TEST

MRI

An MRI uses a strong magnet and radio waves to create detailed body images.

WHAT IT MEASURES
Detailed pictures of organs, tissues, blood vessels, and joints

SAMPLE
None

FASTING NEEDED?
Sometimes for abdominal MRI or sedation

HOW LONG IT TAKES
15 to 60 minutes, sometimes longer

RESULTS IN
Usually several days; timing varies by imaging service

USED FOR
Screening, diagnosis, treatment planning, and monitoring

MAIN LIMITATION
Movement or metal can blur or distort images

Overview

Magnetic resonance imaging, or MRI, creates detailed pictures of the inside of your body. It uses a strong magnet, radio waves, and a computer. It does not use the ionizing radiation used in X-rays and CT scans.

MRI is particularly useful for viewing the brain, spinal cord, nerves, muscles, joints, heart, blood vessels, and many internal organs. Different scanning methods, called sequences, can highlight fluid, blood flow, inflammation, fat, or particular tissues.

Some MRI examinations use a contrast medicine, usually containing gadolinium. It is given through a vein to make certain tissues or blood vessels easier to see.

An MRI produces images rather than a single test number. A radiologist, who is a doctor trained to interpret medical images, reviews the scan and writes a report.

Why the test is ordered

MRI can help investigate symptoms, check an area seen on another test, plan treatment, or

monitor a known condition.

It may be used to look for:

Special types include magnetic resonance angiography for blood vessels, cardiac MRI for the heart, and MRCP for the liver, gallbladder, bile ducts, and pancreas.

- Changes in the brain, spine, nerves, or joints
- Injuries to muscles, ligaments, cartilage, or tendons
- Abnormalities in organs such as the liver, kidneys, uterus, or prostate
- Changes in the heart or blood vessels
- The size or location of a growth
- The effect of surgery, medicine, or other treatment

Who should have the test

MRI may be appropriate when its detailed soft-tissue images could help answer a specific medical question. Whether it is the right test depends on your symptoms, examination, medical history, and previous results.

MRI is also used for screening in selected situations, such as certain breast screening programs for people at increased risk. It is not automatically the best screening test for everyone.

Some implanted devices and metal fragments require extra safety checks. Many modern medical implants can be scanned under specific conditions, but the MRI team must confirm the exact device and settings first. In some situations, CT, ultrasound, X-ray, or another test may be more suitable.

How to prepare

Follow the instructions from the imaging centre. You can usually eat, drink, and take your usual medicines normally. You may be asked not to eat for several hours before some abdominal examinations or if sedation is planned.

Tell the MRI team before the appointment if you:

Bring information about any implant, including its model or safety card if available.

Remove jewellery, watches, hearing aids, removable dental items, piercings, and clothing containing metal when instructed. Phones, bank cards, and other magnetic items must stay

outside the scanner room.

- Have a pacemaker, implanted defibrillator, medicine pump, cochlear implant, or nerve stimulator
- Have surgical clips, artificial joints, metal fragments, or another implant
- Have worked with metal or may have metal in your eyes
- Are pregnant or could be pregnant
- Have kidney problems or are receiving dialysis
- Previously reacted to MRI contrast
- Find enclosed spaces difficult

What happens during the test

You change into suitable clothing if needed and complete a metal-safety questionnaire. If contrast is required, a small tube may be placed into a vein in your arm or hand.

You lie on a padded table that moves into the scanner. A lightweight device called a coil may be placed around the body part being examined. The scanner is open at both ends, although the area being scanned is usually near the centre.

MRI machines make loud knocking, tapping, or buzzing sounds. You receive ear protection and can communicate with the radiographer throughout the scan. You may be asked to hold your breath briefly.

It is important to keep still because movement blurs the images. Most examinations take 15 to 60 minutes, but complex scans can take longer. Sedation may sometimes be offered when anxiety, pain, age, or difficulty remaining still would otherwise prevent a useful scan.

Understanding your results

The radiology report describes what was examined, what was seen, and what the findings may mean. It may compare the images with an earlier MRI, CT, ultrasound, or X-ray.

Terms such as "normal," "unchanged," or "no acute abnormality" generally mean no relevant new problem was identified. "Indeterminate" means a finding cannot be confidently classified from that scan alone. An "incidental finding" is something discovered unexpectedly that may or may not need follow-up.

MRI usually has no universal reference range. If the report includes measurements, expected

values and interpretation can vary by imaging service or laboratory, age, sex, pregnancy status, medicines, and clinical context.

A scan result does not diagnose every condition by itself. Its meaning comes from the images, your symptoms, medical history, examination, and other tests.

What affects the results

Several factors can reduce image quality or make findings harder to interpret without anything being wrong with the scanner.

Movement is the most common problem. Breathing, coughing, swallowing, pain, anxiety, or difficulty staying still can create blur. Following breath-hold instructions helps during chest and abdominal MRI.

Metal can distort the magnetic field. Dental work, artificial joints, surgical clips, and metal fragments may hide nearby tissue even when they are safe to scan.

Other influences include:

Pregnancy can change the normal appearance and position of some organs. It also affects whether contrast is used. Most routine medicines do not directly interfere with MRI, but you should still provide an up-to-date medicine list.

- Using a scan protocol that does not target the suspected problem
- Scanning too early for a very small or developing abnormality
- Poor timing of contrast during blood-vessel or organ imaging
- Reduced contrast clearance in people with impaired kidney function
- Recent surgery, radiotherapy, or other treatment that changes tissue appearance
- Medicines or treatments that alter blood flow, inflammation, or organ activity
- Differences in scanner strength, equipment, and image sequences

Accuracy and limitations

MRI provides excellent soft-tissue detail, but accuracy depends on the body area, suspected condition, scanning method, image quality, and the experience of the person interpreting it. There is no single reliable figure for how often all MRI examinations are correct.

MRI can miss a problem when it is very small, at an early stage, outside the scanned area, or hidden by movement or metal distortion. A protocol designed for one question may not show a

different condition well.

It can also show something that looks abnormal but is harmless. Normal anatomical differences, old injuries, scar tissue, inflammation, and benign growths can sometimes resemble more important disease. Incidental findings may lead to comparison imaging or another test.

A different test may answer some questions better. CT is often faster and can show lungs, bones, bleeding, and calcium clearly. Ultrasound gives real-time images and is useful for many abdominal, pelvic, pregnancy, and blood-flow questions. A biopsy may be needed when imaging cannot determine exactly what a tissue change represents.

Risks and complications

MRI itself does not expose you to ionizing radiation. The strong magnetic field can move unsafe metal objects or interfere with some implants, which is why safety screening is essential.

Some people feel enclosed or anxious. The scanner is noisy, and remaining still may be uncomfortable. Tell the radiographer immediately if you feel burning, unusual heating, pain, or distress during the scan.

An intravenous line can cause a small bruise or brief soreness. Gadolinium contrast can cause temporary symptoms such as nausea, headache, or discomfort at the injection site. Serious allergic reactions are uncommon.

People with severe kidney impairment need additional assessment before some gadolinium contrast medicines because of a rare complication called nephrogenic systemic fibrosis. Small amounts of gadolinium may remain in the body after contrast MRI; the clinical importance of this is still being studied.

Sedation has separate risks and may affect coordination and judgment afterward.

What happens next

Most people can return to normal activities immediately. If you received sedation, you will need the centre's instructions about supervision, driving, work, food, and medicines.

The report is sent to the healthcare professional who requested the scan. Routine follow-up may involve discussing the result, comparing it with earlier imaging, or arranging another test if the finding is unclear.

Mild bruising at an injection site can usually be monitored. Seek emergency help after contrast if you develop difficulty breathing, swelling of the face or throat, collapse, or rapidly worsening symptoms.

Do not wait for an MRI result if you develop new symptoms that may need urgent care, such as sudden weakness, severe breathing difficulty, or loss of consciousness.

Common questions

Can I drink coffee before an MRI?

Usually, unless you were told to fast. Milk, sugar, and caffeine may not be allowed during a fasting period. Follow the instructions for your specific examination.

Does the time of day matter?

Usually not. Timing may matter when the scan must coordinate with fasting, sedation, medicines, menstrual-cycle timing, or another procedure.

Can I exercise beforehand?

Light activity is generally acceptable. Strenuous exercise can temporarily change muscles and other tissues, so ask before an MRI assessing a recent injury, inflammation, or the heart.

Can I wear deodorant or makeup?

Some products contain metallic particles that may affect certain scans, particularly around the head or breasts. The imaging centre may ask you to remove them.

Can I have an MRI if I am pregnant?

MRI does not use ionizing radiation and may be used during pregnancy when clinically appropriate. Tell the MRI team. Gadolinium contrast is generally considered separately and used only when its expected benefit justifies it.

What if I am claustrophobic?

Tell the imaging centre in advance. Options may include preparation and support, a wider scanner where available, or prescribed sedation. If sedated, arrange for a responsible adult to take you home.

Sources

- Magnetic Resonance Imaging Safety , US Food and Drug Administration

- ACR Manual on MR Safety , American College of Radiology
- ACR Manual on Contrast Media , American College of Radiology
- Magnetic Resonance Imaging of the Body , RadiologyInfo.org, American College of Radiology and Radiological Society of North America
- MRI scan , NHS
- Gadolinium-containing contrast agents , European Medicines Agency