

healthsmart!

How to Get a Good MRI

Introduction

Magnetic resonance imaging (MRI) uses magnetic fields and radio waves to make pictures of organs and soft tissues such as muscle and fat. An MRI scanner is a very advanced piece of medical equipment that uses magnets, coils and computer imaging to create the scanned image of your body. The quality of the image depends on the interaction of all these parts.

MRI has less risk of side effects than some other imaging tests because it does not use ionizing radiation. The use of MRI in the United States has grown very fast since it was introduced in 1977. More than 7,000 facilities offer MRI, and more than 26 million scans are done each year.

A doctor may recommend an MRI to help diagnose many medical conditions – tumors, joint injuries, heart problems and spine disease, to name a few.

A high-quality scan is important for making the right diagnosis. A low-quality MRI may lead to mistakes in diagnosis and treatment. Many factors can affect the quality of your MRI scan. This issue of *HealthSmart!* gives an overview of MRI technology and what it takes to get a good scan.

Is an MRI scan always necessary?

An MRI scan is often the best test for many medical problems. It can detect disease that an X-ray would not show. It is important to ask the doctor ordering the scan whether the scan is necessary and how the results will help with treatment. Work with your doctor to decide where to have your MRI performed.

Types of MRI scanners



Traditional



Open bore



Wide-bore magnets

Traditional – The original MRI scanners are like passages with one end closed.

Open bore – Developed to help claustrophobic, older, obese and pediatric patients, this scanner offers more patient comfort because the scan is done in a

more open way. This scanner may let the patient stand during the scan. Some types of exams cannot be done using an open MRI. Even with an open-bore unit, the patient's face may be close to the bore ceiling.

Wide-bore magnets –

A wide-bore scanner has a shorter passage and is open at both ends. Scans may be done with the patient's head outside the opening if the brain is not being scanned. This scanner was developed for claustrophobic and obese patients and can

perform all types of exams. It works with all types of patients, including children, and offers more room between the patient and the bore ceiling.

By using a strong magnetic field and radio waves, MRIs avoid using ionizing radiation like those found in X-rays or CT scans.

Factors for a high-quality MRI

If you and your doctor decide an MRI is needed, it is best to get the highest quality images you can the first time for proper diagnosis and treatment. This is very important if you will make a decision about surgery based on the results. Also, many insurance plans will only pay for one scan.

In addition to the types of MRI scanner used, are several factors help determine image quality.

Scanner technology

The latest MRI technology is found in academic medical centers in large cities. Smaller communities may have fewer options. It is important to understand the types of scanners offered by the facility you choose.

- Field or magnetic strength helps determine the clarity of the images. Magnetic strength is measured in units called Tesla (T), and scanners can range in strength from 0.5 T to 3.0 T. For some medical problems, a higher Tesla is needed to produce higher-resolution images.
- Higher resolution can lead to better-quality images. This helps the doctor who reads the images make better interpretations and diagnoses. So while open MRIs may be more comfortable for the patient, the image resolution maybe less detailed than a smaller enclosed MRI.
- Coils are antennas that receive and transmit image data back to the computer. Coils are pieces of equipment placed around the body part that is being examined. They let the scan be more focused. There are specific coils for foot/ankle, knee, shoulder, hand/wrist, head, heart, breast and whole body.
- For some images, a stronger magnet may mean you spend less time in the MRI to get your scan. Some 3.0 T MRI scans can be completed in as little as 15 minutes.

Why does the MRI scanner make so much noise?

The tapping and knocking noise you hear during an MRI scan is caused by magnetic coils that switch on and off during the scan. These coils measure the signal coming from your body and use that information to make images. Since these noises are often very loud, you will be given some type of hearing protection.

During your MRI scan you will have the choice of headphones with music or ear plugs, depending on the type of scan you get.

MRI and heart disease

Doctors are increasingly using MRIs to:

- Evaluate and manage heart disease or heart weakness.
- Determine the location and extent of tissue damage after a heart attack.
- Determine if your heart is strong enough for angioplasty or bypass surgery.
- Assess reasons for heart rhythm problems.
- Determine the extent of heart damage.
- Get a broader view of congenital heart problems to help make diagnoses.
- Map out cardiac masses for better treatment planning.
- Avoid heart catheterization, which is a more risky procedure, whenever possible.
- Provide an alternative to a traditional stress test.

Imaging software

The software used on the MRI scanners must be up-to-date in order to interpret the results from the unit coils. The use of 3D software allows better planning for surgery and is needed for image fusion where a nuclear medicine study is combined with an MRI scan.

Skill of technologist

MRI technologists have had specific training in performing MRI scans. Their education includes anatomy, physiology, MRI physics and safety training. In order to become certified, they must pass an examination that tests their knowledge and skill.

Skill of the doctor reading the images

To determine the results of your scan, your MRI will be read by a reporting doctor. Be sure to ask for the credentials of the doctor who will read your scan. At many community centers, reporting doctors have general expertise but no subspecialty training. A reporting doctor who specializes in your condition is the best choice to read your MRI.

Insurance coverage and your MRI

Because of the increasing use of MRIs, insurance companies closely examine MRI insurance claims to decide whether each is medically necessary. If your doctor orders an MRI, the information below may help you avoid large out-of-pocket expenses or delays in receiving your scan.

The American Cancer Society recently released guidelines that recommend women at high risk of developing breast cancer have MRI scans in addition to their yearly mammograms. To read more about these guidelines, go to ukhealthcare.uky.edu/publications and click on **Advances & Insights**.

- If you have had an MRI scan in the past, bring copies of the scans to your doctor. This can help reduce the need for additional scans. Copies are normally given on CD. (Be sure and get your copies back.)
- Many health insurance plans require preapproval for an MRI scan. During the preapproval process, the insurance company assesses the necessity of the scan. These review processes are designed to prevent unnecessary MRI scans but they may cause delays in receiving the scan. Know in advance what your insurance company policies are related to MRI, and if your insurance company requires preapproval, be sure to get it before receiving your scan.
- Always check with your insurance company about your coverage and how much out-of-pocket cost you can expect.
- If your insurance plan denies coverage for an MRI scan, you and your doctor have the right to appeal the ruling.

Conditions that can affect MRI

Certain factors can interfere with your test or the accuracy of the results. Talk to your doctor or the reporting doctor if one of these situations applies to you:

- **Pregnancy.** A pregnant woman would not normally have an MRI unless the potential benefits outweigh the potential risks. An MRI scan may be done to get more information about a possible problem that cannot be seen clearly with ultrasound.
- **Electronic medical devices, such as a defibrillator, pacemaker or medication infusion pump.** Other devices you should tell your reading doctor and/or the MRI technologist about are cochlear implants, certain types of clips used on brain aneurysms, deep brain stimulators, artificial heart valves, implanted drug infusion ports and implanted nerve stimulators. The MRI's magnetic field may cause dangerous problems with these devices. If you have a document or card about the medical device that discusses its compatibility with MRI, show it to your doctor.
- **Medical devices that have metal in them.** The metal might make some of the detailed MRI pictures blurry. This may prevent your doctor from seeing the organ being examined. For example, an intrauterine device with metal may prevent your doctor from seeing the uterus clearly.
- **Other metal in your body,** such as shrapnel, metal pins and plates, stents and surgical staples.

- **Inability to remain still during the test.**
- **Obesity.** A person who is very overweight may not fit in a standard MRI scanner.

Staying comfortable

Because it's essential that you remain absolutely still during your scan, the MRI technologist will make every effort to make you comfortable.

1. Most centers have warm blankets if you feel cold.
2. Your MRI technologist is in voice contact with you all the time and a mirror in the scanner lets you see your technologist.
3. Because the MRI scanner makes a loud noise, you are given a button to squeeze so you can call your MRI technologist if needed.
4. Many MRI facilities allow a friend or parent to stay in the room as long as they are screened for safety and the patient is not sedated.
5. Many MRI facilities will allow you to bring your own CD to listen to during the scan or they may provide music.
6. If you are claustrophobic, at the time the exam is scheduled you should ask your doctor to order sedation or a muscle relaxer. For adults, conscious sedation is preferred. If given sedation, you will receive special instructions not to eat or drink.
7. If the child being scanned is very young or active, he or she may need sedation. Talk to your doctor ahead of time. Normally, only major referral facilities have the expertise to offer sedation. For children, unconscious sedation is best.
8. If English is not the patient's first language, a translator may be needed. If this is the case, please let the person who does the scheduling know at the time the scan is scheduled.

MRI process

1. Your doctor's office typically schedules the MRI appointment. This gives them the opportunity to give helpful information to the reporting physician.
2. You will be asked to provide an extensive medical history.
3. You will be asked about medical devices and other metal implants as a safety procedure.
4. You may be asked to have blood tests to rule out any kidney problems, especially if you need to receive a contrast dye for the scan.
5. You will be asked to change out of your clothes into scrubs. Women will need to remove wire bras but can wear sports bras.
6. You will be asked to remove all jewelry and metal objects.

An MRI may find

- If an organ is too large, too small, damaged or absent.
- Abnormal growths, such as tumors.
- Abnormal fluid in the body.
- If a blood vessel is narrowed or blocked or if an aneurysm is present.
- Blockage of important organs.
- Damage to joints, ligaments or cartilage.
- Problems of the nervous system, such as multiple sclerosis, stroke or herniated disc.

MRIs at UK HealthCare

UK HealthCare offers a full range of diagnostic testing capabilities. We perform more than 20,000 MRI scans a year, using seven MRI scanners, each of which can handle a person who weighs up to 550 pounds.

UK HealthCare has reporting doctors who specialize in reading MRI scans on adults and children in the following body regions: brain and spine, breast, heart, chest, abdomen and pelvis, and bones and joints.

We also offer a comprehensive cardiac imaging program staffed by doctors and technologists who have received more specialized training. Such programs are not found at all centers.

In addition, ukhealthcare.uky.edu offers educational resources about MRI and specific injuries that may require an MRI scan. Visit ukhealthcare.uky.edu or call 859-257-1000 or 1-800-333-8874 (toll free) to schedule an appointment.

- *Fact Sheet: A Patient's Guide to MRI*
ukhealthcare.uky.edu/publications/healthfocus/fact_sheets/mrifst.htm
- *Advances & Insights: Evaluating Breast Cancer Imaging Tools*
ukhealthcare.uky.edu/publications/AI/cancer

Other Resources

National Institutes of Health

The NIH has a comprehensive website that gives an overview of MRI, including research, tutorials and links to more information.

5600 Fishers Lane, Room 7C-02
Rockville MD 20857
301-443-4513

www.nlm.nih.gov

American College of Radiology

This health care professional membership group is dedicated to making imaging safe, effective and accessible to those who need it. Their comprehensive website offers patient education information about radiology and a list of accredited MRI facilities.

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www.acr.org