Cardiac (Heart) MRI



Cardiac magnetic resonance imaging (MRI) uses a powerful magnetic field, radio waves and a computer to produce detailed pictures of the structures within and around the heart. Doctors use cardiac MRI to detect or monitor cardiac disease. They also use it to evaluate the heart's anatomy and function in patients with both heart disease present at birth and heart diseases that develop after birth. Cardiac MRI does not use radiation, and it may provide the best images of the heart for certain conditions.

Tell your doctor about any health problems, recent surgeries, or allergies, and whether you are pregnant. The magnetic field is not harmful, but it may cause some medical devices to malfunction. Most orthopedic implants pose no risk, but you should always tell the MRI technologist if you have any devices or metal in your body. Guidelines about eating and drinking before your exam vary between facilities. Unless you are told otherwise, take your regular medications as usual. Leave all jewelry at home and wear loose, comfortable clothing. You may need to change into a gown for the procedure. If you have claustrophobia or anxiety, ask your doctor for a mild sedative prior to the exam.

What is Cardiac MRI?

Magnetic resonance imaging (MRI) is a noninvasive test doctors use to diagnose medical conditions.

MRI uses a powerful magnetic field, radiofrequency pulses, and a computer to produce detailed pictures of internal body structures. MRI does not use radiation (x-rays).

Detailed MR images allow doctors to examine the body and detect disease.

What are some common uses of the procedure?

Cardiac MRI helps your doctor detect or monitor cardiac disease by:

- evaluating the anatomy and function of the heart chambers, heart valves, size of and blood flow through major vessels, and the surrounding structures such as the pericardium (the sac that surrounds the heart).
- diagnosing a variety of cardiovascular (heart and/or blood vessel) disorders such as tumors, infections, and inflammatory conditions.
- evaluating the effects of coronary artery disease (http://www.radiologyinfo.org) such as limited blood flow to the heart muscle and scarring within the heart muscle after a heart attack.
- planning a patient's treatment for cardiovascular disorders.
- monitoring the progression of certain disorders over time.
- evaluating the effects of surgical changes, especially in patients with congenital heart disease.
- evaluating the anatomy and function of the heart and blood vessels in children and adults with congenital (http://www.radiologyinfo.org) heart disease (heart disease present at birth).

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Other reasons for cardiac MRI include, but are not limited to:

- Coronary artery disease
  - Evaluating the extent and recoverability of a prior myocardial infarction (heart attack)
- Diagnosing and monitoring the progression or recovery from other causes of heart failure or arrhythmia such as cardiomyopathy, myocarditis, cardiac amyloidosis, and cardiac sarcoidosis.
- Evaluating arrhythmia or unexplained cardiogenic syncope or near sudden death
- Pericardial diseases
  - Including masses, pericardial constriction, and certain pericardial effusions.
- Evaluating the heart valves and vessels connected to the heart.
  - Evaluating heart valve regurgitation or stenosis.
  - Monitoring the size of the major blood vessels (aortic aneurysms).
- Monitoring of pulmonary hypertension.
- Evaluating masses in or around the heart.
- Evaluating congenital heart disease
  - Used in both preoperative planning and postoperative monitoring.
  - Monitoring a congenital abnormality that does not yet require surgery or intervention.
- Diagnosing and planning management of hypertrophic cardiomyopathy (overgrowth of portions of the heart).

Who interprets the results and how do I get them?

A radiologist, a doctor trained to supervise and interpret radiology exams, will analyze the images. The radiologist will send a signed report to your primary care or referring physician, who will share the results with you.

You may need a follow-up exam. If so, your doctor will explain why. Sometimes a follow-up exam further evaluates a potential issue with more views or a special imaging technique. It may also see if there has been any change in an issue over time. Follow-up exams are often the best way to see if treatment is working or if a problem needs attention.

What are the benefits vs. risks?

If you have a pacemaker, defibrillator, or other implanted heart device, you may still be eligible for MRI. In the past, doctors did not perform MRI on people with a pacemaker or implantable cardioverter defibrillator (ICD). This has changed. Many devices made today are designed and tested for use in the MRI scanner. Research has also shown that people with older devices can often be scanned safely when the imaging team takes the right precautions. Your device will usually need to be checked and may need to be adjusted before and after your exam, and your heart rhythm will be monitored while you are scanned. Tell your doctor and the radiologic technologist about your device before your exam. Bring your device identification card if you have one. Your doctor and the radiologist will decide together whether cardiac MRI is right for you.

Benefits

- MRI is a noninvasive imaging technique that does not involve exposure to radiation.
- MR images of the heart are better than other imaging methods for certain conditions. This advantage makes MRI an invaluable tool in early diagnosis and evaluation of certain cardiac abnormalities, especially those involving the heart muscle.
- MRI has proven valuable in diagnosing a broad range of conditions, including cardiovascular anatomical anomalies (e.g., congenital heart defects), functional abnormalities (e.g., valve failure), tumors, and conditions related to coronary artery disease and cardiomyopathy (disease affecting the heart muscle).

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- MR imaging can be used during certain interventional procedures, such as catheter-based ablation procedures to treat irregular heart rhythms, including atrial fibrillation. The use of MRI can substantially shorten procedure time and result in improved accuracy.
- MRI can detect abnormalities that might be obscured by bone with other imaging methods.
- The MRI gadolinium contrast material is less likely to cause an allergic reaction than the iodine-based contrast materials used for x-rays and CT scanning.
- Cardiac MRI allows your doctor to evaluate the structures and function of the heart and major vessels without the risk of radiation exposure associated with other procedures or exams.

Risks

- The MRI exam poses almost no risk to the average patient when appropriate safety guidelines are followed.
- If sedation is used, there is a risk of using too much. However, your vital signs will be monitored to minimize this risk.
- The strong magnetic field is not harmful to you. However, it may cause implanted medical devices to malfunction or distort the images.
- Nephrogenic systemic fibrosis is a recognized complication related to injection of gadolinium (http://www.radiologyinfo.org) contrast material. It is exceptionally rare with the use of newer gadolinium contrast materials. It usually occurs in patients with serious kidney disease. Nearly all cases have been linked to older contrast materials that are no longer in routine use. Because the risk with the contrast materials used today is very low or possibly absent, testing your kidney function before the exam is no longer routinely required. Your doctor will decide whether any testing is needed in your case.
- There is a very slight risk of an allergic reaction if your exam uses contrast material. Such reactions are usually mild and controlled by medication. If you have an allergic reaction, a doctor will be available for immediate assistance.
- Although there are no known health effects, evidence has shown that very small amounts of gadolinium can remain in the body, particularly the brain, after multiple MRI exams. This is most likely to occur in patients receiving multiple MRI exams over their lifetime for monitoring chronic or high-risk health conditions. The contrast material is mostly eliminated from the body through the kidneys. If you are a patient in this category, consult with your doctor about the possibility of gadolinium retention, as this effect varies from patient to patient.
- IV contrast manufacturers indicate mothers should not breastfeed their babies for 24-48 hours after contrast material is given. However, the most recent American College of Radiology (ACR) Manual on Contrast Media reports that studies show the amount of contrast material absorbed by the infant during breastfeeding is extremely low. The ACR states that mothers may continue to breastfeed without interruption after receiving gadolinium contrast material. If you would still prefer to stop breastfeeding for a short time, discuss this with your doctor.

What are the limitations of a Cardiac MRI?

High-quality images depend on your ability to remain perfectly still and follow breath-holding instructions while the images are being recorded. If you are anxious, confused or in severe pain, you may find it difficult to lie still during imaging.

A person who is very large may not fit into certain types of MRI machines. There are weight limits on the scanners.

Implants and other metallic objects can make it difficult to obtain clear images. Patient movement can have the same effect.

A very irregular heartbeat may affect the quality of images. This is because some techniques time the imaging based on the electrical activity of the heart.

The constant motion of the heart creates challenges in obtaining clear images. These challenges can be overcome by various techniques including synchronizing the imaging with ECG tracing, synchronizing the imaging with breathing, or having you perform repeated short breath holds during imaging.

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MRI is generally not recommended for seriously injured patients. However, this decision is based on clinical judgment. This is because traction devices and life support equipment may distort the MR images. As a result, they must be kept away from the area to be imaged. Some trauma patients, however, may need MRI.

Present data show no convincing evidence that non contrast MRI harms the fetus of a pregnant woman. However, if the need for the exam is not time sensitive your doctor may delay the exam until after delivery. MRI gadolinium contrast materials are generally avoided during pregnancy except in very specific circumstances. Your doctor will discuss the benefits and risks of any MRI procedure with you. Doctors may perform MRI after the first trimester to assess the fetus for findings that are not fully evaluated by ultrasound.

Acquiring detailed images of the coronary arteries and their branches is more difficult with MRI than with other imaging exams. Therefore, coronary artery imaging is most often done with cardiac CT or a more invasive procedure using a catheter placed into the blood vessels via the groin or arm.

An MRI exam typically costs more and may take more time than other imaging exams. Talk to your insurance provider if you have concerns about the cost of MRI.

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