Myelography

This procedure is reviewed by a physician with expertise in the area presented and is further reviewed by committees from the American College of Radiology (ACR) and the Radiological Society of North America (RSNA), comprising physicians with expertise in several radiologic areas.

What is Myelography?

Myelography is an imaging examination that shows the passage of contrast material in the space around the spinal cord (the subarachnoid space) using a real-time form of x-ray (radiography) called fluoroscopy, in which organs can be seen over many seconds (rather than in the static image called an x-ray or radiograph).

An x-ray (radiograph) is a painless medical test that helps physicians diagnose and treat medical conditions. Radiography involves exposing a part of the body to a small dose of ionizing radiation to produce pictures of the inside of the body. X-rays are the oldest and most frequently used form of medical imaging.

Fluoroscopy makes it possible to see internal organs in motion. When the contrast material is injected into the subarachnoid space, the radiologist is able to view and evaluate the status of the spinal cord, nerve roots, and intervertebral disks. By this means, myelography provides a very detailed picture (myelogram) of the spinal cord and spinal column. The radiologist views the passage of contrast material as it is flowing using fluoroscopy but also takes permanent static (unmoving) pictures, called x-rays or radiographs, of the contrast material around the spinal cord and nerve roots in order to document abnormalities. In most cases, the myelogram is followed by a computed tomography (CT) scan to better define abnormalities.

Myelography is most commonly used to detect abnormalities of the spinal cord, the spinal canal, the spinal nerve roots and the blood vessels that supply the spinal cord, including:

- to show whether herniations of the material between the vertebral bodies, termed the intervertebral disks, are pushing on nerve roots or the spinal cord.
- to depict a condition that often accompanies degeneration of the bones and soft tissues surrounding the spinal canal, termed spinal stenosis. In this condition, the spinal canal narrows as the surrounding tissues enlarge due to the development of bony spurs (osteophytes) and the adjacent ligaments.

Myelography can also be used to assess the following conditions when MR imaging cannot be performed, or in addition to MRI:

- tumors
- infection
- inflammation of the arachnoid membrane that covers the spinal cord
- spinal lesions caused by disease or trauma

A myelogram can show whether surgical treatment is promising in a given case and, if it is, can help in planning surgery.

What are some common uses of the procedure?

Magnetic resonance imaging (MRI) is often the first imaging exam done to evaluate the spinal cord and nerve roots. However, on occasion, a patient has medical devices, such as a cardiac pacemaker, that prevent him or her from undergoing MRI. Sometimes, myelography is performed in conjunction with MRI to better define abnormalities.

How should I prepare?

Your physician will give you detailed instructions on how to prepare for your myelogram.

You should inform your physician of any medications you are taking and if you have any allergies, especially to contrast materials. Also inform your doctor about recent illnesses or other medical conditions.
Specifically, the physician needs to know if (1) you are taking medications that need to be stopped a few days before the procedure and (2) if you have a history of contrast reaction to the contrast material used for the myelogram.

Some drugs should be stopped one or two days before myelography. They include certain antipsychotic medications, antidepressants, blood thinners, and drugs—especially metformin—that are used to treat diabetes. However, the most important medication that must be stopped is blood thinners (anticoagulants). If you are taking blood thinners, you should speak with your physician about alternative methods of maintaining anticoagulation while you are undergoing a myelogram. At times, that procedure entails taking intravenous blood thinners such as heparin and stopping the intravenous infusion a few hours before undergoing the myelogram.

Many drugs used to treat seizures are not indicated before a myelogram. Therefore, it is also important that medical staff know in advance if you have a seizure disorder and they can help you plan to stop taking the seizure medications a few days before the myelogram. Although reactions to the contrast material used in the myelogram are extremely uncommon, you should inform your physician if you have had a severe allergic reaction to contrast material or medication. In addition, please mention if you have any allergies to other, non-medical, substances or have a history of asthma. In those instances, you will be watched especially carefully to check for a reaction when injecting the contrast material. Allergy to iodine-containing substances can be especially risky. Usually patients are advised to increase their fluid intake the day before a scheduled myelogram, as it is important to be well hydrated. Solid foods are avoided for several hours before the exam, but fluids may be continued.

You may be asked to remove some or all of your clothes and to wear a gown during the exam. You may also be asked to remove jewelry, eye glasses and any metal objects or clothing that might interfere with the x-ray images.

Women should always inform their physician or x-ray technologist if there is any possibility that they are pregnant. Many imaging tests are not performed during pregnancy because high doses of radiation can be harmful to the fetus. If an x-ray is necessary, precautions will be taken to minimize radiation exposure to the baby.

Unless you are to spend the night in hospital, you should arrange to have a relative or friend take you home.

What does the equipment look like?

The equipment typically used for this examination consists of a box-like structure containing the x-ray tube and fluoroscopic equipment that sends the x-ray images to a television-like monitor for viewing that is located in the examining room or in a nearby room. This structure is suspended over a table on which the patient lies. A drawer under the table holds the x-ray film or image recording plate that captures the images.

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 image recording plate.

Fluoroscopy uses a continuous x-ray beam to create a sequence of images that are projected onto a fluorescent screen, or television-like monitor. When used with a contrast material, which clearly defines the area being examined by making it appear bright white, this special x-ray technique makes it possible for the physician to view internal organs in motion. Still images are also captured and stored either on film or electronically on a computer.

X-ray images are maintained as hard film copy (much like a photographic negative) or, more likely, as a digital image that is stored electronically. These stored images are easily accessible and are sometimes compared to current x-ray images for diagnosis and disease management.
How is it performed?

This examination is usually done on an outpatient basis. As the patient lies face-down on the examination table, the radiologist will use the fluoroscope, which projects radiographic images in a movie-like sequence onto a monitor, to visualize the spine and determine the best place to inject the contrast material.

The contrast material usually is injected into the lower lumbar spine, because it is considered easier and safer. Occasionally, if it is deemed safer or more useful, the contrast material will be injected into the upper cervical spine.

At the site of the injection, the skin will be cleaned and numbed with a local anesthetic. Depending on the location of the puncture, the patient will be positioned on their side, on their abdomen, or in a sitting position as the needle is inserted. In some cases, patients will be placed in a sitting position. If needed, a small amount of cerebrospinal fluid will be withdrawn for laboratory studies. The contrast material is then injected and the x-ray table is slowly tilted so that contrast material will run up and down the spine and surround the nerve roots that are next to the spinal cord. The radiologist will monitor the flow of contrast with fluoroscopy, focusing on the area of the patient’s symptoms. At this point, additional x-ray images will be taken by the technologist; it is important to remain still to reduce the possibility of blurred images.

A computed tomography (CT) scan is frequently performed immediately after myelography while contrast material is still present in the spinal canal. This combination of imaging studies is known as CT myelography.

A myelography examination is usually completed within 30 to 60 minutes. A CT scan will add another 30-60 minutes to the total examination time.

Who interprets the results and how do I get them?

A radiologist, a physician specifically trained to supervise and interpret radiology examinations, will analyze the images and send a signed report to your primary care or referring physician, who will share the results with you.

What will I experience during and after the procedure?

You will feel a brief sting when local anesthetic is injected, and slight pressure as the spinal needle is inserted. Positioning the needle can occasionally cause a sharp pain.

During the exam, you will be asked to lay as still as possible while the table is tilted at different angles. A foot rest and straps or supports will keep you from sliding out of position. You may find the face-down position uncomfortable or that it causes you difficulty breathing deeply or swallowing. However, you should not have to maintain this position for very long.

Rarely, headache, flushing, or nausea may follow contrast injection. Seizures are possible, but also are rare.

Some facilities have patients stay in a recovery area resting with the head elevated at a 30° to 45° angle for as long as four hours. You may be encouraged to take fluids at this time to help eliminate contrast material from your body and to prevent headache.

Following your myelogram, you should refrain from strenuous physical activity and from bending over for one to two days.

You should notify your health professional if you experience fever higher than 100.4°F, excessive nausea or vomiting, severe headache for more than 24 hours, neck stiffness, or numbness in your legs. You should also report if you have trouble urinating or moving your bowels.

What are the benefits vs. risks?

Benefits

- Myelography is relatively safe and painless.
- When a contrast material is injected into the space surrounding the spinal cord, it allows the radiologist to view outlines of the different areas of the spine that usually are not visible or distinguishable on x-rays.
- No radiation remains in a patient's body after an x-ray examination.
- X-rays usually have no side effects.

Risks

- There is always a slight chance of cancer from radiation. However, the benefit of an accurate diagnosis far outweighs the risk.
The effective radiation dose from this procedure is about 4 mSv, which is about the same as the average person receives from background radiation in 16 months.

Although it is uncommon, headache due to the needle puncture following myelography is one risk. The headache, when it occurs, usually begins when the patient begins to sit upright or stand. One of the common features of this type of headache is that it is improved when the patient lays flat. When present, the headache usually begins within 2-3 days after the procedure. Rest while laying on one’s back and increased fluid intake readily relieve mild headaches, but more severe headaches may call for medication. In rare circumstances some patients continue to experience spinal headaches, which may necessitate a special procedure to stop leakage of cerebrospinal fluid from the puncture site.

Adverse reactions to injection of contrast material during a myelogram are infrequent and usually mild in nature, including itching, rash, sneezing, nausea, or anxiety. The development of hives or wheezing may require treatment with medication. More severe reactions involving the heart or lungs are rare.

Other rare complications of myelography include nerve injury from the spinal needle and bleeding around the nerve roots as they enter or exit the spinal cord. In addition, the membrane covering the spinal cord may become inflamed or infected. Seizures are a very uncommon complication of myelography.

There is a very small risk that contrast material will block the spinal canal, which can make surgery necessary.

Women should always inform their physician or x-ray technologist if there is any possibility that they are pregnant.

What are the limitations of Myelography?

- The most significant limitation of myelography is that it only sees inside the spinal canal and the very proximal nerve roots. Abnormalities outside these areas may be better imaged with MRI.
- Myelography usually is avoided during pregnancy because of the potential risk to the baby.
- The findings may not be accurate if the patient moves during the exam.
- It may be difficult to inject contrast material in patients with structural defects of the spine or some forms of spinal injury.
- Myelography cannot be done if the injection site is infected.

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 councils continually review and update the technique standards used by radiology professionals.

State-of-the-art x-ray systems have tightly controlled x-ray beams with significant filtration and dose control methods to minimize stray or scatter radiation. This ensures those parts of a patient's body not being imaged receive minimal radiation exposure.

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