TEST

Heart MRI

A heart MRI uses a magnetic field to create detailed images of the heart.

WHAT IT MEASURES
Heart structure, movement, blood flow, and tissue characteristics

SAMPLE
None

FASTING NEEDED?
Sometimes, especially before contrast or stress imaging

HOW LONG IT TAKES
Usually 30 to 90 minutes

RESULTS IN
Several days; timing differs by imaging center

USED FOR
Diagnosis and monitoring

MAIN LIMITATION
Movement and implanted metal can distort images

Overview

A heart MRI, also called cardiac magnetic resonance imaging or cardiac MRI, creates detailed pictures of your heart. It uses a strong magnetic field and radio waves. It does not use X-rays or other ionizing radiation.

The scan can show the size and shape of the heart, how well its chambers pump, and how blood moves through the heart and major blood vessels. It can also examine heart muscle for scarring, inflammation, unusual thickening, or excess iron.

Some scans use a contrast agent containing gadolinium. This is injected into a vein to make blood vessels and certain tissue changes easier to see. A stress heart MRI also uses medicine to make the heart work harder or increase blood flow, allowing images to be taken under controlled stress.

Why the test is ordered

A heart MRI may provide information that an echocardiogram, which uses ultrasound, cannot

show clearly. It may also help answer a specific question raised by an electrocardiogram, blood test, CT scan, or other assessment.

It may be ordered to investigate or monitor:

Heart MRI is not usually used as a general screening test for people without symptoms or a specific clinical reason.

- Heart muscle weakness, thickening, inflammation, or scarring
- Reduced blood flow to part of the heart
- Damage after a heart attack
- Heart conditions present from birth
- Heart valve or major blood vessel problems
- Fluid, thickening, or inflammation around the heart
- A suspected blood clot or mass
- Iron buildup in the heart
- Changes seen on an earlier scan

Who should have the test

You may be offered heart MRI when detailed information about heart structure, pumping, blood flow, or tissue is needed. It can be particularly useful when earlier tests were unclear or when avoiding radiation is important.

Not everyone can be scanned in the same way. Tell the imaging team about pacemakers, defibrillators, implanted pumps, nerve stimulators, aneurysm clips, metal fragments, or previous surgery. Many modern devices are MRI-compatible under specific conditions, but the exact model must be checked.

Also tell the team if you are or may be pregnant, have kidney disease, have previously reacted to MRI contrast, or find enclosed spaces difficult. These factors do not always prevent the scan, but they may change how it is performed.

How to prepare

Follow the instructions from your imaging center. Preparation differs between a routine heart MRI and a stress MRI.

You may be asked not to eat for several hours. For a stress MRI, you may also need to avoid caffeine because it can block the effect of some stress medicines. Caffeine may be present in coffee, tea, cola, energy drinks, chocolate, and some medicines.

Take your usual medicines unless your care team gives you specific instructions. Do not stop heart or blood pressure medicine on your own. Certain medicines may need to be adjusted before stress imaging.

Before entering the scanner room, you will remove metal objects such as jewelry, hearing aids, removable dental appliances, watches, and clothing with metal fasteners. Bring details of any implanted device.

A kidney function blood test may be needed if gadolinium contrast is planned, especially if you have kidney disease or related risk factors.

What happens during the test

You will lie on a narrow table. Sticky pads may be placed on your chest to record your heartbeat, and a blood pressure cuff may be fitted. A lightweight receiver called a coil is placed over your chest to collect the MRI signals.

If contrast or stress medicine is needed, a small plastic tube is placed into a vein in your arm. The table then moves into the scanner, which is shaped like a short tunnel.

The scanner makes loud tapping, buzzing, and knocking sounds. You will receive ear protection and can communicate with the radiographer throughout the test.

You need to remain as still as possible. You will often be asked to hold your breath for several seconds while images are taken. Each breath-hold helps reduce blurring caused by chest movement.

During a stress MRI, medicine is given while your heartbeat, blood pressure, and symptoms are monitored. The medicine is stopped after the required images have been collected.

Understanding your results

A specialist in medical imaging reviews the scan and prepares a report. The report may describe:

One common measurement is the ejection fraction. This is the percentage of blood pumped out of a heart chamber with each beat. It is interpreted alongside chamber size, symptoms, medical history, and findings from other tests.

Reference values can differ by imaging center, scanner, software, and measuring method. Interpretation may also be affected by age, sex, body size, pregnancy status, medicines, heart rhythm, and the clinical reason for the scan. A finding outside a listed range does not by itself establish a diagnosis.

- Heart chamber size and wall thickness
- How strongly the heart pumps
- Blood flow through the heart and major vessels
- Heart valve movement
- Areas of reduced blood supply
- Patterns suggesting scar, inflammation, or other tissue change
- Fluid or changes around the heart
- Masses, clots, or structural differences

What affects the results

Heart MRI relies on carefully timed images, so movement is a major source of blur. Difficulty lying still or holding your breath can reduce detail without indicating a heart problem.

An irregular or very fast heartbeat can interfere with timing because many images are matched to particular points in each heartbeat. The team may adjust the scanning method, but some measurements may remain less reliable.

Metal implants can create artifacts, which are distorted or blank areas on an image. Even when an implant is safe for MRI, it may hide nearby heart tissue.

For a stress MRI, caffeine can make some stress medicines less effective. Certain heart medicines may also alter the heart-rate or blood-flow response. This is why preparation instructions must be specific to the type of stress medicine being used.

Kidney function does not usually change the heart images directly, but it may affect whether gadolinium contrast is given. Without contrast, some questions about scar, inflammation, blood flow, or masses may be harder to answer.

Pregnancy can change normal heart measurements and may affect decisions about contrast. Body size, breathing pattern, recent heart procedures, and the strength or type of scanner can also influence image quality and comparison with earlier studies.

Accuracy and limitations

Heart MRI is highly detailed, but it is not a single yes-or-no test. Its ability to find a problem depends on what is being investigated, the scanning method, image quality, and the person interpreting the images.

It may miss very small or early tissue changes. Movement, an irregular heartbeat, or metal-related distortion can hide a real abnormality. This is a false-negative result: the scan appears reassuring even though a problem is present.

It can also show changes that resemble disease but have another explanation. For example, scarring patterns, increased wall thickness, or changes in blood flow are not always specific to one condition. This can produce a false-positive result, where the scan suggests a problem that further testing does not confirm.

Other tests may be better for particular questions. CT can show calcium and the coronary arteries in greater anatomical detail. Echocardiography may be better for real-time valve assessment and is easier to repeat. An electrocardiogram records the heart's electrical activity. In selected situations, a tissue biopsy is needed to identify the exact cause of a heart muscle change.

Risks and complications

Heart MRI itself does not expose you to ionizing radiation. The strong magnetic field can interact with metal or electronic implants, which is why careful safety screening is essential.

A needle used for contrast or medicine may cause brief discomfort, bruising, or light-headedness. Gadolinium contrast can cause nausea or an allergic-like reaction, although serious reactions are uncommon. In people with severe kidney disease, particular care is taken when choosing whether and which contrast agent to use.

Stress medicines can temporarily cause flushing, shortness of breath, chest discomfort, dizziness, or a racing heartbeat. You are monitored during the test, and the medicine can be stopped if needed.

Some people feel anxious in the scanner. If sedation is planned, it carries separate risks and you will usually need someone to take you home.

What happens next

You can usually return to normal activities immediately after a routine scan. Drink and eat as

directed by the imaging center. If you received sedation, follow the center's restrictions on driving, alcohol, work, and important decisions.

Your referring clinician will review the report with your symptoms, examination, and other test results. Routine next steps may include no further testing, a follow-up appointment, changes to monitoring, or another test aimed at a specific finding.

After a stress MRI, tell staff immediately if chest discomfort, severe breathlessness, faintness, or another symptom continues before you leave. After going home, seek urgent medical help for severe or worsening chest pain, major breathing difficulty, fainting, or signs of a serious allergic reaction such as swelling of the face or throat. Mild bruising at the injection site can usually be discussed at routine follow-up if it does not improve.

Common questions

Can I drink coffee before a heart MRI?

Usually yes for a routine scan, unless your center says otherwise. Before a stress MRI, you may need to avoid coffee and all other caffeine for a set period because caffeine can interfere with some stress medicines.

Does the time of day matter?

Usually not. Appointment timing may matter if you need to fast, avoid caffeine, or change when you take a medicine.

Can I exercise beforehand?

Normal activity is often acceptable before a routine scan. For stress imaging, follow the center's instructions because exercise can affect your heart rate and the planned stress response.

Will I need contrast?

Not always. Contrast is more likely when the scan needs to assess scar, inflammation, blood supply, a mass, or certain blood vessels.

Can I have a heart MRI with a pacemaker?

Possibly. Many devices can be scanned under specific conditions, while others cannot. The imaging team needs the manufacturer, model, and implant details before deciding.

Can I drive afterward?

You can usually drive after a routine scan. Do not drive if you received sedation or if the imaging center gives you different instructions.

Sources

- American College of Radiology. ACR Manual on Contrast Media , 2024
- Kramer CM, Barkhausen J, Bucciarelli-Ducci C, et al. Standardized cardiovascular magnetic resonance imaging protocols: 2020 update . Journal of Cardiovascular Magnetic Resonance, 2020;22:17
- American College of Radiology and Radiological Society of North America. Cardiac MRI . RadiologyInfo.org
- U.S. Food and Drug Administration. Gadolinium-based contrast agents are retained in the body; new class warnings required , 2017
- Kim D, Hausenloy DJ, Chen Y, et al. Cardiovascular magnetic resonance in patients with cardiac implantable electronic devices: SCMR expert consensus statement . Journal of Cardiovascular Magnetic Resonance, 2024