

Guidelines For Lumbar Punctures

Purpose of LPs

Diagnostic: For diagnosis of malignancy and infection and measurement of CSF pressure.

Therapeutic: For intrathecal administration of chemotherapeutic agents (methotrexate, hydrocortisone and cytarabine).

Research: Measurement of drug levels.

Timing of LPs

Whenever possible, LPs should be performed Monday to Friday 0800–1700 hr.

Exceptions:

- Suspected meningitis/encephalitis.
- Unstable newly diagnosed or newly relapsed patients, when timing of diagnosis and/or intrathecal chemotherapy is deemed to be crucial.

When LPs and intrathecal chemotherapy are performed out of hours and if the patient is being sedated one MD must do the procedure and a second MD must be immediately available on the ward throughout the procedure.

When intrathecal chemotherapy is required and ordered outside of normal pharmacy service hours (Monday to Friday 0700–1530 hr) a staff oncologist will authorize this requirement and pharmacy staff will prepare the dose (this may require calling appropriately trained staff). Under no circumstances will the dose be prepared by any other health professional.

Location for LPs

Whenever possible, LPs should be performed in a room which is large enough for the procedure and, if necessary, to resuscitate the patient. A maximum of five people (excluding the patient) will be allowed in the room.

Whenever possible LPs should be performed in the following locations:
Oncology Outpatients, 3B, OR, ICU.

Exceptions:

- Patient in isolation on another unit
- Suspected meningitis/encephalitis
- Unstable, newly diagnosed or relapsed patient, when timing of diagnosis or treatment is deemed crucial.

When LPs requiring sedation are performed in locations other than Oncology OPD, 3B, OR or ICU, two MDs should be present during the procedure.

Personnel required for LPs

A minimum of three people are required in the room:

- MD to perform procedure
- RN to assist with procedure
- MD or RN to observe if the patient is sedated (in accordance to BCCH Sedation Guidelines).
A third person is not necessary if no sedation used.

Training Of Personnel

a. Physicians

All physicians should be trained according to these “Guidelines in Oncology: and should have been supervised while performing at least three LPs with intrathecal chemotherapy.

Physicians should be encouraged to attend either a Pediatric Advanced Life Support course or to attend several sessions in the operating room to familiarize themselves with pediatric resuscitation.

b. Nurses

All nurses assisting with the procedure should follow standard nursing procedures. One of the nurses assisting with the procedure must be chemotherapy certified.

Equipment

- a. Height adjustable patient bed/stretchers
- b. Height adjustable chair
- c. Height adjustable procedure tray stand or table
- d. Adequate lighting
- e. Crash cart should be immediately available but not necessarily in the room
- f. Clock
- g. Adequate electrical outlets for IV pumps and monitoring and resuscitation equipment
- h. A panic call button
- i. Oxygen and suction should be set up and in working order
- j. Blood pressure monitor
- k. Oxymeter
- l. ABC resuscitation box

Sedation

See attached intravenous sedation/analgesia. Guidelines for non-anesthetists (pending approval by Patient Care Committee).

Procedure For Lumbar Puncture

Indications in Oncology

1. Diagnostic—For diagnosis of malignancy and infection and measurement of CSF pressure.
2. Therapeutic—For intrathecal injection of chemotherapeutic agents (methotrexate, hydrocortisone and cytarabine).
3. Research—Measurement of drug levels.

Contraindications

1. Elevated intracranial pressure is an absolute contraindication until the etiology is clarified. This is due to risk of uncal herniation from mass lesions.
2. Infected overlying skin, due to potential for infectious seeding.
3. Severe bleeding diathesis or severe thrombocytopenia ($<20 \times 10^9/L$) are relative contraindications due to increased risk of spinal subdural hematoma.

Equipment

- Lumbar puncture tray. Commercial trays contain most necessary items: Drapes, 1% lidocaine with appropriate needles and syringes, 3–4 collecting tubes, spinal needle with stylet. Adult trays will also contain a 3-way stopcock with connecting tubing and manometer.
- Antiseptic solutions (0.5% chlorhexidine or povidone)
- Sterile gloves
- A 22-gauge spinal needle (or smaller) should be used to reduce the incidence of spinal headache.

Method

- Review history of prior procedures with the patient and/or parents
- Procedure and risks are explained and written or verbal consent obtained.
- If there is any question of raised intracranial pressure (ICP) a careful fundoscopic and neurological examination is required to rule out papilledema or focal neurologic deficit. If there is any doubt that raised ICP exists, a CT scan and neurosurgery consultation should be obtained.
- Proper **positioning** is the most crucial step to ensure success:

The lateral decubitus position is preferred in most circumstances. The patient is placed curled on his side, on a firm surface, with his knees flexed up to the chest and neck flexed forward. The lumbar region should be close to the edge of the bed and the plane of the back and shoulders as perpendicular to the bed as possible. An assistant may restrain the patient by placing one arm under the flexed knees and the other arm around the neck and shoulders. In addition to restraint, this will help maintain the lumbar spine in flexion, thereby widening the spaces between the lumbar spinous processes.

Alternatively the patient may be placed in a seated position with neck and spine maximally flexed, with arms resting on a bedside table (older child) or leaning over a pillow and held against a seated assistant (younger child).

- Drawing an imaginary line between the two posterior iliac crests will allow identification of the L4-5 or L3-4 interspaces.
- Using sterile technique done sterile gloves and clean, prep and drape the area. Infiltrate skin and deeper tissues with 1% lidocaine. When experienced at performing lumbar punctures it may be unnecessary to use lidocaine if EMLA cream has been applied to the skin.

- Review tray set-up, ensure lids of collecting containers are unscrewed and containers are readily available.
- Review patient position and restraint.
- Identify L4-5 or L3-4 interspace and insert spinal needle, with stylet in place, along the midline with bevel facing upwards (assumes lateral decubitus positioning). Prior to insertion, do not handle the needle at any point other than the hub to avoid possible contamination.
- Proper alignment of the needle is aided by placing the thumb of the non-inserting hand on the spinous process above the interspace being used.
- Direct the needle slightly cephalad along an imaginary line towards the umbilicus and advance it slowly. Resistance may be felt as the needle penetrates the ligamentum flavum and further smaller “pop” may be felt as the needle penetrates the dura. These changes are not always felt so the stylet should be frequently withdrawn to look for the presence of CSF. If none is visible, rotate the needle 90° to attempt to free the bevel of any occluding tissue. If no CSF is forthcoming replace the stylet, advance the needle slightly and recheck.
- If an opening pressure is required, once CSF is seen in the hub, attach the 3-way stopcock and manometer to the needle hub. (Familiarize yourself with the positions of the stopcock prior to starting the procedure.) Note the height of the fluid column.
- Collect approximately 0.5–1 cc of CSF sequentially in each of the sterile tubes to be sent for appropriate chemical, cytologic and, microbiologic tests. The last tube should be sent for cell count and differential, as it is least likely to be contaminated with red cells.
- Replace the stylet prior to removal of the needle as this may reduce incidence of post-LP headache.
- Remove LP needle and apply pressure over puncture site. The patient should be kept recumbent in a semi-prone position for approximately 1 hour post procedure.
- The physician must label the specimens (hospital # and date of birth) before they are taken out of the room.

Complications

- Post LP or “spinal” headache is seen more frequently in teenagers and adults (estimated incidence 10–25%). It is rarely seen in younger children and infants. Frequency may be minimized by using a small gauge needle and keeping the patient recumbent after the procedure.
- A traumatic tap is localized bleeding resulting from rupture of venous plexuses overlying the dura. As long as no coagulation defect exists it is clinically insignificant. When a traumatic tap occurs, white blood cells may be passively transferred to the CSF. In general, for every 700 RBCs found in the CSF, 1 WBC is also expected (applies to traumatic tap only).
- Immediate painful paresthesia due to nerve root irritation is another common complication but usually resolves upon repositioning the needle.

- Rare complications (<1%)—Local infection (spinal epidural or subdural empyema); persistent leg paresthesias; hematoma; arachnoiditis from tracking of povidone on the needle; transient cranial nerve palsies (especially CN VI when large volumes of CSF removed); rupture of nucleus pulposus; formation of intraspinal epidemoid tumors (when stylet not used); and vagal cardiac arrest. Anticoagulants in the presence of coagulopathy increase the risk of spinal hematoma (approximately 7%). Tonsillar herniation is an infrequent but potentially lethal complication of LP when increased intracranial pressure is present.

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The following figures are reproduced from Pediatric Outpatient Procedures by Jacob A. Lohr



Figure 17-4
Lumbar puncture. Lateral decubitus position

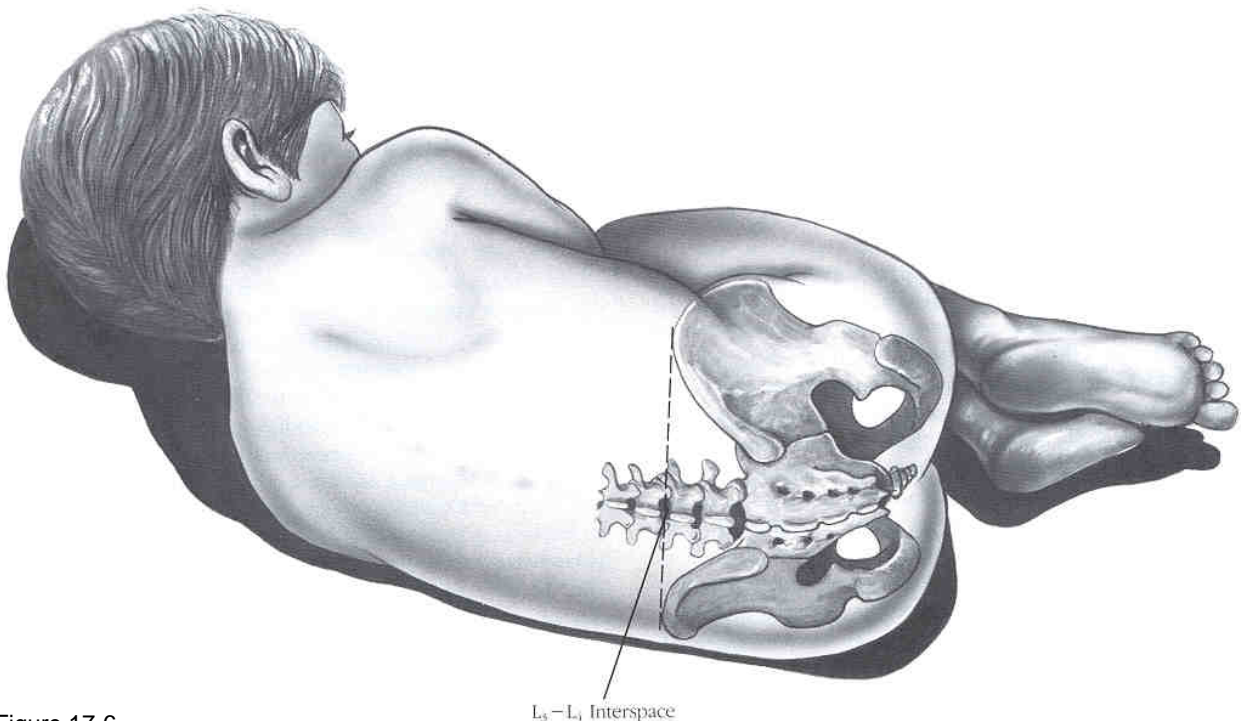


Figure 17-6
Lumbar puncture. Technique for locating the preferred site

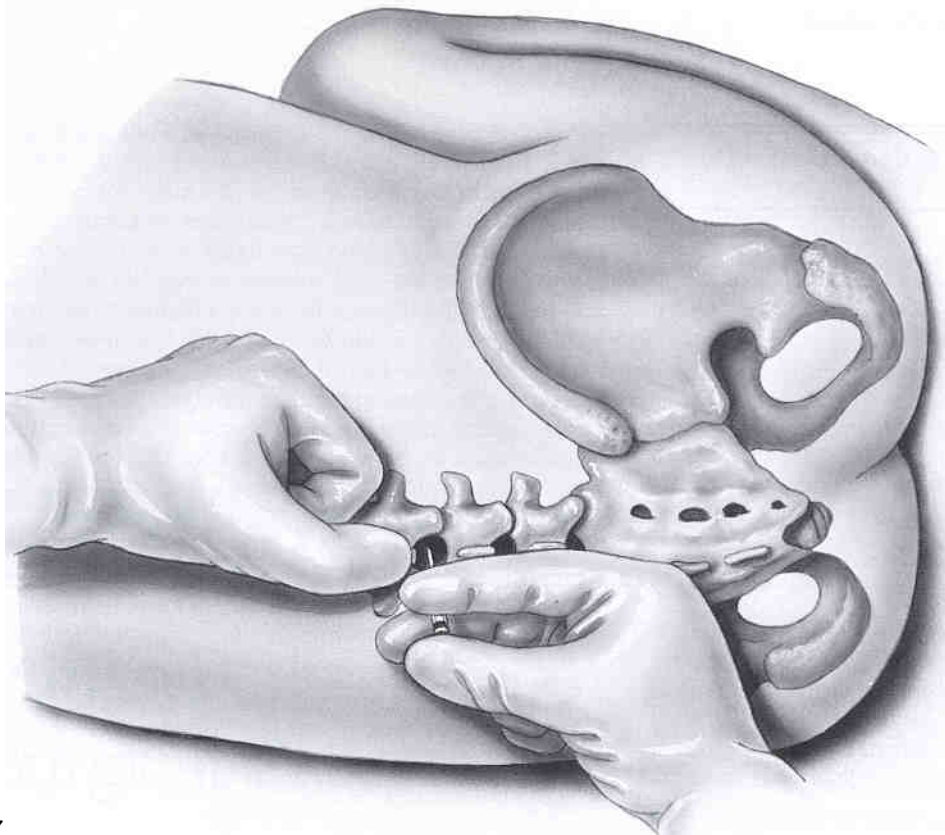


Figure 17-7
Lumbar puncture. Technique for proper alignment of the spinal needle.



Figure 17-8
Lumbar puncture. Proper position of the spinal needle in the spinal canal.