Approved by Safety & Quality Committee
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Lumbar Puncture

This Local Operating Procedure is developed to guide safe clinical practice in Newborn Care Centre (NCC) at The Royal Hospital for Women. Individual patient circumstances may mean that practice diverges from this Local Operating Procedure.

INTRODUCTION

Lumbar puncture (LP) is a procedure to safely sample cerebrospinal fluid (CSF) for evidence of bacterial, viral or fungal infection, biochemical analysis or markers of metabolic disorders. In some cases (eg. haemorrhagic hydrocephalus), LP is performed to decrease ventricular dilatation.

1. AIM

- To obtain a sample of CSF

2. PATIENT

- Newborns

3. STAFF

- Medical and nursing staff

4. EQUIPMENT

- Spinal needle
- Dressing pack
- Sterile green drapes x 1
- Plastic drape x 2 (1 x small, 1 x large)
- Sterile scissors
- Chlorhexidine 0.5% maxi swab x 2
- Hat and mask
- Sterile gown
- Sterile surgical gloves x 2
- 25% oral sucrose
- 3 x sterile yellow top specimen tubes (5 ml capacity)
- Blue incontinent sheet
- Tegaderm
- CSF neurotransmitter tubes if required (can be requested from SEALS specimen reception)

NOTE:
Spinal needles

- **In term or near term infants use a 22G spinal needle**
- **In preterm infants use a 25G spinal needle (or a 25G orange needle if not available)**

5. CLINICAL PRACTICE

1. Explain the procedure to infant's parent/s and obtain consent.
2. Perform a *Clinical Procedure Safety Check* prior to procedure:
   - Log on to infant's eMR
   - Click on *Chart* on task-bar above Infant's information bar (blue bar) for drop-down field
   - Click on *Ad Hoc Charting*
   - Tick in the box for *Clinical Procedure Safety Checklist Level 1*
   - Click on *Chart* at the bottom right of page for the form
   - Complete checklist before starting the procedure
3. Check resuscitation equipment is available for use if needed:
   - Suction equipment
   - Neopuff/resuscitator
   - Oxygen

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4. Perform hand hygiene.
5. Examine the infant, orientate to the infant's anatomy and identify the insertion site prior to scrubbing.
6. Collect equipment. Clean work surface with neutral detergent.
7. Don hat and mask.
8. Perform procedural hand wash.
9. Don sterile gown and gloves (closed gloving).
10. Assistant:
    - Open the sterile plastic drape for the proceduralist to cover the work surface
    - Open equipment for the proceduralist
11. Assistant administers oral sucrose prior to starting the procedure (refer to Australasian Neonatal Medicines Formulary guideline). If on morphine infusion, a bolus dose can be considered.
12. Positioning the infant:
    - Place a blue incontinent sheet under the infant
    - Position the infant in a lateral decubitus position with legs fully flexed (knee-chest position) (Picture 1) with the infant's back at the edge of an open bed (the nappy should be below the natal cleft)
    - The infant must be held firmly by the assistant, maximising thoracic and lumbar flexion but avoiding neck flexion which may compromise the airway
    - Ensure that the hips are aligned vertically, if the top hip falls forward the chance of overshooting the spinal space increases
    - Observe the clinical condition of the infant during the procedure
13. Preparation:
    - Clean the identified lumbar puncture site with chlorhexidine maxi swabsticks – start at the approximate insertion site and prep in a widening circle (including the iliac crest)
    - Allow antiseptic solution to dry and repeat cleaning
    - Apply green drape beneath the infant
    - Place plastic drape with fenestration or hole (cut with sterile scissors) positioned over insertion site (Picture 1)
    - Ensure the infant's mouth and nose are not covered by drapes
    - Remove second pair of sterile gloves

Picture 1

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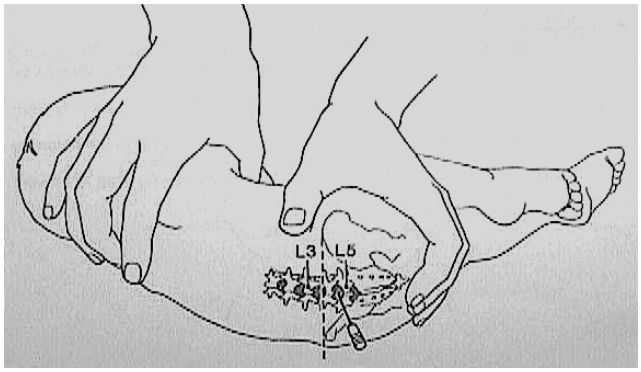
14. Identify anatomical landmarks (Picture 2):
    - Palpate both iliac crests and draw and imaginary line between them
    - The interspace above the line should correlate with L3-L4 and the interspace below the line should correlate with L4-L5
    - The termination of the cord ascends from L4 to L2 between 25-40 weeks:
        - Access the L4-L5 space in preterm babies
        - Access the L3-L4 space in term or older infants

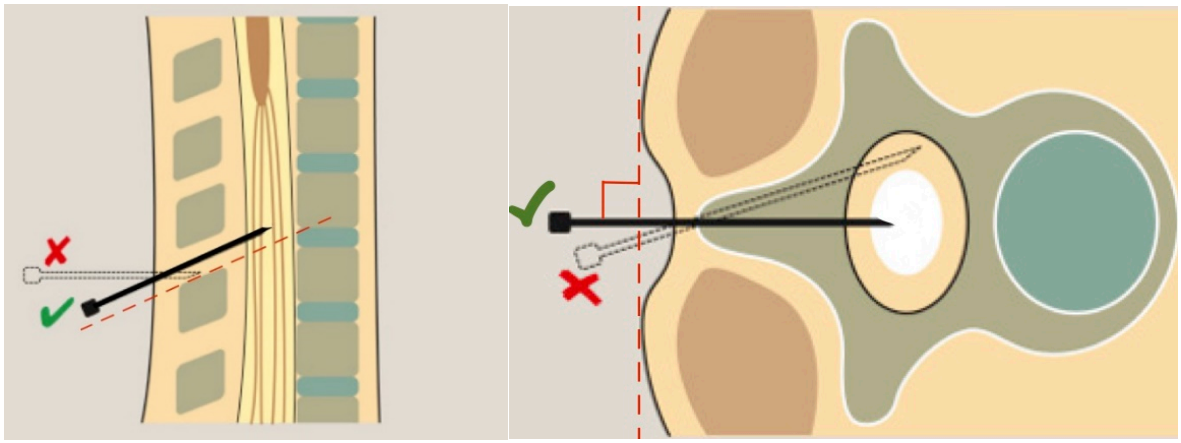


Picture 2

15. Procedure:
    - Confirm desired site of entry and anticipate the course of the needle. There are two reference points for the entry point and two planes for the path of insertion that need to be considered:
        - Point of entry
            - Longitudinal: palpate the space, the needle tip should enter in the bottom half of the space
            - Lateral: palpate the lateral margins of the spinous processes, the needle tip should enter exactly halfway between
        - Plane of passage
            - Longitudinal: the needle should pass slightly cephalad which will allow it to remain parallel to the upward sloping spinous processes and smoothly into the spinal canal
            - Lateral: the needle must be horizontal to the bed, and exactly perpendicular to the vertical back. It is important to keep the hips aligned vertically so the needle does not overshoot the spinal space
    - Insert the spinal needle into the designated area of the spine.

Lumbar Puncture cont'd

- Enter skin strictly in midline - aim for a 90° angle, slightly towards the head of the infant. (Picture 3)



Picture 3

- While keeping the non-procedural thumb on the higher spinous process, insert the needle with the bevel up and stylet in situ. The baby may wriggle when the skin is pierced, so pause for a moment before advancing.
- Advance the needle to the required depth (a term infant will require insertion to 1-1.5 cm, less in a preterm baby).
- Slightly withdraw the stylet to check for CSF. If no CSF, advance by 0.5 cm and reassess. If no CSF, advance a further 0.5 cm and reassess. Do not advance further than this.
- If resistance is met (usually the spinous process), slightly withdraw the needle and re-angle based on the principles above.
- A drop in resistance can be felt as the needle passes through the ligamentum flavum and dura mater (this can be subtle in preterm babies).
- If you feel the drop in resistance but there is no CSF egress, try rotating the needle 90° anticlockwise to face the bevel cephalad in the spinal canal.
- If there is still no CSF egress, remove the needle and use a new needle to trial in the higher interspace if possible.
  NB. NO MORE than two attempts should be taken. If no CSF is obtained, seek help from NCC fellow or consultant.
- Collect CSF for diagnostic studies. Keep the needle still with one hand using a pincer grip and use the other hand to hold the CSF tube under the dripping hub.
- The amount required may change depending on clinical scenario, but usually:
  - 5-7 drops in 3 x containers
  - The tubes should be labelled 1-3 (collect the specimens in this order)
  - The first tube will be used for culture and the last tube will be used for cell counts unless the sample progressively becomes bloody
- Remove the needle and apply manual pressure with gauze then apply an adhesive dressing.
- Discard equipment used.
- Clean the work surface and return any unused items.
- Label and send specimens with pathology form in chute.

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- Nurse infant in supine position for 1 hour post procedure if there is no evidence of distress or reactions.
- Examine the puncture site in 1 hour.
- Document the procedure in eMR.

16. Post-procedure:
    - Check LP site for bleeding or CSF leakage for 24 hours.
    - Monitor temperature with usual observations.
    - Monitor oxygen saturations for 4 hours if infant was sedated during the procedure.
    - If sedated, feeds should be withheld for 1 hour post procedure.
    - Remove the adhesive dressing at next cares.

6. DOCUMENTATION

- eMR
- Neonatal Observation Chart
- NICUS database

7. EDUCATIONAL NOTES

- Positioning of the infant is vital to the success of the procedure.
- Flexion of the spine is important to open up the interspinous spaces and stretch the skin over the processes allowing for better definition of landmarks.
- Flexing the neck will compromise the infant's airway and potentially increase cerebral venous pressure.
- Indications for LP in NCC:
    - Diagnosis of CNS infections (TORCH, bacterial, fungal)
    - Monitoring efficacy of antimicrobial therapy in the context of proven CNS infection
    - Aid in diagnosis of metabolic disease
- Other indications rarely performed in the NCC:
    - Drainage of CSF in communicating hydrocephalus associated with intraventricular haemorrhage (rarely performed in NCC when neurosurgical services available)
    - Aid in diagnosis of intracranial haemorrhage, or oncologic processes
    - Instilling chemotherapeutic agents or contrast for myelography
- Contraindications:
    - Suspicion of raised ICP (risk of cerebral herniation even with open sutures):
        - Bradycardia with hypertension
        - Irritability
        - Unequal, dilated, or poorly responsive pupils
        - Focal neurology
        - Posturing
    - Uncorrected thrombocytopaenia or abnormal coagulation (in general, product/factor corrections and/or consultation with haematology should be made if INR >1.4 or platelet count <50)
    - Overlying infection at puncture site (risk of introducing meningitis, discitis, vertebral osteomyelitis or epidural abscess)
    - Lumbosacral anomalies
    - Cardiorespiratory instability
- Consent for LP:
    - Informed parental consent must be obtained:
        - Purposes: to look for red blood cells, white blood cells, protein, glucose as markers of infection, as well as microbiology/cultures/inflammatory markers to further guide management
        - Risks: Bleeding, infection, headache/pain, failure to gain sample

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- Analgesia and anaesthetic
  - Oral sucrose is the preferred analgesic for painful procedures in the NCC
  - Local anaesthetic is not routinely used

8. RELATED POLICIES/PROCEDURES/CLINICAL PRACTICE LOP

- NSW Health Policy Directive PD2017_032. Clinical Procedure Safety. 22 September 2017. https://www1.health.nsw.gov.au/pds/ActivePDSDocuments/PD2017_032.pdf
- NSW Health Information Bulletin IB2020_010. Consent to Medical and Healthcare Treatment Manual. 30 March 2020. https://www1.health.nsw.gov.au/pds/ActivePDSDocuments/IB2020_010.pdf

9. RISK RATING

- Low

10. NATIONAL STANDARD

- Standard 1 Clinical Governance
- Standard 3 Preventing and Controlling Healthcare-Associated Infection
- Standard 5 Comprehensive Care

11. ABBREVIATIONS AND DEFINITIONS OF TERMS

NCC	Newborn Care Centre	CNS	Central Nervous System
LP	Lumbar Puncture	TORCH	Toxoplasmosis; Other (such as syphilis, varicella, mumps, parvovirus, and HIV) Rubella; Cytomegalovirus; Herpes simplex
CSF	Cerebrospinal Fluid	ICP	Intracranial Pressure

12. REFERENCES

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- Gleason CA, Martin RJ, Anderson JV, et al. Optimal position for a spinal tap in preterm infants. Pediatrics. 1983;71:31-5.
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13. AUTHOR

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