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Magnetic Resonance Imaging (MRI)

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What is an MRI?

Most radiology imaging studies use x-rays to visualize what lies inside the body. For example, a chest x-ray allows the doctor to see through the skin and study the heart and lungs. Modern x-rays are very safe, but do expose the body to some x-ray radiation.

Magnetic resonance imaging (MRI) is a different method of looking inside the body. Instead of x-rays, the MRI scanner uses magnetism and radio waves to produce remarkably clear pictures. The powerful magnetic field causes the hydrogen ions in the body to become magnetized and line up in a certain order. The data received is analyzed and turned into an image by a high powered computer to create detailed image slices (cross sections) of your body. MRI can produce better soft-tissue images than standard x-rays and is better at distinguishing normal, healthy soft tissue from diseased tissue.

How does MRI differ from a CT scan?

One of the most basic differences between the two tests is that Computerized Tomography (CT) Scanning uses x-rays and MRI does not. A CT scan uses faster scanning times and can be performed in patients with pacemakers and other metallic implants. But a CT scan does expose the patient to x-rays and risks allergic reactions to intravenously administered iodine-containing dye. The MRI produces better images of the body's soft tissues and involves no x-rays or iodine dyes. But MRI scanning times are longer and difficult for patients who are not able to hold their breath. Patients with pacemakers and intra-cerebral aneurysm clips cannot be scanned by MRI.

Where Is an MRI performed?

MRI studies can be safely and accurately performed in a hospital radiology department, in a mobile MRI unit, or a freestanding MRI center. Our office sends patients to one of two local MRI units:

- Thorn Run MRI
935 Thorn Run Road

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Suite 116
Moon Township, PA 15108
Tel 412.269.1674

- [West Hills Open MRI](#)
West Hills Professional Center
890 Beaver Grade Road
Moon Township, PA 15108
Tel 412.269.9995

Who performs the exam?

An MRI study is performed by a trained MRI technician under the supervision of a radiologist, a medical doctor trained in special imaging studies. The results of the test are analyzed by the radiologist and reported to your doctor within a few days.

Regular vs "Open" MRI

There are two types of MRI magnet machines: Closed and Open, based upon their shape. The standard "Closed" MRI is done in a narrow tube-like device about 2 feet in diameter and 6 feet to 8 feet long to optimize the images. Because of the small bore of the magnet, some patients experience claustrophobia and have difficulty in cooperating during the study. In the "Open" type, the large magnet that generates the image is generally suspended a couple of feet above the patient, and except for its supports, the unit is Open all around. If a patient is severely claustrophobic or over 300 pounds in weight, the doctor may suggest that the examination be done in an "Open" MRI unit because it has more room inside than a Closed magnet. Most Open units can accommodate patients up to 450 pounds in weight.

The Open unit is more "patient friendly", but most radiologist feel that the Closed MRI operates much faster and produces a higher-resolution image with finer detail than the Open type. Closed magnets can be used for all MRI procedures, and Open magnets are used for more routine applications. Open MRI technology has improved over the years and may be adequate in many cases. Specialized studies such as MR angiography (MRA) and MR cholangiopancreatography (MRCP) can only be performed in Closed MRI machines.

Scheduling an MRI

An MRI is usually scheduled through the local hospital radiology department or a freestanding Open MRI center. In order to perform

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the study, they need an order for the study and an insurance referral from your physician.

MRI is a non-invasive test and really without significant risks. One concern, however, is the "projectile effect", which involves the forceful attraction of metallic objects to the magnet. Because of this, there are several conditions under which MRI may not be safe. Patients should notify the receptionist or technologist prior to their appointment if they have any of the following:

- An implanted pacemaker, defibrillator ("AICD"), or heart valve
- An implanted pump device (such as an insulin or pain medication pump)
- An inner ear implant
- An aneurysm clip within the brain
- An intrauterine device (IUD)
- Metal in the eyes (at any time), or have ever been a metal worker of any kind
- Permanent tattoo eyeliner
- Currently pregnant
- Artificial joints or metallic plates
- Shrapnel

Patients can safely undergo MRI with orthopedic hardware in their joints, such as a metallic plate or hip replacement. However, if the metal device is located close to the part of the body being examined, the images can be seriously degraded and useless.

MR cholangiopancreatography (MRCP)

This big word refers to a special test of the liver, bile ducts, and pancreas done using MRI. MRCP can produce images very similar as those obtained from the more invasive approach with [ERCP](#) (Endoscopic Retrograde Cholangiopancreatography) without the added risk of pancreatitis, sedation, and perforation. However, image quality is less with MRCP and there is no way to correct whatever problem is found, as there is during ERCP. ERCP is best used when there is a high likelihood of gallstones obstructing the bile ducts or another blockage of the liver or pancreas. MRCP is of value in patients with a low probability of gallstones or obstruction in the bile ducts or pancreas, or in patients who are too sick for the anesthesia required for ERCP.

Preparing for an MRI

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There is no special preparation for an MRI examination. There is no need for a change in daily routine. All prescription medications can be taken normally. *However, patients undergoing MRI examination of the gallbladder and bile ducts (MRCP) will be asked to not eat for 12 hours prior to imaging.* No special preparation is required for other body examinations. Patients are asked to bring the physician's order, insurance cards, referral forms, and any previous MRI, CT, or x-ray films relating to their exam. It is best to wear loose clothing without zippers or metallic parts. Elastic waistbands are suggested.

During the exam

The MRI technician explains the exam and answers any questions the patient may have. The patient may be asked to sign a consent form giving permission for the test and may be asked to change into a patient gown. Because MRI uses a powerful magnet, watches, metal objects in pockets, and credit cards with magnetic strips will not be permitted in the MRI room. Patients must also remove any other metallic objects such as jewelry, hairpins, eye glasses, wigs (if it has metallic clips), and non-permanent dentures.

In a Closed MRI unit, the patient is positioned on a scanning table, head first, with arms at the side. The scanning table then slides into the magnet, covering the whole body. For clear pictures, the patient will be asked to hold very still, and in some cases, to hold their breath for up to 30 seconds. There is no pain or other sensation during the exam; however, an MRI is a noisy machine which produces intermittent humming, clicking and knocking sounds. Earplugs are available. Most MRI units also provide an assortment of music to help the patient relax. Patient are welcome to bring their own CD or cassette. There is a two-way intercom providing communication between patient and the technologist. For some studies such as MRCP, the radiologist will inject a "contrast agent" into a vein to improve the quality of the images. This material is injected into a vein in the arm.

How long does an MRI exam take?

The length of MRI examinations can vary from 15 minutes to 1 1/2 hours, averaging 45 minutes. Each test consists of several sequences or collections of data gathered over 2 to 10 minutes.

After the exam

There are no post-exam instructions. You may resume your normal

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diet and activities.

What about pregnancy?

Although there are no known side effects of magnetism on the developing baby, it is recommended that a pregnant woman wait until the second trimester for MR imaging.

Getting the test results?

Because very large amounts of data are created during these studies, they can easily have hundreds of images that require hours of manipulation to interpret. The study will be read by a board-certified radiologist who sends the results to the referring physician who will notify the patient. Results are usually available within 72 hours.

What does an MRI cost?

The cost of an MRI study can range from \$400 to more than \$2,000, with a typical cost being about \$800. Most health insurance, including Medicare, covers MRI testing.

In summary

MRI stands for Magnetic Resonance Imaging. An MRI offers a safe and efficient method of diagnosing many conditions, without the use of harmful x-rays. In many cases, MRI can lead to early detection and treatment of disease without surgery or biopsy. It is a non-invasive method of examining the soft tissue of the body including organs, muscles and tendons and requires little patient preparation. If you have any more questions about MRI, ask your doctor.

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