

# Lumbar Puncture

**Indications:** diagnosis or exclusion of possible meningitis, subarachnoid haemorrhage or CNS diseases (e.g. GBS, MS); relief of idiopathic intracranial hypertension

**Contraindications:** ↑ICP; midline shift; brain abscess; coagulopathy (INR >1.4, platelets <50, oral anticoagulant <24 hours, clopidogrel <7days); infection over puncture site

## Introduction

- Wash hands, Introduce self, Patients name & DOB & wrist band, Explain procedure and get written consent
  - Common risks: headache; bleeding/haematoma; paraesthesia; pain; infection; failure
  - Rare risks: tonsillar herniation; CSF leak; damage to local structures (including nerves)
- Perform CT head pre-LP if: risk of ↑ICP (*suggested by* ↓GCS, focal neurology, pupil abnormalities, papilloedema, seizures); elderly (>60y); immunocompromised; known CNS lesion
- \*\*Check patients clotting screen, platelet count and if they have been on an oral anticoagulant/clopidogrel\*\*
- Ensure assistant is available and make sure there is a chair for you to sit on next to the patient

## Preparation part

- Wash hands and apply apron
- Clean a trolley
- Gather equipment onto bottom of trolley (think through what you need in order)
  - Sterile pack
  - Cleansing snap-sponge (iodine or alcohol/chlorhexidine) x2
  - Sterile drape with hole in centre (or 2-3 drapes without holes in)
  - 10ml syringe and 3 needles (1 orange 25G, 2 green 21G) for local anaesthetic
  - Lumbar puncture equipment
    - Spinal needle (usually start with black 22G needle, or less flexible yellow 20G needle in larger patients)
    - LP manometer
  - Cotton gauze swabs (used whenever needed throughout procedure to dry/clean sterile area)
  - Sterile dressing
  - Equipment to be kept outside of the sterile field
    - Sterile gloves
    - 10ml 1% lidocaine (maximum 3mg/kg – note 1ml 1% lidocaine = 10mg)
    - 4 white-topped sample collection bottles (labelled with biro 1-4)
    - 1 grey biochemistry sample bottle for glucose
- Walk to patient
- Wash hands
- Open sterile pack to form a sterile field on the top of the trolley
- Open packets (without touching the instruments themselves) and drop sterile instruments neatly into the sterile field
- Pick up waste bag from sterile pack without touching anything else and stick to side of trolley

## Patient part

### Positioning and exposure

- Expose patient's back
- Position patient
  - Lying on their left-hand side on a flat bed with their neck, hips and knees flexed as much as possible (foetal position)
  - Ask them to hold their knees as close to their chest as possible and touch their chin on their chest
  - Place a pillow between their knees and under their head
- Locate insertion point:
  - Identify iliac crests
  - The disk space in the horizontal plane between the iliac crests is L3-4
  - The insertion point is mid-way between the L3/L4 (or L4/L5) spinous processes
- Mark insertion point with a skin pen/indentation

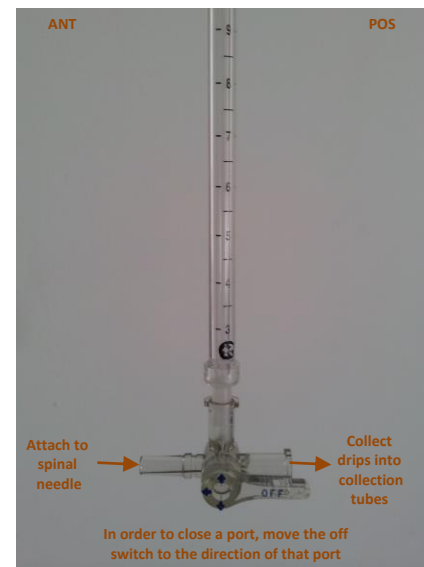
### Preparation

- Wash hands
- Apply sterile gloves using sterile technique (open pack on a side surface)
- Sterilize area
  - Work from middle outwards in one spiral motion (use cleansing snap-sponge)
  - Repeat this with 2<sup>nd</sup> cleansing snap-sponge
  - Ensure you also clean the iliac crests (for repeat palpation)
  - *Discard used snap-sponges as they are no longer sterile, but note all equipment used after this (including all needles) can be returned to the sterile field after use*

- Apply the sterile drape over the patient's body so that the hole is in the correct place to allow access to the insertion site (or apply 2-3 drapes centred around exposed insertion site if no holes)
- Anaesthetise tract
  - Ask assistant to snap open lidocaine bottle and hold open upside-down
  - Draw up lidocaine using 1<sup>st</sup> green needle on 10 ml syringe
  - Change to the orange needle and insert at an acute angle to form a single subcutaneous bleb around insertion site in order to anaesthetise the skin
  - Change to the 2<sup>nd</sup> green needle and insert perpendicular to the skin to anaesthetise the insertion tract
    - This is done by instilling lidocaine in small increments of increasing depth
    - Always aspirate when advancing the needle (so you know if you get to the subarachnoid space) and aspirate before injecting lidocaine (to check you are not in a vessel)
    - Stop if CSF is aspirated (this will not occur in most people because the needle will not be long enough to enter the subarachnoid space)
    - Leaving the needle in (so you do not lose the position), disconnect syringe and wait 1 minute to take effect
- While waiting for anaesthetic to work, assemble manometer if unassembled

### Performing the LP

- Needle insertion
  - Remove green needle used to anaesthetise the tract
  - Insert the spinal needle perpendicular to the skin aimed towards the umbilicus at the same insertion point as the green needle (with the bevel facing towards the patient head)
  - Use both hands – one gently holding needle close to skin to angle it, the other holding the needle slightly distally to provide necessary force
  - Slowly advance through the insertion tract, regularly withdrawing the stylette at small increments of increasing depth (observing for drips of CSF to determine if you are in the subarachnoid space)
  - The subarachnoid space is deep to the dura (~5cm depth) where you may feel a 'give'
  - If you strike bone at any point, withdraw the needle slightly, re-angle and advance again
  - Once you are in the subarachnoid space, CSF will start to drip from the needle when you withdraw the stylette
- Pressure measurement
  - Remove the stylette and place back into sterile field
  - Connect the manometer to the needle via the 3-way tap (off switch pointing posteriorly to close posterior tap)
  - CSF will rise up the manometer
  - Note the pressure at the point it stops rising
- Sample collection
  - Ask the assistant to place the collection bottles under the posterior tap in labelled order
  - When ready, turn the 3-way tap off switch anteriorly to close the tap connected to the spinal needle – allowing CSF to drip from the manometer gage into the collection tubes
  - When all the CSF from the manometer gage is used up, turn the 3-way tap off switch superiorly, to allow CSF to bypass the manometer gage and drip straight from the patient into the tubes
  - Collect 10-15 drops into each tube
  - Lastly, ask assistant to collect 5-10 drips into grey biochemistry tube
- Completion
  - Remove the manometer and 3-way tap
  - Replace the stylette and then remove the needle (reduces headache incidence)
  - Apply a sterile dressing



### To complete

- Thank patient and cover them
- Advise patient to stay lying for at least 1 hour
- Ask nurses to perform neurological observations twice during the hour
- Bin waste and gloves, dispose of sharps safely, clean trolley and wash hands
- Label sample tubes and urgently send to lab for
  - White sample tubes (labelled 1-4)
    - MC&S x2 - **tubes 1 and 3** → microbiology
    - Protein and glucose - **tube 2** → biochemistry
    - Xanthochromia - **tube 4** → biochemistry (keep this sample dark in an envelope)
    - Others e.g. oligoclonal bands, PCR (meningococcal, VZV, herpes simplex, EBV)
  - Grey biochemistry tube
    - Glucose → biochemistry
- Perform venepuncture to determine concurrent blood glucose and protein level
- Fully document LP procedure in patients notes