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Overview

Magnetic resonance imaging (MRI) is a medical imaging technique that uses a magnetic field and computer-generated radio waves to create detailed images of the organs and tissues in your body.



Brain tumor MRI

Most MRI machines are large, tube-shaped magnets. When you lie inside an MRI machine, the magnetic field temporarily realigns water molecules in your body. Radio waves cause these aligned atoms to produce faint signals, which are used to create cross-sectional MRI images — like slices in a loaf of bread.

The MRI machine can also produce 3D images that can be viewed

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Why it's done

MRI is a noninvasive way for your doctor to examine your organs, tissues and skeletal system. It produces high-resolution images of the inside of the body that help diagnose a variety of problems.

MRI of the brain and spinal cord

MRI is the most frequently used imaging test of the brain and spinal cord. It's often performed to help diagnose:

- Aneurysms of cerebral vessels
- Disorders of the eye and inner ear
- Multiple sclerosis
- Spinal cord disorders
- Stroke
- Tumors
- Brain injury from trauma

A special type of MRI is the functional MRI of the brain (fMRI). It produces images of blood flow to certain areas of the brain. It can be used to examine the brain's anatomy and determine which parts of the brain are handling critical functions.

This helps identify important language and movement control areas in the brains of people being considered for brain surgery. Functional MRI can also be used to assess damage from a head injury or from disorders such as Alzheimer's disease.

MRI of the heart and blood vessels

MRI that focuses on the heart or blood vessels can assess:

- Size and function of the heart's chambers
- Thickness and movement of the walls of the heart
- Extent of damage caused by heart attacks or heart disease
- Structural problems in the aorta, such as aneurysms or dissections
- Inflammation or blockages in the blood vessels

MRI of other internal organs

MRI can check for tumors or other abnormalities of many organs in the body, including the following:

- Liver and bile ducts
- Kidneys
- Spleen
- Pancreas
- Uterus
- Ovaries
- Prostate

MRI of bones and joints

MRI can help evaluate:

- Joint abnormalities caused by traumatic or repetitive injuries, such as torn cartilage or ligaments
- Disk abnormalities in the spine
- Bone infections
- Tumors of the bones and soft tissues

MRI of the breasts

MRI can be used with mammography to detect breast cancer, particularly in women who have dense breast tissue or who might be at high risk of the disease.

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Risks

Because MRI uses powerful magnets, the presence of metal in your body can be a safety hazard if attracted to the magnet. Even if not attracted to the magnet, metal objects can distort the MRI image. Before having an MRI, you'll likely complete a questionnaire that includes whether you have metal or electronic devices in your body.

Unless the device you have is certified as MRI safe, you might not be able to have an MRI. Devices include:

- Metallic joint prostheses
- Artificial heart valves
- An implantable heart defibrillator
- Implanted drug infusion pumps
- Implanted nerve stimulators
- A pacemaker
- Metal clips
- Metal pins, screws, plates, stents or surgical staples

- Cochlear implants
- A bullet, shrapnel or any other type of metal fragment
- Intrauterine device

If you have tattoos or permanent makeup, ask your doctor whether they might affect your MRI. Some of the darker inks contain metal.

Before you schedule an MRI, tell your doctor if you think you're pregnant. The effects of magnetic fields on fetuses aren't well understood. Your doctor might recommend an alternative exam or postponing the MRI. Also tell your doctor if you're breast-feeding, especially if you're to receive contrast material during the procedure.

It's also important to discuss kidney or liver problems with your doctor and the technologist, because problems with these organs might limit the use of injected contrast agents during your scan.

How you prepare

Before an MRI exam, eat normally and continue to take your usual medications, unless otherwise instructed. You will typically be asked to change into a gown and to remove things that might affect the magnetic imaging, such as:

- Jewelry
- Hairpins
- Eyeglasses
- Watches
- Wigs
- Dentures
- Hearing aids
- Underwire bras
- Cosmetics that contain metal particles

What you can expect

During the test

The MRI machine looks like a long narrow tube that has both ends open. You lie down on a movable table that slides into the opening of the tube. A technologist monitors you from another room. You can talk with the person by microphone.

If you have a fear of enclosed spaces (claustrophobia), you might be given a drug to help you feel sleepy and less anxious. Most people get through the exam without difficulty.

The MRI machine creates a strong magnetic field around you, and radio waves are directed at your body. The procedure is painless. You don't feel the magnetic field or radio waves, and there are no moving parts around you.

During the MRI scan, the internal part of the magnet produces repetitive tapping, thumping and other noises. You might be given earplugs or have music playing to help block the noise.

In some cases, a contrast material, typically gadolinium, will be injected through an intravenous (IV) line into a vein in your hand or arm. The contrast material enhances certain details. Gadolinium rarely causes allergic reactions.

An MRI can last anywhere from 15 minutes to more than an hour. You must hold still because movement can blur the resulting images.

During a functional MRI, you might be asked to perform a number of small tasks — such as tapping your thumb against your fingers, rubbing a block of sandpaper or answering simple questions. This helps pinpoint the portions of your brain that control these actions.

After the test

If you haven't been sedated, you can resume your usual activities immediately after the scan.

Results

A doctor specially trained to interpret MRIs (radiologist) will analyze the images from your scan and report the findings to your doctor. Your

doctor will discuss important findings and next steps with you.

Video: MRI

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Seeing Inside the Heart with MRI

A cardiac MRI provides still or moving pictures of how the blood is flowing through the heart.

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