

## Body MRI

Magnetic resonance imaging (MRI) of the body uses a powerful magnetic field, radio waves and a computer to produce detailed pictures of the inside of your body. Doctors may use it to help diagnose or monitor treatment for a variety of conditions within the chest, abdomen, and pelvis. If you are pregnant, the doctor may use body MRI to safely monitor your baby.

Tell your doctor about any health problems, recent surgeries, or allergies and whether there's a possibility you are pregnant. The magnetic field is not harmful, but it may cause some medical devices to malfunction. Most orthopedic implants pose no risk, but you should always tell the technologist if you have any devices or metal in your body. Guidelines about eating and drinking before your exam vary between facilities. Unless your doctor says otherwise, take your regular medications as usual. You should remove all jewelry, avoid wearing makeup, and wear loose, comfortable clothing. Most MRI facilities will ask that you change to a hospital gown. Some clothing may contain metallic fibers which cannot be worn inside the MRI. If you have claustrophobia or anxiety, you may want to ask your doctor for a mild sedative prior to the exam. If you take any relaxation medication, you should make sure you have a ride home.



## What is MRI of the Body?

Magnetic resonance imaging (MRI) is a noninvasive test doctors use to diagnose medical conditions.

MRI uses a powerful magnetic field, radiofrequency pulses, and a computer to produce detailed pictures of internal body structures. MRI does not use radiation (x-rays).

Detailed MR images allow doctors to examine the body and detect disease.

## What are some common uses of the procedure?

MR imaging of the body evaluates:

- organs in the abdomen—including the liver (<http://www.radiologyinfo.org>) , kidneys (<http://www.radiologyinfo.org>) , spleen (<http://www.radiologyinfo.org>) , bowel, pancreas (<http://www.radiologyinfo.org>) , and adrenal glands
- pelvic organs including the bladder and the reproductive organs
- blood vessels (this may require a specific type of MRI called MR Angiography or MR venogram)
- lymph nodes.

Physicians use an MR exam to help diagnose or monitor treatment for conditions such as:

- tumors of the abdomen or pelvis.
- diseases of the liver, such as cirrhosis, and abnormalities of the bile ducts and pancreas.
- inflammation of the bowel caused by Crohn's disease (<https://www.radiologyinfo.org/en/info/crohns-disease>) and ulcerative colitis or appendicitis in pregnant or younger patients

- malformations of the blood vessels and inflammation of the vessels (vasculitis).
- assessing a fetus in a pregnant person.

## How should I prepare for the procedure?

Most MRI facilities will ask you to change into a hospital gown or hospital scrubs. Guidelines about eating and drinking before an MRI vary between specific exams and facilities. Take food and medications as usual unless your doctor tells you otherwise.

Guidelines about eating and drinking before an MRI vary between specific exams and facilities. Take food and medications as usual unless your doctor tells you otherwise.

Some MRI exams use an intravenous (IV) injection of contrast material. The technologist will ask if you have allergies to contrast material. They also may ask you if you have known kidney disease or risk factors for kidney disease. You may need a blood test to assess your kidney function before having an MRI with contrast. MRI exams commonly use a contrast material called gadolinium (<http://www.radiologyinfo.org>). Gadolinium can be used safely in patients who are allergic to iodine contrast. *For more information on allergic reactions to gadolinium contrast, please consult the ACR Manual on Contrast Media (<https://www.acr.org/Clinical-Resources/Contrast-Manual>).*

You should always tell your doctor and technologist if you are pregnant. MRI has been used since the 1980s with no reports of any ill effects on pregnant persons or their unborn babies. However, the baby will be in a strong magnetic field. Therefore, pregnant persons should not have an MRI in the first trimester unless the benefit of the exam clearly outweighs any potential risks. Pregnant persons should not receive gadolinium contrast unless absolutely necessary. *See the MRI Safety During Pregnancy (<https://www.radiologyinfo.org/en/info/safety-mri-pregnancy>) page for more information about pregnancy and MRI.*

If you have claustrophobia (<http://www.radiologyinfo.org>) (fear of enclosed spaces) or anxiety, ask your doctor to prescribe a mild sedative prior to the date of your exam. Do not drive yourself home if you are taking a sedative medication before undergoing your MRI. These medications can make it dangerous to drive, so make sure you have a ride home arranged.

Leave all jewelry and other accessories at home or remove them prior to the MRI scan. Patients should also be makeup free as some makeup contains metal. This can cause artifacts on the medical image due to metal interacting with the magnetic field. Metal and electronic items are not allowed in the exam room. They can interfere with the magnetic field of the MRI unit, cause burns, or become harmful projectiles. These items include:

- jewelry, watches, credit cards, and hearing aids, all of which can be damaged
- pins, hairpins, metal zippers, and similar metallic items, which can distort MRI images
- removable dental work
- pens, pocketknives, and eyeglasses
- body piercings
- mobile phones, electronic watches, and tracking devices.

In most cases, an MRI exam is safe for patients with metal implants, except for a few types. People with the following implants may not be scanned and should not enter the MRI scanning area without first being evaluated for safety:

- some cochlear (ear) implants
- some types of clips used for brain aneurysms (<http://www.radiologyinfo.org>)
- some older cardiac defibrillators (<http://www.radiologyinfo.org>) and pacemakers (<http://www.radiologyinfo.org>)
- some spinal or nerve stimulators

Tell the technologist if you have medical or electronic devices in your body. These devices may interfere with the exam or pose a

risk. Many implanted devices will have a pamphlet explaining the MRI risks for that device. If you have the pamphlet, bring it to the attention of the scheduler before the exam. MRI cannot be performed without confirmation and documentation of the type of implant and MRI compatibility. You should also bring any pamphlet to your exam in case the radiologist or technologist has any questions.

If there is any question, an x-ray can detect and identify any metal objects. Metal objects used in orthopedic surgery generally pose no risk during MRI.

Tell the technologist or radiologist about any shrapnel, bullets, or other metal that may be in your body. Foreign bodies near and especially lodged in the eyes are very important because they may move or heat up during the scan and cause injury to the eye. Dyes used in tattoos may contain iron and could heat up during an MRI scan. This is rare but let your MRI technologist know if you feel heating during the exam.

Infants and young children often require sedation or anesthesia to complete an MRI exam without moving. This depends on the child's age, intellectual development, and the type of exam. Sedation is available at many facilities. A specialist in pediatric sedation or anesthesia should be available during the exam for your child's safety. You will receive instructions on how to prepare your child.

Some facilities may have personnel who work with children to help avoid the need for sedation or anesthesia. They may prepare children by showing them a model MRI scanner and playing the noises they might hear during the exam. They also answer any questions and explain the procedure to relieve anxiety. Some facilities also provide goggles or headsets so the child can watch a movie during the exam. This helps the child stay still and allows for good, quality images.

## **What does the equipment look like?**

The traditional MRI unit is a large cylinder-shaped tube that looks like a big donut. You will lie on a table that slides into a tunnel towards the center of the MRI machine.

Some MRI units are designed to be more “open” which can help patients who have severe claustrophobia. Open MRI is not available for certain exams. For more information, consult your radiologist.

Some newer MRI machines have a larger diameter bore, which can be more comfortable for larger patients or those with claustrophobia.

## **How does the procedure work?**

Unlike x-ray and computed tomography (CT) exams, MRI does not use radiation. MRI uses a high-power magnet to temporarily change the position of hydrogen atoms that naturally exist within the body. This does not cause any long term changes in your body. As the hydrogen atoms return to their usual position, they emit different amounts of energy depending on the type of tissue they are in. The scanner captures this energy, and a computer creates a picture using this information.

Most MRI units produce the magnetic field by passing an electric current through wire coils. Other coils are inside the machine and, in some cases, are placed around the part of the body being imaged. These coils send and receive radio waves, producing signals that the machine detects. The electric current does not come into contact with the patient.

MRI is often able to tell the difference between diseased tissue and normal tissue better than x-ray, CT, and ultrasound.

## **How is the procedure performed?**

The technologist will position you on the moveable exam table. They may use straps and bolsters to help you stay still and maintain your position.

The technologist may place devices that contain coils capable of sending and receiving radio waves around or next to the area of the body under examination. They may also place padding material around you to ensure your skin is not touching the inside of the machine or other parts of your body. Skin that touches skin on another part of your body or touches the machine can heat up during an MRI and cause a skin burn. Your MRI technologist will explain this before your exam.

MRI exams create multiple types of pictures of the part of your body being imaged. When the machine is creating the pictures, you will hear loud clicking, tapping and thumping noises. The technologist will give you earphones or ear plugs to wear to decrease the noise you hear during your exam.

If your exam uses a contrast material, a nurse, or technologist (<http://www.radiologyinfo.org>) will insert an intravenous (<http://www.radiologyinfo.org>) catheter (IV line) into a vein in your hand or arm. They will use this IV to inject the contrast material.

The technologist will place you into the magnet of the MRI unit. They will perform the exam while working at a computer outside of the room. You will be able to talk to them via an intercom.

If your exam uses a contrast material, the technologist will inject it into the intravenous line (IV) after an initial series of scans. They will take more images during or following the injection. You may feel a little warm or have a strange taste in your mouth when you receive the contrast. This is normal and expected. You may need to hold your breath for 15-25 seconds as the technologists takes pictures after you receive the contrast.

When the exam is complete, the technologist may ask you to wait while the radiologist checks the images in case more are necessary.

The technologist will remove your IV line after the exam is over and place a small dressing over the insertion site.

Depending on the type of exam and the equipment used, the entire exam usually takes 30 to 60 minutes.

## **What will I experience during and after the procedure?**

Most MRI exams are painless. However, some patients find it uncomfortable to remain still. Others may feel closed-in (claustrophobic) while in the MRI scanner. The scanner can be noisy.

It is normal for the area of your body being imaged to feel slightly warm. If it bothers you, tell the radiologist or technologist. It is important that you remain perfectly still during the exam. You will know when the technologist is taking images because you will hear and feel loud tapping or thumping sounds. The coils that generate the radio waves make these sounds when they are activated. The technologist will provide you with earplugs or headphones to reduce the noise made by the scanner. You may be able to relax between imaging sequences. However, you will need to keep the same position as much as possible without moving.

You will usually be alone in the exam room. However, the technologist will be able to see, hear, and speak with you at all times using a two-way intercom. They will give you a “squeeze-ball” that alerts the technologist that you need attention right away. Many facilities allow a friend or parent to stay in the room once they are screened for safety.

The technologist will give children appropriately sized earplugs or headphones during the exam. Music may be played through the headphones to help pass the time. MRI scanners are air-conditioned and well-lit.

In some cases, you may receive an IV injection of contrast material before the technologist takes the images. The IV needle may cause you some discomfort and you may experience some bruising. There is also a tiny chance of skin irritation at the site of the IV tube insertion. Some patients may have a temporary metallic taste in their mouth after the contrast injection.

If you do not require sedation, no recovery period is necessary. You may resume your usual activities and normal diet immediately after the exam. On rare occasions, a few patients experience side effects from the contrast material. These may include nausea,

headache, and pain at the site of injection. It is very rare that patients experience hives, itchy eyes, or other allergic reactions to the contrast material. If you have allergic symptoms, tell the technologist right away. A radiologist or other doctor will be available for immediate assistance.

## Who interprets the results and how do I get them?

A radiologist, a doctor trained to supervise and interpret radiology exams, will review your images. The radiologist will send a report (<https://www.radiologyinfo.org/en/info/all-about-your-radiology-report>) to your physician who ordered the exam. Many facilities will release a copy of your MRI report to your patient portal. However, you should always follow up with your doctor so they can share the results with you and explain what they mean.

You may need a follow-up exam. If so, your doctor will explain why. Sometimes a follow-up exam further evaluates a potential issue with more views or a special imaging technique. It may also see if there has been any change in an issue over time. Follow-up exams are often the best way to see if treatment is working or if a problem needs attention.

## What are the benefits vs. risks?

### Benefits

- MRI is a noninvasive imaging technique that does not involve exposure to radiation.
- MR images of the soft-tissue structures of the body—such as the liver and many other organs—are sometimes more likely to accurately identify disease than other imaging methods. This detail makes MRI an invaluable tool in early diagnosis and evaluation.
- MRI has proven valuable in diagnosing a broad range of conditions, including cancer, heart and vascular disease (<http://www.radiologyinfo.org>), and muscular and bone abnormalities.
- MRI can detect abnormalities that bone might obscure with other imaging methods.
- MRI allows physicians to assess the biliary system noninvasively and without contrast injection.
- The MRI gadolinium contrast material is less likely to cause an allergic reaction than the iodine-based contrast materials x-rays and CT scanning use.
- MRI provides a noninvasive (<http://www.radiologyinfo.org>) alternative to x-ray, angiography (<http://www.radiologyinfo.org>) and CT for diagnosing problems of the heart and blood vessels.

### Risks

- The MRI exam poses almost no risk to the average patient when technologists follow appropriate safety guidelines.
- If the exam uses sedation, there is a risk of using too much. However, the doctor will monitor your vital signs to minimize this risk.
- The strong magnetic field is not harmful to you. However, it may cause implanted medical devices to malfunction or distort the images.
- Nephrogenic systemic fibrosis is a recognized complication related to injection of gadolinium (<http://www.radiologyinfo.org>) contrast. It is exceptionally rare with the use of newer gadolinium contrast agents. It usually occurs in patients with serious kidney disease. Your doctor will carefully assess your kidney function before considering a contrast injection.
- There is a very slight risk of an allergic reaction if your exam uses contrast material. Such reactions are usually mild and often resolve on their own. If you have an allergic reaction, a doctor will be available for immediate assistance. Although there are no known health effects, evidence has shown that very small amounts of gadolinium can remain in the body after multiple MRI exams.

## What are the limitations of MRI of the Body?

High-quality images depend on your ability to remain still and follow breath-holding instructions while the technologist records the images. If you are anxious, confused or in severe pain, you may find it difficult to lie still during the MRI and the image quality will suffer.

A large person may not fit into certain types of MRI machines. There are weight limits on the scanners.

Implants and other metallic objects can make it difficult to obtain clear images. Patient movement can have the same effect. A large amount of ascites fluid in the abdomen/pelvis can also create artifact that results in low-quality MR images.

If you cannot hold your breath, some MRI exams may be of limited quality as the pictures will be blurry.

An MRI exam typically costs more and may take more time than other imaging exams. Talk to your insurance provider if you have concerns about the cost of MRI.

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