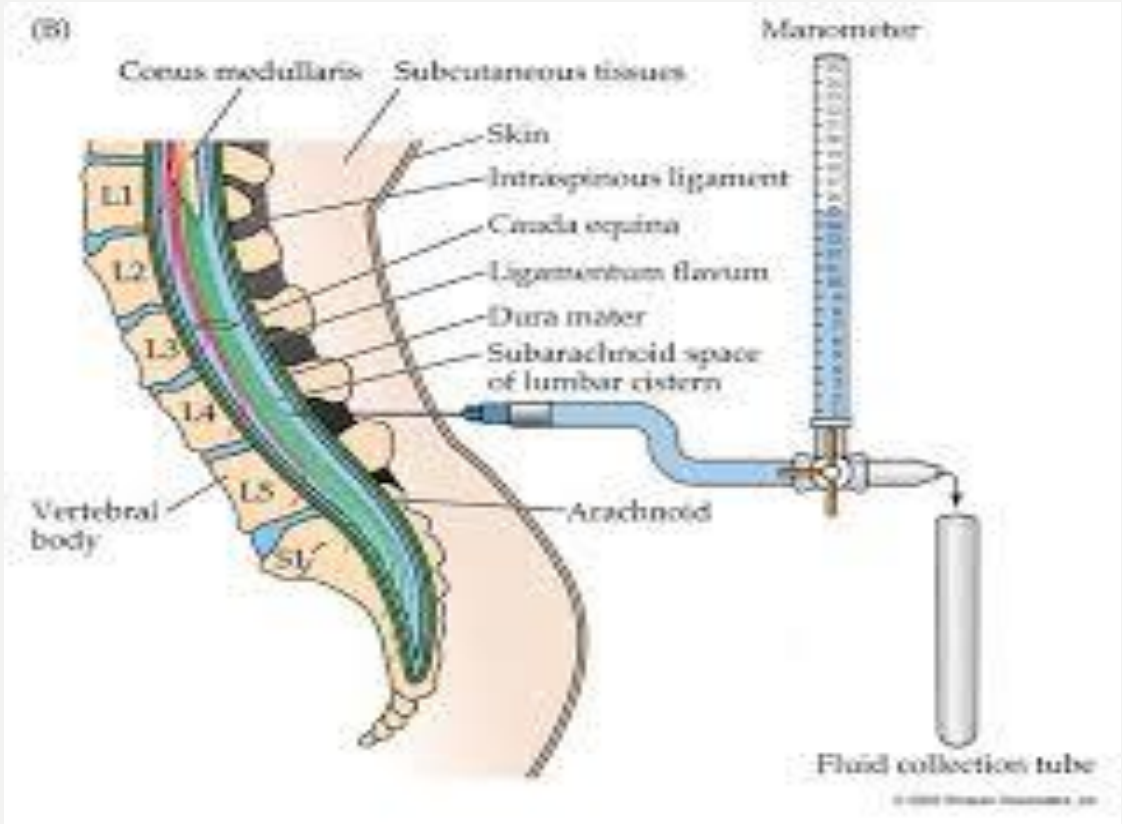
INSERTING THE NEEDLE



- Skin
- Subcutaneous tissues
- Supraspinous ligament
- Interspinous ligament between the spinal processes
- Ligamentum flavum "The Pop"
- Epidural space
- Dura
- Arachnoid
- Subarachnoid space

Procedure: How to Do a Lumbar Puncture
http://www.ebmconsult.com/articles/procedure-lumbar-puncture

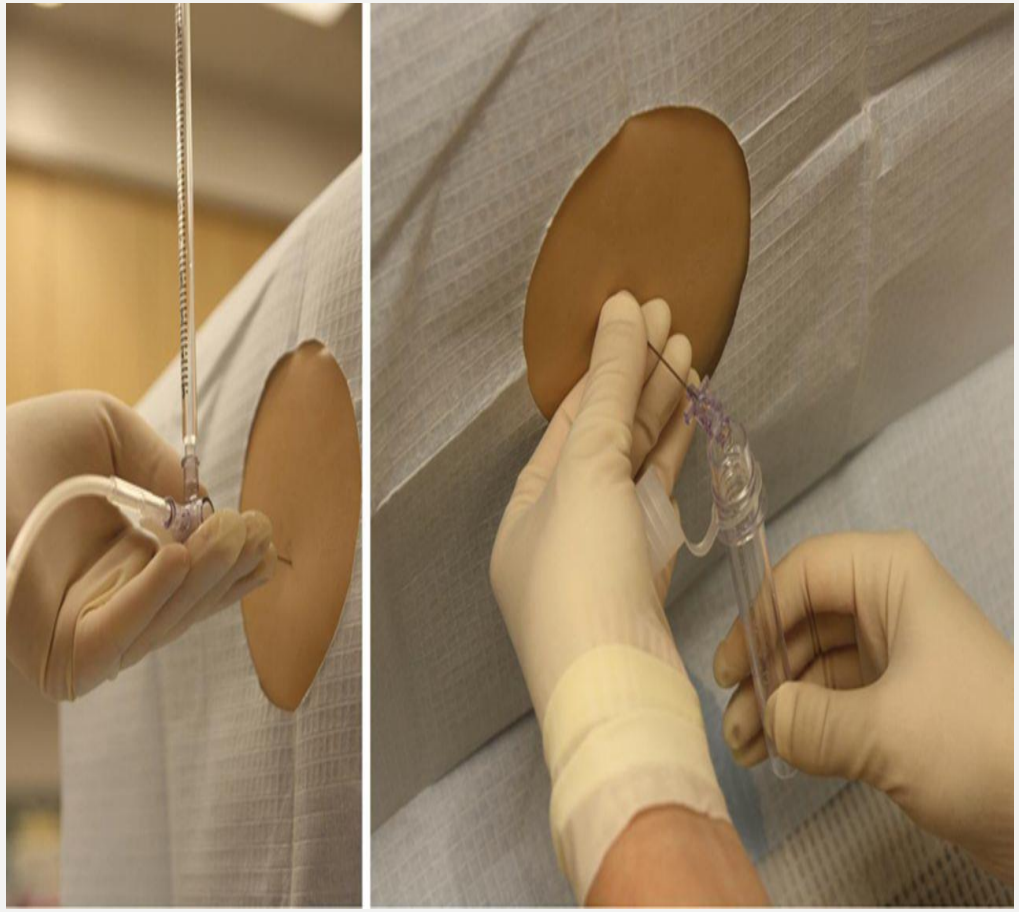
OPENING PRESSURE



- Can only take place in lateral recumbent position before you collect the samples
- Use a flexible tube to connect monometer to hub of the needle
- Measurement is made after the column of fluid stops rising
- Affected by the breathing of the patient

Lumbar Puncture
healthcare-professionals.sw.org

COLLECTING YOUR SAMPLE



- How much fluid do you need?
- Keep sample amount as small as possible but 40ml can be safely removed if needed for special studies
- If taking opening pressure, collect fluid by turning stopcock toward the patient
- Replace the stylet once fluid collection completed to reduce risk of post lumbar puncture headache

Sign In
http://www.neurology.org/content/79/2/132/F2.expansion.html

COMMON INTRATHECAL THERAPY

- Methotrexate
- Cytarabine
- Pemetrexed
- Topotecan
- Hydrocortisone
- Rituximab
- Thiotepa

INTRATHECAL CHEMOTHERAPY
SIDE EFFECTS

- Infection
- Hemorrhage
- Headache
- Arachnoiditis
- Meningitis
- Nausea/vomiting
- Backache

POST LUMBAR PUNCTURE CARE

- Place bandage over the site and ensure hemostasis
- Caffeine
- No trials have shown that bed rest following LP significantly decreases the risk of post LP headache (Strupp J. Neurology 1998; 245-589)
- Most clinicians tell patients to lay flat for 1 hour

POST LP HEADACHE

- Most common complication caused by leakage of CSF from the dura and traction on pain sensitive structures
- Present with frontal or occipital headache within 24-48hours of the procedure, exacerbated in upright and improved in supine position
  - May be associated with nausea, vomiting, dizziness, tinnitus, and visual changes
- Taking large volumes of CSF can cause an immediate post procedural headache from decrease in intracranial CSF pressure triggering meningeal vasodilation [1]
- Needle Size: Larger spinal needles produce more frequent post LP headaches [2]
- Direction of Bevel: Incidence of headache after lumbar puncture is less if needle is inserted with bevel parallel to dural fibers [2]
  - Separating vs. Cutting
- Needle Design [2]
  - Atraumatic needles with diamond shaped tip
- Replacement of the stylet [2]
- Number of Lumbar puncture attempts [2]

[1] Factors-Associated With the Onset and Persistence of Post-Lumbar Puncture Headaches. (2014). *JAMA, 72*(3), 325-332.

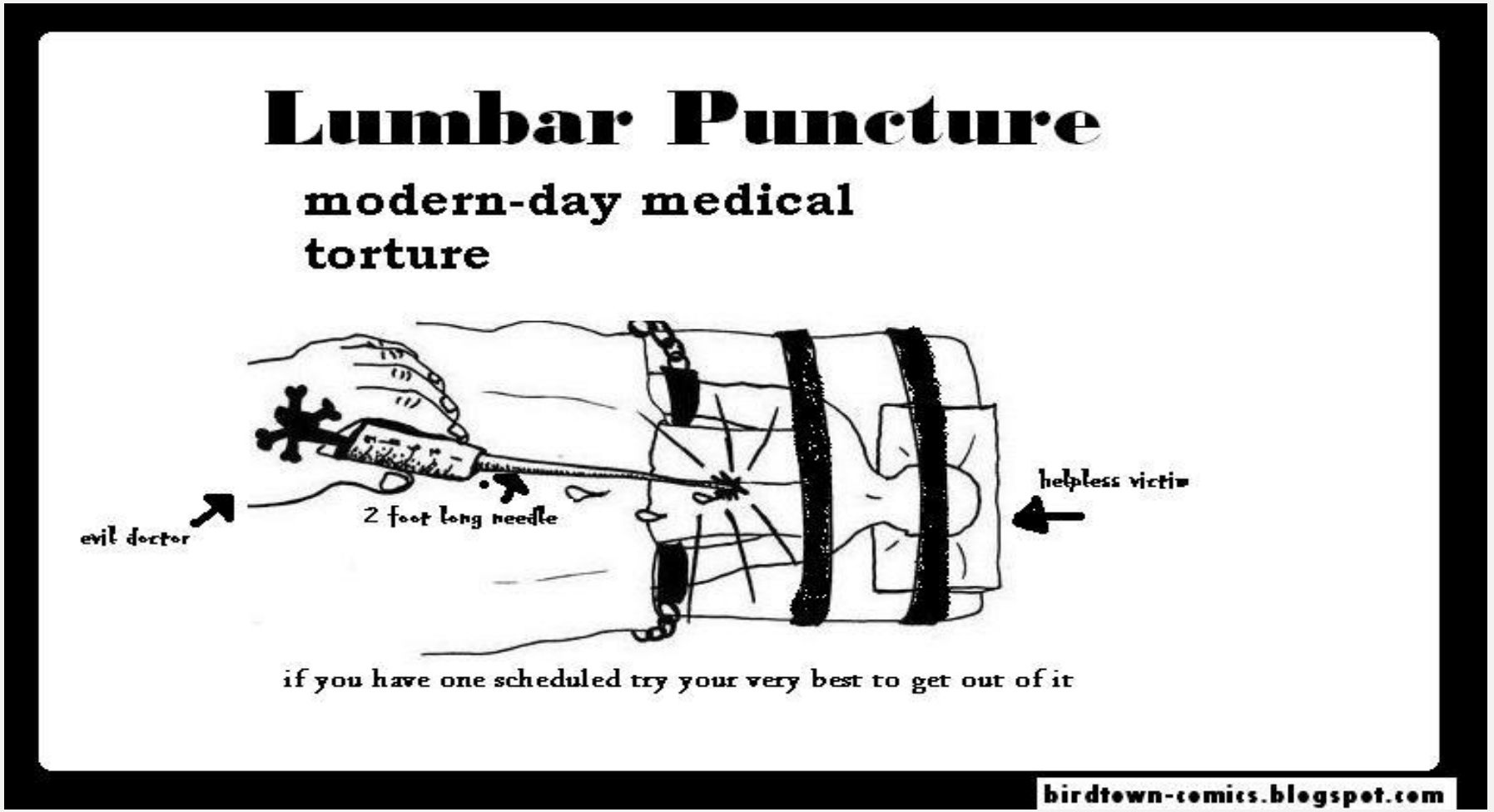
[2] Ahmed, S. V., Jayawarna, C., & Jude, E. (2006). Post Lumbar Puncture Headache: Diagnosis and Managment. *Postgrad Med Journal,* (82), 713-716.

POST LP HEADACHE MANAGEMENT

- Supine Position
- Hydration: Oral or if needed intravenous
- Caffeine
  - Can act as cerebral vasoconstrictor
- Epidural blood patch
- Surgical Closure of the dural gap

Ahmed, S. V., Jayawarna, C., & Jude, E. (2006). Post Lumbar Puncture Headache: Diagnosis and Managment. *Postgrad Med Journal,* (82), 713-716.

QUESTIONS?


Lumbar Puncture
modern-day medical torture
evil doctor
2 foot long needle
helpless victim
if you have one scheduled try your very best to get out of it
birdtown-comics.blogspot.com