

VII. Back



31. Lumbar Puncture

PURPOSE: To diagnose central nervous system infections, subarachnoid hemorrhages, and many other neurologic pathologies.

EQUIPMENT NEEDED (FIGURE 31-1):

- Spinal or lumbar puncture tray (specifically the items listed below)
- Sterile gloves
- Manometer
- Three-way stopcock
- Sterile dressing
- Antiseptic solution with skin swabs
- Sterile drape
- 1% Lidocaine
- 3-cc syringe
- 20- and 25-gauge needle
- 20- and 22-gauge spinal needle
- Four plastic test tubes, numbered 1 to 4, with caps

TECHNIQUE:

1. Obtain informed consent from the patient or next of kin.
2. Obtain a CT scan of the head or perform a fundoscopic exam to check for papilledema. It is absolutely necessary to rule out increased intracranial pressure before proceeding.
3. Place the patient in a sitting position on the edge of the bed (much like the position for a spinal or epidural) or in a lateral recumbent position (lying on the side with knees tucked to chest and chin to chest) (Figure 31-2).
4. Locate the L3-L4 space. To do this, find the iliac crests and move your fingers medially from the crests to the spine.

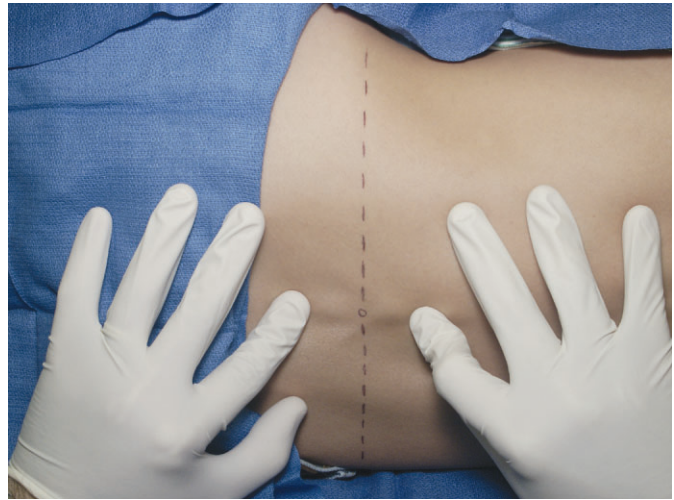


31-1 Standard commercial lumbar puncture kit.

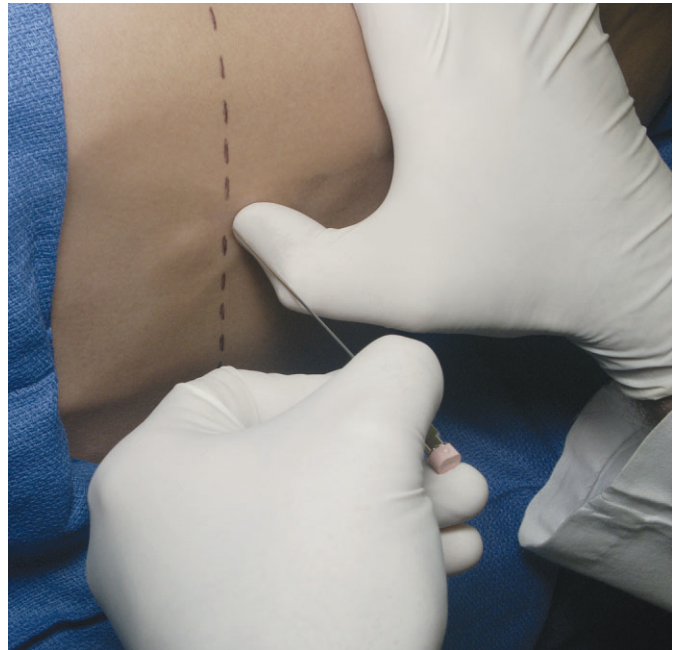


31-2 Lateral recumbent position for lumbar puncture.

5. Mark the entry site with your thumbnail or a marker (Figure 31-3).
6. Open and prepare the spinal tray in a sterile manner.
7. Assemble the stopcock on the manometer and set it aside, ensuring that everything is kept sterile.
8. Use the skin swabs and sterile antiseptic solution to clean the skin at the interspace you have chosen, along with the space below (in case you need to move to the lower space after a failed attempt). Clean the L3-L4 space in a circular fashion starting at the center and moving outward. (Do not spill cleaning solution on the tray.)
9. Place the sterile drape on the patient.
10. Use the 25-gauge needle and the 3-cc syringe to administer the 1% lidocaine intradermally, creating a skin wheal.
11. Remove the 25-gauge needle, and use the 20-gauge needle to anesthetize the deeper subcutaneous tissue.
12. Open the plastic numbered test tubes and place them upright in the preformed circular slots in the tray while you are waiting for the lidocaine to take effect.
13. Insert the spinal needle (20- or 22-gauge) through the skin wheal between the L3 and L4 spinous processes at a slightly cephalad angle toward the umbilicus (Figure 31-4).
14. Advance the needle slowly but smoothly. Usually a characteristic “pop” is felt as the needle passes through the dura (usually 4 to 5 cm into the skin).



31-3 Lumbar puncture landmarks.



31-4 Insertion of lumbar puncture spinal needle.

15. Stop and remove the stylus to observe for fluid return once you think you have felt the pop (Figure 31-5). If you see no fluid, you have not yet passed through the dura and you must replace the stylus and advance a few millimeters to recheck.
16. Attach the stopcock to the needle once cerebrospinal fluid (CSF) is seen in the needle hub, and turn the stopcock to allow flow into the manometer. This is the opening pressure. Make a mental note of the pressure and color of the CSF.
17. Switch the stopcock to collect about 3 cc of CSF in the four plastic numbered tubes starting with tube number 1 (Figure 31-6).
18. Remove the needle from the patient's back.
19. Place a sterile dressing on the site and have the patient stay in the supine position for 2 hours.

COMPLICATIONS:

- Post-spinal puncture headache
- Brain herniation
- Bloody tap (may lead to hematoma)
- Meningitis

POST-PROCEDURE CARE:

1. Send the four tubes for the following labs:
 - a. Tube 1, bacteriology: Gram stain, culture and sensitivity, acid-fast bacilli, fungal cultures and stains, cell count (compare with tube 3 to differentiate traumatic tap from subarachnoid hemorrhage).
 - b. Tube 2, biochemistry: glucose, protein, and electrophoresis (if working up for multiple sclerosis to detect oligoclonal banding).
 - c. Tube 3, hematology: cell count with differential.
 - d. Tube 4, special studies if needed: VDRL (neurosyphilis), India ink (*Cryptococcus neoformans*).



31-5 Removal of stylus.



31-6 Cerebrospinal fluid collection.

PEARLS/TIPS:

- Contraindications include:
 - ◆ Puncture site infection
 - ◆ Anticoagulation
 - ◆ Increased intracranial pressure
 - ◆ Thrombocytopenia
- Remember that the spinal cord ends at the conus medullaris, which is at about the L2 level in adults.
- The smaller the needle used for lumbar puncture, the smaller the risk of post-spinal puncture headache.
- To prevent herniation, make sure patient does not have increased intracranial pressure (no papilledema, or a negative CT).

**32. Epidural and Spinal Block**

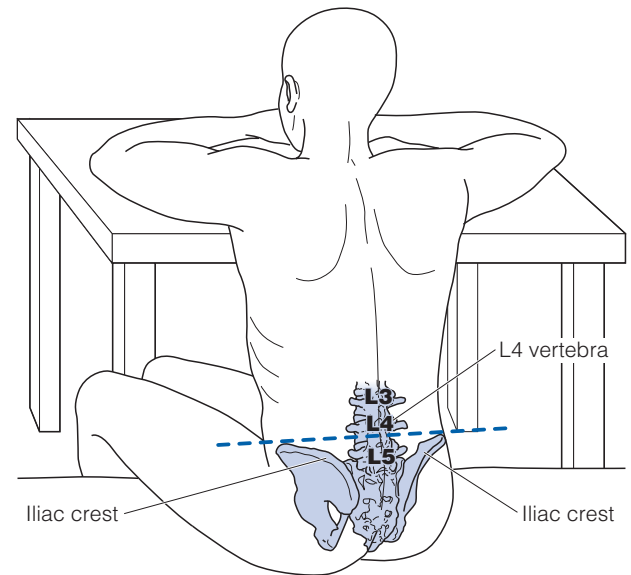
PURPOSE: To achieve analgesia for postoperative pain control, labor pains, lower abdominal or pelvic surgery, or lower extremity surgery.

EQUIPMENT NEEDED:

- Epidural tray or spinal tray should contain sterile gauze, sterile cleaning solution (such as povidone iodine, three cleaning sponges, sterile saline [0.9% NaCl], glass syringe, 18-gauge epidural needle, epidural catheter)
- 1-cc syringe
- Extra filter needle
- Fentanyl or sufentanil
- Two pairs of sterile gloves
- 25-gauge spinal needle
- 1% Lidocaine
- 1.5% Lidocaine with epinephrine
- Tape
- Clear semipermeable adhesive film (Opsite)
- 0.75% Bupivacaine
- 0.02 cc (10 μ g sufentanil)
- Assistant

TECHNIQUE #1—EPIDURAL CATHETER INSERTION:

1. Obtain informed consent from the patient or next of kin.
2. Have the patient sit on the side of the bed with his or her feet comfortably on a stool or chair (Figure 32-1). At times the patient will be unable to sit comfortably on the side of the bed; at this point it may be warranted to perform the procedure with the patient in the lateral decubitus position. Coach the patient on proper position.
3. Stand behind the patient and verbally communicate each step of the process.
4. Locate the posterior iliac crests and then the L4 vertebra by moving fingers from crests horizontally toward midline (Figure 32-1).
5. Palpate the L4 vertebra, then move superiorly off the spinous process and into the space between L3 and L4. The space must be well delineated.
6. Press a firm, visible mark in the skin using your thumb nail.
7. Put on sterile gloves, and open the epidural or spinal tray (make sure to keep tray sterile).
8. Have an assistant drop the extra 1-cc syringe and the extra filter needle onto the tray in a sterile fashion.
9. Open package of sterile cleaning solution and pour into receptacle.
10. Clean the L3-L4 space in a circular fashion with the three supplied cleaning sponges. (Do not spill cleaning solution on the epidural or spinal tray.)
11. Arrange the sterile drape (you may need your assistant to apply some tape to firmly secure the drape).
12. Dry the L3-L4 space with supplied sterile gauze. If the above is done in a timely fashion, your thumbnail mark should still be visible. If not, repalpate the L3-L4 space.
13. Anesthetize the skin by making a skin wheal with the 1% lidocaine in a 3-cc syringe and 25-gauge needle.
14. Anesthetize deeper tissue through the skin wheal.
15. Prepare epidural tray while waiting for skin analgesia.
16. Open the vial of 1.5% lidocaine with epinephrine.



32-1 Proper epidural position and location of L4 vertebra.

17. Draw 3 cc through filter and place this “test dose” to the side. Prepare the supplied glass syringe by lubricating the interior with the supplied sterile saline through filter. Some prefer to have 2 cc of saline with a small bubble inside the glass syringe, while others remove all fluid and use only air. Regardless, have the glass syringe pulled back 2 to 3 cc and ready to attach to 18-gauge epidural needle when needed. Skin analgesia should have been obtained by now.
18. Insert 18-gauge epidural needle with bevel upward through skin wheal into the interspinous ligament.
19. Attach glass syringe with 2 to 3 cc of air or saline.
20. Advance epidural needle slowly.
21. Keep needle stabilized with the nondominant hand by resting dorsal surface of hand on patient’s back. Most epidural needles have markings in centimeters.
22. Advance needle slowly while pulsating the glass syringe. While in the ligament, a firm resistance should be felt with each pulsation of the glass syringe.
23. Advance needle slowly. Most epidural spaces will be found at a depth of 4 to 6 cm. Once the needle enters the epidural space, resistance to thumb pulsations will markedly decrease.
24. Remove glass syringe and watch for cerebrospinal fluid (CSF) return. If no CSF returns, continue procedure and place epidural catheter through epidural needle. Catheter should be inserted 5 to 6 cm into epidural space (so if the 18-gauge needle is 5 cm at the skin, the catheter should be inserted to 10 cm at the skin). Never withdraw the catheter back through the needle, because this could sever the catheter.
25. Remove 18-gauge epidural needle (*do not* remove catheter with needle).
26. Insert exposed end of catheter into catheter adapter and snap the wings of the adapter together.
27. Administer “test dose” of 3 cc 1.5% lidocaine with epinephrine. Remember to aspirate first. A negative aspiration is one in which no blood is aspirated back through catheter.
28. Observe patient’s heart rate and ask patient if he or she experiences any symptoms of intravascular injection such as ringing in the ears or a metallic taste.
29. After intravascular placement of catheter is ruled out, place an adhesive-backed catheter pad and secure catheter to patient’s back with clear Opsite and tape.

30. Remove sterile drape and place patient back into supine position. You have completed the procedure and are now ready to connect the epidural catheter to an infusion pump if so desired.

TECHNIQUE #2—SPINAL BLOCK:

1. Prepare patient as above in steps 1 through 14.
2. Draw up the medication desired for spinal block while waiting for skin analgesia. A dose of 1.6 cc of 0.75% bupivacaine and 0.2 cc (10 µg) of sufentanil will suffice for an adult of average height. Remember to use a filter needle. Instead of the 18-gauge epidural needle, use the included sterile introducer needle and the 24-gauge spinal needle.
3. Place the introducer through the skin wheal into the interspinous ligament.
4. Place spinal needle into the introducer needle and slowly advance. You should feel a characteristic “pop” and loss of resistance when the dura has been punctured.
5. Remove the stylet from the spinal needle and observe CSF return.
6. Connect the spinal needle with the syringe of local anesthetic and opioid.
7. Aspirate and observe the CSF form a swirl in syringe.
8. Administer the medication, and remove all needles from the patient’s back.
9. Place the patient in a supine position and check the anesthesia “level” with an alcohol pad and/or sharp plastic needle. A level of about T6-T4 (about nipple line) is adequate for most procedures.

COMPLICATIONS:

- Epidural
 - ♦ Hypotension
 - ♦ Unintentional dural puncture (wet tap)
 - ♦ Intravascular catheter insertion
- Spinal block
 - ♦ Unexpected high block

POST-PROCEDURE CARE:

1. All patients who have had an epidural should be seen 24 hours after catheter removal to ensure intact sensation and motor function.

PEARLS/TIPS:

- Contraindications:
 - ◆ Patient refusal
 - ◆ Coagulopathy
 - ◆ Uncontrolled hemorrhage
 - ◆ Increased intracranial pressure
 - ◆ Infection at the site of needle insertion
- The position of the patient is the most important part of this procedure. Make sure the patient is able to open the lumbar space for you by pushing the low of his or her back out toward you. To facilitate this, have the patient relax his or her shoulders, slouch forward toward assistant, and rest chin on chest.