



Lumbar Puncture

A lumbar puncture uses a thin, hollow needle and a special form of real-time x-ray called fluoroscopy to remove a small amount of cerebrospinal fluid for lab analysis. It also may be used to deliver an injection of chemotherapy or other medication into the lower spinal canal.

Your doctor will instruct you on how to prepare, including any changes to your medication schedule. Tell your doctor if there's a possibility you are pregnant and discuss any recent illnesses, medical conditions, allergies and medications you're taking, including herbal supplements, blood thinners, aspirin or other pain relievers. You may be advised to stop taking aspirin, nonsteroidal anti-inflammatory drugs (NSAIDs) or blood thinners several days prior to your procedure. You may be told not to eat or drink anything after midnight before your procedure. Leave jewelry at home and wear loose, comfortable clothing. You may be asked to wear a gown.

What is a lumbar puncture?

A lumbar puncture (also called a spinal tap) is a minimally invasive, image-guided diagnostic test that involves the removal of a small amount of cerebrospinal fluid (CSF)—the fluid that surrounds the brain and spinal cord—or an injection of medication or other substance into the lumbar (or lower) region of the spinal canal.

CSF serves several important functions in the central nervous system. It cushions the brain and spinal cord against shock and helps to maintain pressure at a constant level inside the skull. CSF also delivers nutrients to the brain and carries waste products away into the bloodstream. Studies of the CSF can be useful in diagnosing conditions of the nervous system like meningitis, hemorrhage and multiple sclerosis.

What are some common uses of the procedure?

A lumbar puncture is typically performed to:

- collect a sample of cerebrospinal fluid to be analyzed in a laboratory
- measure the pressure of fluid in the spinal canal
- remove some cerebrospinal fluid to decrease pressure in the spinal canal
- inject chemotherapy drugs, contrast material, or other medications into the cerebrospinal fluid.

The lumbar puncture procedure helps physicians diagnose:

- bacterial, fungal and viral infections, including meningitis, encephalitis and syphilis
- bleeding around the brain (subarachnoid hemorrhage)
- cancers involving the brain and spinal cord
- inflammatory conditions of the nervous system, including Guillain-Barre syndrome and multiple sclerosis.

How should I prepare?

Prior to your procedure, your blood may be tested to determine how well your kidneys are functioning and whether your blood clots normally.

This test will also help detect signs of increased intracranial pressure which should be detected prior to performing the lumbar puncture with computed tomography (CT) or magnetic resonance imaging (MRI). You may also have a CT scan prior to the lumbar puncture to determine if there is abnormal swelling in and/or around your brain called hydrocephalus.

You should report to your doctor all medications that you are taking, including herbal supplements, and if you have any allergies, especially to local anesthetic medications or to general anesthesia. Your physician may advise you to stop taking aspirin, non-steroidal anti-inflammatory drugs (NSAIDs) or a blood thinner for a specified period of time before your procedure.

You should tell your doctor if you are taking blood-thinning medications such as Warfarin (Coumadin®), Pradaxa®, Heparin®, Lovenox®, clopidogrel (Plavix®) and over-the-counter pain relievers such as aspirin, ibuprofen or naproxen.

Also inform your doctor about recent illnesses or other medical conditions.

You will likely be instructed not to eat or drink anything after midnight before your procedure. Your doctor will tell you which medications you may take in the morning.

You should plan to have a relative or friend drive you home after your procedure.

You will be given a gown to wear during the procedure.

Women should always inform their physician and x-ray technologist if there is any possibility that they are pregnant. Many imaging tests are not performed during pregnancy so as not to expose the fetus to radiation. If an x-ray is necessary, precautions will be taken to minimize radiation exposure to the baby. See the Safety page for more information about pregnancy and x-rays.

If your child is having a lumbar puncture, you may be able to stay in the room during the procedure.

What does the equipment look like?

The equipment typically used for this examination consists of a radiographic table, one or two x-ray tubes and a television-like monitor that is located in the examining room. Fluoroscopy, which converts x-rays into video images, is used to watch and guide progress of the procedure. The video is produced by the

x-ray machine and a detector that is suspended over a table on which the patient lies.

The length and diameter of the thin, hollow needle used in this procedure varies.

Other equipment that may be used during the procedure includes an intravenous line (IV), ultrasound machine and devices that monitor your heart beat and blood pressure.

How does the procedure work?

X-rays are a form of radiation like light or radio waves. X-rays pass through most objects, including the body. Once it is carefully aimed at the part of the body being examined, an x-ray machine produces a small burst of radiation that passes through the body, recording an image on photographic film or a special detector.

Different parts of the body absorb the x-rays in varying degrees. Dense bone absorbs much of the radiation while soft tissue, such as muscle, fat and organs, allow more of the x-rays to pass through them. As a result, bones appear white on the x-ray, soft tissue shows up in shades of gray and air appears black.

Until recently, x-ray images were maintained on large film sheets (much like a large photographic negative). Today, most images are digital files that are stored electronically. These stored images are easily accessible for diagnosis and disease management.

Fluoroscopy uses a continuous or pulsed x-ray beam to create a sequence of images that are projected onto a fluorescent screen, or television-like monitor. Still images are also captured and stored either on film or electronically on a computer.

How is the procedure performed?

This examination is usually done on an outpatient basis.

A nurse or technologist will insert an intravenous (IV) line into a vein in your hand or arm so that sedative medication can be given intravenously. Moderate sedation may be used. As an alternative, you may receive general anesthesia.

You will be positioned lying face down on your stomach on the examining table.

You may be connected to monitors that track your heart rate, blood pressure and pulse during the procedure.

The area of your body where the catheter is to be inserted will be sterilized and covered with a surgical drape.

Your physician will numb the area with a local anesthetic.

Guided by real-time x-ray images (fluoroscopy), the physician will insert the needle through the skin between two lumbar vertebrae and into the spinal canal. Once the needle is in place, you may be asked to change your position slightly while fluid pressure in the spinal canal is measured.

Depending on the reason for your lumbar puncture:

- a small amount of fluid may be withdrawn through the needle to be tested in a laboratory
- cerebrospinal fluid may be removed to relieve pressure in the spinal canal
- chemotherapy or other medication may be injected into the spinal canal as prescribed by your physician

The needle is then removed.

Pressure will be applied to prevent any bleeding and the opening in the skin is covered with a bandage. No sutures are needed.

Your intravenous line will be removed.

You may be asked to lie on your back or side for a few hours following the procedure.

This procedure is usually completed within 45 minutes.

What will I experience during the procedure?

You will feel a slight pin prick when the needle is inserted into your vein for the intravenous line (IV) and when the local anesthetic is injected. Most of the sensation is at the skin incision site, which is numbed using local anesthetic. You may feel pressure when the catheter is inserted into the vein or artery.

You will be asked to remain very still during the procedure. A nurse or technician may help children stay still by holding them in place during the procedure. Children may also receive a sedative to help them stay comfortable and still.

You should plan to lay on your back and rest the day following your procedure.

Some patients develop a headache after a lumbar puncture that begins several hours or up to two days after the procedure. The headache may be accompanied by nausea, vomiting and dizziness and can last from a few hours to a week or more. You also may feel pain and tenderness in your lower back, which may radiate down your legs.

A pain-relieving medication such as acetaminophen can help reduce headache or back pain following the procedure. If your headache is severe, you should contact your doctor.

Who interprets the results and how do I get them?

Your referring physician will share the results with you.

Your interventional radiologist may recommend a follow-up visit after your procedure or treatment is complete.

The visit may include a physical check-up, imaging procedure(s) and blood or other lab tests. During

your follow-up visit, you may discuss with your doctor any changes or side effects you have experienced since your procedure or treatment.

What are the benefits vs. risks?

Benefits

- No radiation remains in a patient's body after an x-ray examination.
- X-rays usually have no side effects in the typical diagnostic range for this exam.

Risks

- Any procedure where the skin is penetrated carries a risk of infection. The chance of infection requiring antibiotic treatment appears to be less than one in 1,000.
- There is a risk of bleeding (epidural hematoma or subarachnoid hemorrhage) following a lumbar puncture.
- In rare cases, compression or herniation of the brainstem may occur following a lumbar puncture because of increased intracranial pressure and the presence of a brain tumor or other lesion. A CT or MRI performed prior to the procedure helps determine if there is increased intracranial pressure in advance of a lumbar puncture.
- There is always a slight chance of cancer from excessive exposure to radiation. However, the benefit of an accurate diagnosis far outweighs the risk.
- Women should always inform their physician or x-ray technologist if there is any possibility that they are pregnant. See the Safety page for more information about pregnancy and x-rays.

A Word About Minimizing Radiation Exposure

Special care is taken during x-ray examinations to use the lowest radiation dose possible while producing the best images for evaluation. National and international radiology protection organizations continually review and update the technique standards used by radiology professionals.

Modern x-ray systems have very controlled x-ray beams and dose control methods to minimize stray (scatter) radiation. This ensures that those parts of a patient's body not being imaged receive minimal radiation exposure.

What are the limitations of lumbar puncture?

It may be difficult to obtain a cerebrospinal fluid sample through lumbar puncture on patients with a condition called spinal stenosis and in individuals who are severely dehydrated.

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