# Lumbar Puncture (spinal tap)

## Overview
A lumbar puncture (LP), also called a spinal tap, is an invasive outpatient procedure used to remove a sample of cerebrospinal fluid (CSF) from the subarachnoid space in the spine. (This test is similar to a blood test, in which a needle is inserted into an artery to collect blood for testing.)

## How does a lumbar puncture work?
Your brain and spinal cord are surrounded and bathed by a clear fluid called cerebrospinal fluid (CSF). This fluid is produced in the ventricles of the brain and circulates around the subarachnoid space of the brain and spinal cord (see Anatomy of the Spine).

During a lumbar puncture, a hollow needle is inserted through the skin in the lower back. The needle passes between the vertebrae and into the spinal canal. A lumbar puncture can be used to:

- collect CSF for testing to detect disease conditions
- measure CSF pressure to detect hydrocephalus
- deliver contrast dye to the spinal canal during a myelogram
- deliver anesthetic numbing agents to the spinal cord
- treat/relieve hydrocephalus
- control CSF pressure and relax the brain during surgery

## What does a lumbar puncture show?
Many conditions can be detected in the CSF including:

- infection of the membranes surrounding the brain and spinal cord (meningitis)
- bleeding (subarachnoid hemorrhage, stroke)
- viral infection (encephalitis)
- tumors (lymphoma, cancer)
- autoimmune disorders like multiple sclerosis

In addition to testing for abnormal cells, the CSF pressure can be measured to determine if you have a condition called hydrocephalus. The normal pressure of CSF is between 70 and 180 mm.

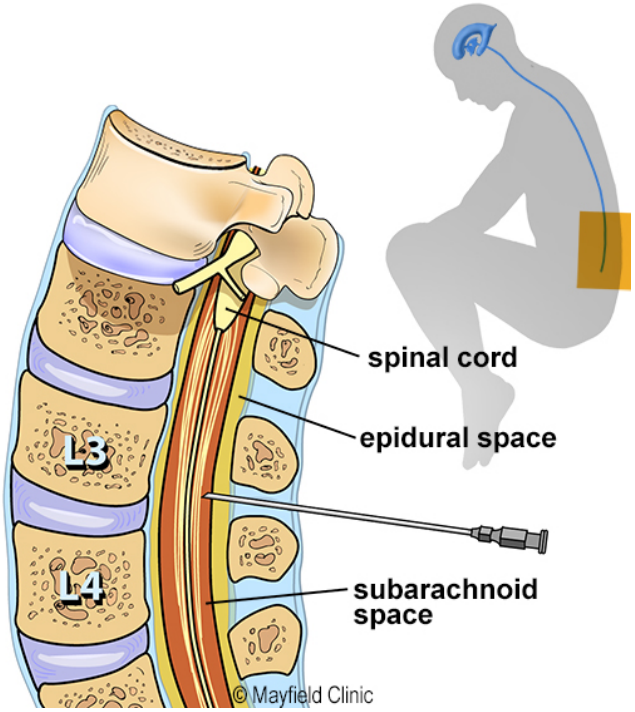


Figure 1. A needle is placed in the subarachnoid space at the level of the 3rd and 4th lumbar vertebra to collect a sample of cerebrospinal fluid.

## Who performs the test?
This test is performed by a doctor, physician assistant, or advanced practice registered nurse in the office or in the hospital.

## How should I prepare for the test?
Follow any instructions given to you about stopping food, drink, or medications (blood thinners) before the test. The doctor or nurse will discuss the test with you, explain the risks, answer any questions, and have you sign consent forms. You may receive a mild sedative, IV fluids, or additional medication before the procedure.

## What happens during the test?
Although the fluid collection only takes a few minutes, the entire test takes about 20 minutes.

**Step 1: prepare the patient**
You may be given a sedative to make you drowsy and relaxed. A doctor and an assistant will be in the room. You will be positioned so that your lower spine is curved. This position may be sitting on the table and leaning forward. Or, you may lie on your side with knees drawn to chest. After cleaning your lower back with antiseptic, the doctor will numb the area where the needle will be inserted. This may cause some brief stinging.

**Step 2: insert the needle**
Next, a hollow needle is inserted between the third and fourth lumbar vertebrae into your spinal canal (Fig. 1). The needle doesn't touch the nerves of your spinal cord. Your doctor will collect between 5 to 20 ml of cerebrospinal fluid in 2 to 4 tubes.

You will feel pressure when the needle is inserted, and some people feel a sharp stinging sensation when the needle goes through the protective dural layer that surrounds the spinal cord. Although you may feel some discomfort, it is important that you lie still. Let your doctor know if you are feeling pain.

**Step 3: measure CSF pressure (optional)**
You will be asked to straighten your legs to decrease abdominal pressure and increase cerebrospinal fluid pressure. The needle is attached to a meter and the pressure in your spinal canal is measured.

**Step 4: insert a lumbar drain (optional)**
In cases of hydrocephalus, a catheter may be inserted to continuously remove CSF and relieve pressure on the brain.

## What happens after the test?
The doctor will apply pressure to the puncture site, then apply a bandage. You will need to rest and avoid strenuous activity for at least 24 hours. You should also drink plenty of fluids. Let your doctor know if any blood or fluid is leaking from the puncture site.

## What are the risks?
A lumbar puncture is safe for most people. Some people get a severe headache known as a "spinal headache" caused by CSF leakage.

Rare complications include back or leg pain, accidental puncture of the spinal cord, bleeding in the spinal canal, and brain herniation caused by a sudden decrease of CSF pressure.

Spinal fluid leak from the injection site can cause prolonged headache. A 'blood patch' may be used to seal the leak if the severe headache does not get better.

## How do I get the test results?
The doctor will get immediate information from the color of the CSF, which is normally clear. A reddish color indicates a bleed or subarachnoid hemorrhage. A cloudy or yellowish color indicates an infection, possibly meningitis. Thorough analysis by a laboratory will detect substances such as antibodies, blood, sugar, bacteria, cancer cells, and excess protein or white blood cells. The laboratory test results can take longer and will be discussed with you when completed.

## Sources & links
If you have further questions about this diagnostic test, contact the doctor that ordered the test.

## Glossary
**arachnoid mater:** one of three membranes that surround the brain and spinal cord; the middle web-like membrane.
**blood patch:** a small amount of the patient's blood is injected above a hole in the dura sac to seal a CSF leak and relieve spinal headaches.
**cerebrospinal fluid (CSF):** a clear fluid produced by the choroid plexus in the ventricles of the brain that bathes the brain and spinal cord giving them support and buoyancy to protect from injury.
**hemorrhage:** external or internal loss of blood from damaged blood vessels. Hemorrhage is stopped by blood clotting.
**hydrocephalus:** an abnormal build-up of cerebrospinal fluid usually caused by a blockage of the ventricular system of the brain. Increased intracranial pressure can compress and damage brain tissue. Also called "water on the brain."
**meninges:** the three membranes (pia mater, arachnoid mater, and dura mater) that surround the brain and spinal cord.
**meningitis:** infection and inflammation of the meninges surrounding the brain and spinal cord caused by bacteria or virus.
**subarachnoid space:** the space between the pia and arachnoid mater of the brain and spinal cord that contains cerebrospinal fluid (CSF).
**spinal canal:** the hollow space within the bony vertebrae of the spine through which the spinal cord passes.

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