

MRI of the Spine

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What is MRI of the Spine?

Magnetic resonance imaging (MRI) is a non-invasive imaging method that uses radio waves and a powerful magnetic field rather than x-rays to produce clear and detailed images of virtually any part of the body. This procedure has greatly improved the ability to visualize normal and diseased tissue in the spine (also called vertebral column or backbone), the bony structure that encloses the spinal cord. MRI frequently makes it possible to determine the cause of back pain. The examination shows the anatomy of the vertebrae that make up the spine, as well as the spinal cord and the spaces between the vertebrae through which nerves pass. MRI does require specialized equipment and expertise in order to perform it properly and correctly interpret the findings.

What are some common uses of the Spinal MRI?

- Perhaps the most common reason for spinal MRI is to detect a bulging, degenerated, or herniated intervertebral disk—a frequent cause of severe lower back pain and sciatica.



Full spinal MRI.

- Compressed (or pinched) and inflamed nerves are visible on MRI. In some cases the cause of nerve compression, whether from a herniated disk, arthritis, or some other abnormality, also is indicated. MRI generally is the next non-invasive imaging examination used after x-rays of the lower spine.
- MRI is frequently done to help plan surgeries on the spine such as the decompression of a pinched nerve or spinal fusion. MRI performed after spinal surgery will show whether anything has changed and whether post-operative scarring or infection is present. If a patient has failed to improve as expected, MRI may show why.
- The exam can help to diagnose—or rule out—spinal infection or tumors that arise in, or have spread to, the spine; they include prostate, lung and breast cancers.
- When done before steroid is injected to relieve spinal pain, MRI can ensure that the medication will not be mistakenly injected into a tumor or site of infection.
- If your child has trouble with daytime wetting and does not fully empty the bladder, imaging the spinal cord may show why this is happening.



MRI of vertebrae.

How should I prepare for my MRI of the Spine procedure?

The strong magnetic field used in MRI can disrupt the operation of an implanted cardiac pacemaker or other medical device. Staff will ask whether you have a pacemaker, artificial heart valve, implanted drug infusion port, artificial limb, intrauterine device, or any metal pins, screws, plates or surgical staples. In most cases, metal objects used in orthopedic surgery pose no risk during MRI. Other objects that may prohibit MRI are an inner ear implant, clips used on brain aneurysms, and a recently placed artificial joint. Sheet metal workers and others who might have metal objects such as a bullet or shrapnel in their body should have an x-ray performed before MRI.

You will be asked to remove all metal objects including jewelry, watches and hairpins. Dyes used in tattoos may contain iron and could heat up during MRI, but this is rarely a problem. You may wear a hospital gown during the exam, or may be allowed to keep your own clothing if it is loose-fitting and

has no metal fasteners. If you might be pregnant you should mention this to MRI staff.

Because some MRI studies use oral or injected contrast material to obtain the clearest images, the radiologist or technologist will ask you about allergy of any kind such as hay fever, hives, allergic asthma or allergy to food or medications. The radiologist should know of any serious health problems because some of them—such as kidney disease or sickle cell anemia—may prevent you from having MRI with contrast material. People who tend to be claustrophobic might become uncomfortable if examined by an enclosed MRI unit, and may find it hard to lie still during the exam. A sedative will relieve anxiety in this situation, but probably only one in twenty patients will require such medication. Another option is to use an open MRI unit.



Spinal MRI.

How does the MRI of the Spine procedure work?

Among imaging methods, MRI is unique in that it does not depend on ionizing radiation, as does the conventional x-ray examination. The basis of MRI is to direct radio waves at protons, particles that help make up the nucleus of hydrogen atoms. When this is done in a strong magnetic field generated by a large magnet that surrounds the patient's body, the protons are alternately "excited" and "relaxed," emitting signals that are processed by a computer program to form images. Because protons are most abundant in the hydrogen atoms of water (the "H" in H₂O), MRI images depict differences in the content and distribution of water in various tissues. With MRI, different types of tissue within the same body structure are clearly displayed in fine anatomic detail. In the spine, for instance, fatty tissue, cerebrospinal fluid, and the central portion of the material making up the intervertebral disks contain considerable water, more than is found in bone, cartilage, and nerve tissue. MRI is well suited to detecting conditions that increase the amount of fluid, such as tumors, inflammation, and infection.

A typical MRI exam includes two to six imaging sequences, which produce sectional views or "slices" of the spine in different planes: left to right, front to back, upper to lower. The sections are often about a quarter-inch apart, providing a detailed look at the tissues making up the spinal column. The images may be stored in a computer and subsequently viewed on screen, or they may be printed on film much like a conventional x-ray. Depending on the location of symptoms, you probably will have only part of your spine imaged: the cervical (neck) portion, the thoracic (chest) spine, or the lumbar (lower) spine.

How is the MRI of the Spine performed?

You will lie on your back on a narrow table that can be moved back and forth, into and out of the MRI tunnel. The table is moved by an automatic mechanism operated by the technologist. Bolsters or cushions are used to maintain proper positioning and to make you as comfortable as possible. When all is ready, the radiologist, a physician specially trained to obtain and interpret medical imaging, and the radiologic technologist will leave the examining room, but you will be able to communicate with the technologist at any time using a two-way intercom installed in the MRI unit. The technologist will watch you through a glass window next to the examining room. Many imaging centers permit a friend to remain near the patient, or a parent if a child is being examined. An MRI study generally takes 15 to 45 minutes, although only a fraction of that time is needed for the actual imaging. You will be instructed not to move during imaging, because motion will blur the images. You will know when images are being recorded because you will hear tapping or thumping sounds whenever the coils creating a secondary magnetic field are turned on. Each imaging sequence takes from a few seconds to a few minutes, so that you will be able to relax at intervals during the examination. When it is completed you will wait a short time on the table while the images are examined; occasionally additional images are needed.

What will I experience during my Spinal MRI?

MRI causes no pain, although some patients find it uncomfortable to stay still while imaging is taking place. This is sometimes the case for those who are considerably overweight, or for those who are bothered by a closed-in feeling similar to claustrophobia. These discomforts usually can be relieved by having the exam in an open MRI unit or by taking a sedative. It is rare that a patient is unable to tolerate MRI of any type and requires a different form of imaging.

When first entering the MR unit, you may hear a fan and feel air moving. Some centers provide earplugs or a stereo headset to block the noises heard during the imaging procedure. If contrast material is to be injected, you may feel brief pain from the needle stick and a sense of warmth when the material is injected—which takes one to two minutes.

No period of recovery is needed after MRI of the spine unless you have received a sedative. You may resume normal activities, your usual diet, and needed medications immediately.

What are the benefits vs. risks of MRI of the Spine?

Benefits

- MRI is an excellent method of obtaining clear, detailed images of the bony structures and soft tissues of the spine, including the spinal cord. It demonstrates abnormalities, injuries and diseases in the spinal region that may not be visualized with other imaging methods.
- MRI is a noninvasive study that—unlike conventional x-rays, CT scanning, and myelography—does not require exposure to radiation.
- This method takes little time to carry out, making it very useful for evaluating people who have been injured. It is especially helpful for diagnosing or ruling out acute compression of the spinal cord when clinical examination shows muscle weakness or paralysis.
- The contrast material sometimes used for MRI does not contain iodine, and therefore it is far less likely to produce an allergic reaction than the contrast materials used for conventional x-rays and CT scanning.
- MRI is able to detect subtle changes in the vertebral column that may be an early stage of infection or tumor. The procedure may be better than CT scanning for evaluating tumors, abscesses, and other masses near the spinal cord.

Risks

- An iron-containing implant or cardiac pacemaker may be affected by the strong pull of the magnetic field.

What are the limitations of MRI of the Spine?

MRI generally is not done in the first 12 weeks of pregnancy. Radiologists prefer to use other methods such as ultrasound imaging in pregnant women unless no examination other than MRI will do. It may not be possible to perform MRI in a very obese patient, although an open unit will work in most cases. The presence of an implant or other metallic object often makes it difficult to obtain clear images, and patient movement can have the same effect. A patient with severe pain may not be able to lie still during imaging.

The MRI findings by themselves do not establish an absolute diagnosis, but in most situations the findings will suggest the correct diagnosis. The images must be interpreted along with the patient's history, physical findings, and information from other tests.

Vertebral fractures may be better detected by CT scanning.

MRI may be more costly than other imaging methods including CT scanning.