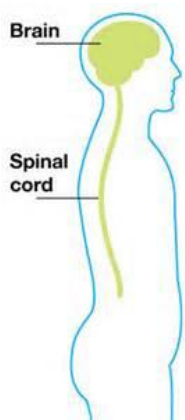


Intrathecal Chemotherapy and Lumbar Puncture

What is Intrathecal Chemotherapy?

Intrathecal chemotherapy is anticancer medication(s) delivered directly to your central nervous system. We inject the chemo into the cerebrospinal fluid that surrounds your brain and spinal cord.

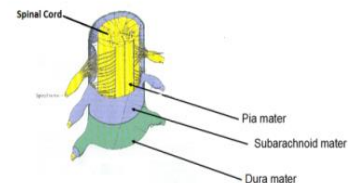
Terms to Know



Central Nervous System (CNS): The brain and the spinal cord.

Cerebrospinal Fluid (CSF): Clear, watery fluid that cushions and protects your brain and spinal cord. CSF is made in the brain and circulates through the subarachnoid (or intrathecal) space and the ventricles inside the brain and around spinal cord.

Intrathecal Space: The spinal cord and brain are protected by the meninges - 3 membranes made of connective tissue, called the dura mater, subarachnoid mater, and pia mater. The intrathecal space is located under the subarachnoid layer, and it is filled with CSF. It is also called the subarachnoid space.



Why Do I Need Intrathecal Chemotherapy?

In some cancers, cancer cells can get into the CSF, possibly spreading the cancer to the brain or spinal cord. Chemotherapy taken by mouth or given through an IV (into a vein) cannot get into the CSF from the blood stream. If the cancer has spread to the CSF, or if there is a risk that it might, your doctor may use intrathecal chemotherapy to make sure that those cancer cells are treated.

Why is Chemotherapy Given This Way?

The human body has an effective design that helps protect the brain and spinal cord from harmful substances: the *blood-brain barrier*. It allows oxygen, nutrients, and other needed substances to pass through from your blood, but it blocks out most bacteria, viruses, and toxins. Unfortunately, it can also be a significant problem if you are trying to get medications from your blood stream to reach cells in the central nervous system.

When doctors need to get chemotherapy or other medications into your central nervous system and the blood-brain barrier is blocking them, the doctor may use intrathecal therapy, and put the medications into the cerebral spinal fluid (CSF) instead of the bloodstream.

To get the medication into the CSF and bypass the blood-brain barrier, your doctor is likely to use one of two intrathecal procedures:

- Lumbar puncture with intralumbar injection: the chemotherapy medication is injected into the intrathecal space, which contains CSF. The injection is usually given in the lower (lumbar) back.
- An Ommaya reservoir: the chemotherapy medication is delivered directly into the brain. In a surgical procedure, a reservoir is placed under the scalp. The reservoir is connected to a catheter that goes through the skull and into a hollow area (ventricle) in the brain. (CSF is made in the ventricles.) The chemotherapy is injected into the reservoir and it travels down the catheter into the ventricle and the CSF.

What is a Lumbar Puncture?

During a lumbar puncture, a hollow needle is inserted between the bones of the lower back (the lumbar spine) and into the CSF-filled space around the spinal cord. Sometimes, an x-ray machine is used to guide the procedure. A lumbar puncture is performed by a doctor or a specially trained nurse, usually under a local anesthetic. A lumbar puncture can be used to give medication, but it can also be used to take a small sample of cells from the CSF for testing. These tests can help your doctor identify the best treatment for you or show how you are responding to your current treatment.

How Do I Prepare?

Medications

Some over-the-counter and prescription medications can interfere with normal blood clotting and may increase the risk of bleeding. Follow the guidelines in the chart on when to stop taking certain medications, vitamins, and supplements.

If your doctor gives you different instructions, always follow your doctor's instructions.

7 days (1 week) before the procedure, stop taking:

- aspirin
- products containing aspirin
- herbal supplements, garlic tablets
- vitamins

5 days before the procedure, stop taking:

- warfarin (Coumadin® or Jantoven®)
- clopidogrel (Plavix®) Note: Your doctor may tell you to stop this medication 7 days before the

procedure

3 days before the procedure, stop taking non-steroidal anti-inflammatory medications (NSAIDs) such as:

ibuprofen (Advil®/ Motrin®)	oxaprozin(Daypro®)
naproxen (Aleve®/Anaprox®)	piroxicam (Feldene®)
diclofenac (Voltaren®)	sulindac (Clinoril®)
etodolac (Lodine®)	diflunisal
meloxicam (Mobic®)	ketoprofen

1 day (24 hours) before your procedure, stop taking:

- enoxaparin (Lovenox®)

Other medications (besides the ones listed in the chart) may be used to treat or prevent blood clots. If you are taking any of the medications listed below, talk to your doctor about when (or if) you should stop taking your medication before the lumbar puncture.

- | | |
|------------------------------|--------------------------|
| ○ apixaban (Eliquis®) | ○ prasugrel (Effient®) |
| ○ cilostazol (Pletal®) | ○ rivaroxaban (Xarelto®) |
| ○ dabigatran (Pradaxa®) | ○ ticagrelor (Brilinta®) |
| ○ dalteparin (Fragmin®) | ○ ticlopidine (Ticlid®) |
| ○ eptifibatide (Integrilin®) | ○ tinzaparin (Innohep®) |
| ○ fondaparinux (Arixtra®) | ○ tirofiban (Aggrastat®) |
| ○ lepirudin (Refludan®) | |

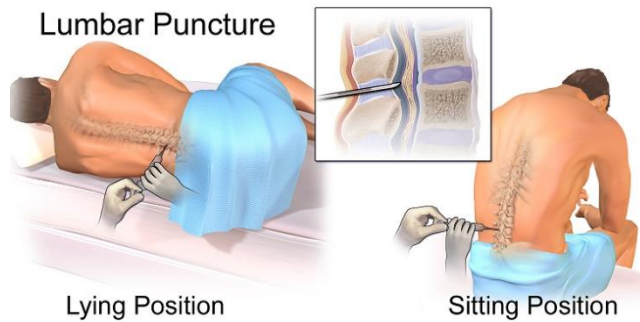
For Patients Having Conscious Sedation

Conscious sedation is a combination of medicines to help you relax and to block pain during a medical procedure. You will probably stay awake but you may not be able to speak. Conscious sedation lets you recover quickly and return to your everyday activities soon after your procedure.

If you are an outpatient, there are some additional preparations if you will have conscious sedation for the procedure.

- If you are currently taking medication for clotting disorders or to “thin your blood”, please talk with your Roswell Park healthcare provider about when/if you need to stop taking that medication before your procedure.
- If your doctor tells you to take your routine medication(s) on the morning of the procedure, take them with a small sip of water.
- **Stop all food and drink 6 hours before your procedure except for clear liquids.**

- Stop clear liquids 2 hours before your procedure. Clear liquids are liquids that you can see through at room temperature (about 72°-78°).
- If you have diabetes and take insulin, talk to the doctor that manages your diabetes about how to take your insulin on the day of the procedure.
- You must have someone to drive you home after the procedure. (You cannot drive until the next day.) If you do not have someone to drive you home, your procedure will be cancelled.



The Lumbar Puncture Procedure

- During your lumbar puncture, you'll either be asked to lie on one side with your knees drawn up towards your chest OR to sit up, bent over a table and supported by pillows. Both positions allow your back to curve as much as possible so that the bones of the spine are widely separated.
- The skin over the lower spine is cleaned with an antiseptic. A local anesthetic is injected to numb the area. The doctor will wait for a few minutes for the anesthetic to take effect.
- A very thin, hollow needle is inserted between two of the spinal bones (vertebrae) and into the spinal canal.
- You'll need to stay as still as possible at this time. You may feel a sensation of pressure as the needle is put in, but most people do not feel any pain.
- A lumbar puncture does not usually take more than a few minutes once the needle is in place. When the needle is in the right position, a small amount of CSF will flow back into the needle. This fluid is collected and sent to the laboratory for examination.
- The chemotherapy is given through the same needle. This only takes a few seconds. Then the needle is removed, and a bandage is put over the site.
- The entire procedure normally takes around 20 minutes.

After the Procedure

You'll need to lie flat for some time after the procedure, to avoid a headache. This time can vary from one hour to several hours, depending on how you feel. You will be able to roll from side to side, but if you have a headache, sitting up can make it worse.

If you get a headache, tell your doctor or nurse. A mild pain medication can be given to help. We will also check your blood pressure and pulse. Ask when it will be safe for you to sit up. Once you have rested and feel well, you can return to your normal activities, although it's best not to drive or operate machinery for 24 hours after a lumbar puncture.

Your doctor will discuss your follow-up care with you.

Are There Risks?

Common risks and complications include:

- headache, which may require medication and bed rest
- minor pain and/or infection at the injection site, which may require antibiotics
- bleeding or bruising at the puncture site
- nerve damage. this is usually temporary, and should get better over a period of time

Less common risks and complications, which may require additional treatment, include:

- severe headache, which may require several days of bed rest or follow up medical procedures
- vomiting
- damage to surrounding structures, such as blood vessels, organs and muscles
- allergy to injected drugs

Rare risks and complications include:

- Injury to the spinal cord that may require surgery
- Seizures, coma, and other severe forms of nerve toxicities
- Permanent nerve damage, with possible paralysis
- Meningitis, requiring antibiotics and other treatment

When to Call the Doctor

Call the clinic immediately if you have:

- **Fever of 100.4°F (38°C) or higher**, or fever with chills
- Any other signs of infection such as a sore throat, painful urination, or a skin wound that is red, swollen, painful, and/or warm to the touch