Lumbar Puncture Workshop

Neurology Clerkship

Washington University

Workshop Objectives

* Explain the procedure to the patient and obtain written consent.
* Position the patient properly, set-up LP tray, and prepare the patient by sterilizing skin and injecting local anesthetic.
* Perform proper technique to measure opening pressure and obtain fluid.
* Obtain proper studies and write procedure note.

Keys to Successful Procedure

* Good patient education and preparation, so they are reassured, relaxed, and cooperative.
* Proper positioning of the patient!
* Ensure your own comfort for the procedure!
* Proper identification of landmarks and entry techniques.

What is a Lumbar Puncture?

* CSF is a filtrate of venous blood at the choroid plexus, produced at a rate of 500 ml/day (20 ml/h).
* Total CSF volume is approximately 140 ml.
* CSF equalizes the pressure inside the brain and outside the brain and spinal cord.
* CSF serves as a physical support and cushion.
* CSF also provides biochemical support for homeostasis of inflammation, neural-endocrine transport, and excretion of metabolites and degradation products.

Why do a Lumbar Puncture?

* Evaluate for acute infection.
  * Bacterial infections (i.e. pneumoncoccal, Neiseria)
  * Viral infections (i.e. HSV, enterovirus)
* Evaluate for subacute or chronic infection.
  * Bacterial infections (i.e. syphilis, TB, cryptococcus)
* Measure opening pressure.
  * Idiopathic intracranial hypertension
* Evaluate for a tumor.
  * Carcinomatous meningitis (mets, lymphoma)
* Evaluate inflammatory and biomarker profile for diagnosis.
  * Multiple sclerosis
  * Neuromyelitis optica
  * Creutzfeldt-Jakob disease

What are the contraindications?

* Brain mass
  * Large intracranial mass lesion with midline shift.
  * Brain lesions with potential to expand over the next couple days.
  * Obstruction of CSF pathways (i.e. non-communicating hydrocephalus)
* Bleeding disorder
  * Coumadin
  * Platelet count <50,000
  * INR >1.5
* Overlying skin abscess or cellulitis

What are the Risks?

COMMON

* Post LP Headache (10 – 20%)
* Sore Back
* Brief Radicular symptoms during procedure

* UNCOMMON
* Bleeding (hematoma with nerve root compression)
* Infection (sterile technique)

Pearls for the Consenting Process.

* Simple, common, and safe procedure.
* Very important for proper diagnosis and treatment.
* CSF will be replenished within hours after the procedure.
* We will use a lot of lidocaine to minimize any discomfort.
* Possible side-effects are…
* Unlikely complications are...
* Questions or concerns?

* Almost all are reassured after you talk to them. If anxiety remains very high, can try alprazolam 0.125 – 0.25 mg before procedure.
* Sometimes, recruiting a family member to be with the patient can be helpful.

Patient Positioning

* Entire back should be exposed to ensure no twisting or sagging.
* Back should be aligned to the edge of the bed or table.
* Support head with 1-2 pillows.
* When you begin, patient should bring knees-to-chest and chin-to-chest.
* Feel for hips and find the L3-4 interspace. Mark the space with a big ‘X’, or make an impression with a retractable pen.

Procedure Set-Up

* Perform entire procedure sitting with everything within reach (chair, tray, bed height, waste basket).
* Need kit, Sprotte needle, 5 cc syringe, extra tube of 1% or 2% lidocaine, sterile gloves, and Betadine.
* Helpful to have a partner, or tape extra lidocaine to table.
* Take top off kit, unfold sterile kit coverings holding outside, add Betadine, Sprotte needle, and 5cc syringe to kit.
* Start kit prep: Put on gloves, fill syringe with large needle then replace with small needle.

Sterilize and Anesthetize

* Soak sponge with Betadine and remove all excess.
* Start with demarcated entry point and make concentric circles.
* Add drape, and dry entry point with gauze.
* Warn patient, make a lidocaine wheal with the small needle.
* Switch to the larger needle and inject 1 cc into 4 quadrants.
* Finish kit prep: Open and stand-up tubes, assemble manometer.

Needle Insertion

* Ask patient to curl tight, arch back, and take deep breaths.
* Insert cutting needle between spinous processes, aiming towards navel.
* Insert Sprott needle towards the navel.
* If the needle stops short, you are probably hitting a pedicle, and you need to back-up and move towards center.
* If your needle hits the hub, you are probably in the psoas muscle. You need to take-out the needle and restart.
* If your needle goes deep and stops, you probably hit the vertebral body. Back-up a touch, and check for fluid.

Opening Pressure and Fluid Collection

* Get manometer ready. Have patient relax their fetal-position and take deep breaths.
* Remove the stylus and add the manometer.
* Record the level once it stabilizes.
* Move the stopcock and collect the manometer fluid.
* Continue to fill vials.
* If fluid stops, try giving needle a quarter turn, push it in a nudge, or back it out a touch. Never aspirate CSF.

Finishing the Procedure

* Replace stylet, remove needle, clean back with warm water and towel, dry and add band-aid.
* Ensure ALL sharps are accounted and disposed.
* Patient can get-up when they feel ready.
* No strenuous activity for the rest of the day.
* If they get a headache, take OTC analgesic, drink fluids, lie down.
* If headache is severe or persistent, call for prescription meds or a blood patch.

Studies

* Tube 1 (Microbiology): Gram's stain, Cryptoantigen, bacterial/fungal/mycobacterial cultures, PCR tests. Cell count and differential if bloody.
* Tube 2: Cytology (if indicated) or hold for add-on studies.
* Tube 3 (Chemistry/Immunology): Protein, glucose, VDRL, CSF immunoglobulin index (requires paired serum sample).
* Tube 4 (Hematology): Cell count with differential.
* Personally ensure labs go immediately to lab. Each tube needs patient name, DOB, and hospital number.

Note

* Review of coag studies and imaging.
* Sterile prepping and draping procedure.
* Amount of lidocaine.
* Needle type.
* Patient position and interspace entered.
* Opening pressure.
* Amount of fluid.
* Patient tolerance and disposition.

On Workshop Day

* Clerkship group will be divided, with separate start times.
* Stations:
  * Patient explanation, consent, and positioning
  * Opening tray, gloving, set-up tray, anesthetize
  * Mannequin for obtaining opening pressure and fluid