External lumbar cerebrospinal fluid drainage

A lumbar drain is a small flexible catheter that is placed in the lumbar spine. The tube drains some of the cerebrospinal fluid that fills the ventricles of the brain and surrounds the brain and spinal cord. In people with Normal Pressure Hydrocephalus, draining cerebrospinal fluid for a few days is helpful in determining if you will benefit from a shunt.

Learn more: Read our Spinal Fluid Drainage from a Lumbar Catheter patient information handout.

What will happen during the procedure?

An antibiotic will be given to reduce the risk of infection. You will be asked to sit in a special chair or lie down on one side of the bed. The area where the spinal needle is inserted will be marked with a marking pen. The lower back will be cleaned thoroughly with an antiseptic solution and allowed to dry. The back will be covered by a sterile drape. A local anesthetic will be injected in the skin, which may cause burning for a few minutes. The spinal needle will then be inserted in the area marked and directed towards the spinal canal. If there is arthritis of the spine, the needle may have to be re-directed until the right space is reached. You will feel dull pressure as the needle is advanced. If you feel a sharp pain, you should let the doctor know so that more local anesthetic can be given. Once the needle is in the right space, a flexible catheter is inserted through the needle. The needle is then withdrawn and the catheter is held to the lower back with a sterile bandage and connected to a pressure transducer. What equipment is used for the procedure?

IV antibiotic, spinal needle, flexible catheter, sterile bandage, and pressure transducer

How long does the procedure last?

We will drain spinal fluid for 2-3 days. This will let us know if you need a shunt. Even if you did not respond to a single large volume tap, this extended drainage will help us know if you may respond to a shunt.

What do I need to do to prepare for the procedure?

You will be scheduled 3-7 days before your drain to run a few tests. You will have appointments with a physical therapist and an occupational therapist to test your balance and your ability to perform daily tasks. A doctor will assess memory and other brain functions. A nurse will test your walking. Lab tests, including blood and urine tests, will be done to ensure you are safe to have the procedure, and have no bleeding tendency or infection. If these tests are abnormal, your procedure may be rescheduled.

What can I expect after the procedure is over?

Sometimes, after the lumbar drain is pulled out, fluid continues to leak from the small hole left by the tube. A simple stitch is placed in the skin to close the wound. The stitch is taken out in 1 week.

Any improvement in symptoms that you may experience in the hospital will only last for a few days. You should expect your symptoms to return to their usual state after you leave the hospital.

Are there side effects from the procedure?

Infection: There is a 3-4% risk of infection with this procedure, despite all safety measures. The infection, meningitis, is serious, but treatable with antibiotics, which need to be given intravenously.
for 14 days. This procedure has been performed over 1,000 times at Johns Hopkins and there has only been 1 death associated with lumbar drainage.

Leg or Back pain: Occasionally, while passing the spinal needle or catheter in the lumbar space, a nerve root may be touched. This causes a brief pain shooting down the back or leg. Moving the body to a different position usually alleviates the pain. There is rarely any lasting injury to the nerve root.

Headache: If too much fluid is removed, you may develop a headache. This headache will get worse when sitting or standing. You may also experience nausea or light-headedness. Stopping the fluid drain for a few minutes will usually alleviate the headache. Sometimes, you may develop a similar headache after the tube is removed. You should drink plenty of caffeine containing fluids and take ibuprofen or acetaminophen as needed. If this kind of headache persists, a blood patch may be applied to the area to plug the fluid leak.

Bleeding: Bleeding is minimal during the procedure. There is a potential for bleeding around the brain if excess fluid is drained. This procedure has been performed over 1,000 times and only one patient experienced blood inside the skull. This patient had to have surgery to remove the blood. To decrease the chance of this complication, please notify the nurse when you change positions or have to use the bathroom.

Dizziness or light-headedness: Sometimes you may feel light-headed or dizzy when you stand up. This may be a sign of excess fluid drainage and stopping the fluid drain for a few minutes could make the dizziness stop.

Spinal Fluid Leak: Rarely, spinal fluid may leak around the catheter and its dressing. If it leaks onto a non-sterile area, the physician may decide to remove the catheter. Depending on how much you have drained, a new one may be put in or multiple spinal taps may be done to drain more spinal fluid.

The external lumbar drainage is a closed, sterile system that allows the continuous drainage of CSF from the subarachnoid space.


**Equipment**

A. Equipment needed for insertion

Many of the disposable surgical supplies listed here are available in generic and custom kits supplied by LDD manufacturers.

Check kit contents for the following:

- antimicrobial scrub solution
- antimicrobial swabs or swab sticks
- sterile gloves, surgical caps, masks, and sterile surgical gown
- sterile drape
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- local anesthetic (1% or 2% lidocaine without epinephrine)
- 5-cc or 10-cc syringe with 18-gauge needle to draw up lidocaine.
- 23-gauge needle to administer lidocaine.
- Tuohy needle
- lumbar drainage catheter
- sterile scissors and needle holder
- sterile suture with needle
- sterile occlusive dressing
- sterile CSF drainage system (i.e., collection tubing, bag, (±) chamber).

B. Additional equipment

Additional equipment depends upon the type of drainage management and hospital protocol, but could include the following:

- system holder (i.e., device to secure system to pole to maintain ordered level)
- transducer cable
- external strain gauge transducer.

II. Assessment and Monitoring

A. Placement of the LDD

1. Patient preparation

a. Consult hospital policies and procedures for obtaining informed consent.

b. Explain and reinforce to the patient or the person giving consent the rationale for placement, procedure, and risks.

c. Review the most recent laboratory results, which should include a coagulation profile.

d. Perform and record a baseline comprehensive neurologic assessment.

e. Provide medication or sedation as indicated to provide for the patient's comfort and safety.

2. Drain placement

a. Depending on individual institutional policies, LDDs may be inserted in the operating room or at the patient’s bedside in the intensive care unit (ICU) or the nursing unit.

For LDDs that are placed outside the operating room, all personnel at the bedside must wear caps, masks, gowns, and sterile gloves.

b. Obtain the needed supplies for placement of the LDD.
c. Position the patient in the side-lying position and have the patient bring his or her knees to the chest, tucking the chin to chest. An alternative position is to have the patient sit up and lean over a bedside table. The objective is to round the patient’s back and widen the intervertebral space to aid in the proper placement of the catheter.

d. Shave the lumbar area, if necessary, prep it, and drape it in a sterile manner.

e. The neurosurgeon or designated, properly credentialed practitioner performs appropriate site preparation by following the institution’s policy, injects the area with local anesthetic, and inserts a spinal (e.g., Tuohy) needle into the subarachnoid space—usually at the L4–L5 intervertebral space. (Note. L2–L3 or L3–L4 also may be used).

The lumbar drainage catheter is advanced through the needle to approximately the T12–L1 space.

Then needle is then withdrawn, and the catheter is attached to a sterile, closed CSF collection system. The catheter is secured to the skin with a suture at one or two sites.

Parts

Lumbar drainage catheter

Indications

see External lumbar drainage for idiopathic normal pressure hydrocephalus.

see External lumbar drainage for cerebrospinal fluid fistula.

Reduce intracranial pressure (ICP) during a craniotomy.

Manage of nontraumatic subarachnoid hemorrhage in order to prevent vasospasm.

Complications

The complications are mainly divided into 3 groups:

A - complications related to alterations in CSF drainage rate.

Cerebrospinal fluid overdrainage and cerebrospinal fluid hypovolemia due to LD could induce severe fatal complications, which include transtentorial herniation and infratentorial hemorrhage.

B - complications due to mechanical failure of the catheter.

C - infection.

The overall complication rate is found to be 44.4%. Overdrainage, pneumocephalus and meningitis are found to be the most severe complications, but most of these complications are reversible with early recognition.
Lumbar subarachnoid drainage is a safe method unless the development of any neurological findings should prompt rapid discontinuation of lumbar drainage and immediate radiographic evaluation.  

Case reports

A 63-year-old man with transtentorial herniations and Duret hemorrhage attributable to lumbar drainage after the operation of thalamic hematoma removal. This is probably the first reported case of severe complications of LD. Thus, complications related to transtentorial herniations and Duret hemorrhage should be kept in mind while performing LD.