MODERN MEDICAL MODALITIES CORPORATION

Cardiac MRI (MRI of the Heart, Great Vessels and Adjacent Structures)

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What is a Cardiac MRI?

MRI (magnetic resonance imaging) uses radiofrequency waves and a strong magnetic field rather than x-rays to provide remarkably clear and detailed pictures of internal organs and tissues. The procedure is valuable in diagnosing a broad range of conditions in all parts of the body, including heart and vascular disease, stroke, cancer and joint and musculoskeletal disorders. MRI is unique in that it can also create detailed images of blood vessels without the use of contrast material (although there is a trend toward the use of special non-iodinated MRI contrast material—for example, gadolinium). MRI requires specialized equipment and expertise and allows evaluation of some body structures that may not be as visible with other imaging methods.

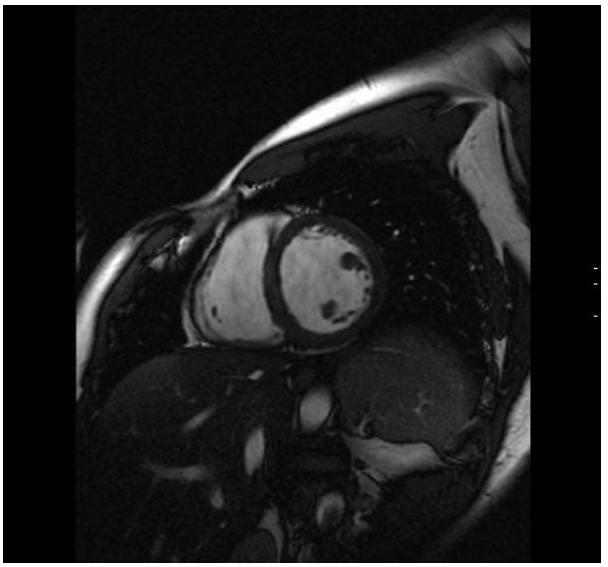
What are some common uses of Cardiac MRI?

Magnetic resonance imaging is becoming very important in the initial diagnosis and subsequent management of coronary heart disease. MRI can help physicians to look closely at the structures and function of the heart and major vessels quickly and thoroughly, without the risks associated with traditional, more invasive procedures. Using MRI, physicians can examine the size and thickness of the chambers of the heart, and determine the extent of damage caused by a heart attack or progressive heart disease.

After a heart attack, for example, an MRI examination can help the cardiologist understand how well the heart is pumping, whether the flow of blood is blocked in any chamber or major vessel, whether the heart muscles

are damaged or whether the lining of the heart is swelling. This is critical knowledge needed to administer prompt and effective treatment.

MRI can also detect the buildup of plaque and blockages in the blood vessels, making it an invaluable tool for detecting and evaluating coronary artery disease. Recently, specialists in MRI have demonstrated its potential for showing not only the structure, but also the function of the heart muscles, valves and vessels. Using MRI, they have created movie-like images of the beating heart that doctors can use to diagnose a variety of cardiovascular problems. More and more, MRI is being used as part of the traditional cardiac stress test to help physicians with earlier diagnosis and treatment of heart disease and to assess the patient's recovery after treatment.



Cardiac MRI scan.

How should I prepare for my Cardiac MRI?

Because the strong magnetic field used for MRI will pull on any iron-containing object in the body, MRI staff will ask whether you have a heart pacemaker or implanted defibrillator, implanted port, infusion catheter (often referred to by brand names such as Port-o-cath, Infusaport or Lifeport), intrauterine device (IUD), or any metal plates, pins, screws or surgical staples in your body. In most cases, surgical staples, plates, pins and screws pose no risk during MRI. Red dyes used in tattoos and permanent eyeliner may contain metallic iron oxide and could heat up during MRI; however, this is rare. You will be asked if you have ever had a bullet or shrapnel in your body or ever worked with metal. If there is any question of metal fragments, you may be asked to have an x-ray that will detect any metal objects.

The radiologist or technologist may ask about drug allergies and whether you have undergone any surgery in the past. If you are or might be pregnant, mention it to the MRI staff. Some patients who undergo MRI in an enclosed unit may feel confined or claustrophobic. If you are not easily reassured, a sedative may be administered. Fewer than one in 20 patients will require medication.

How does the Cardiac MRI procedure work?

MRI is a unique imaging method because, unlike the usual radiographs (x-rays), radioisotope studies, and even computed tomography (CT) scanning, it does not rely on radiation. Instead, radiofrequency waves are directed at protons, part of the nuclei of hydrogen atoms, in a strong magnetic field. The protons are first "excited" and then "relaxed," causing them to emit radiofrequency signals that can be computer-processed to form an image. In the body, protons are most abundant in the hydrogen atoms of water—the "H" of H2O—so that an MRI shows differences in the water content and distribution in various body tissues. Even different types of tissue within the same organ, such as the muscle and vessels of the heart, can be easily distinguished.

How is the Cardiac MRI performed?

The patient is placed on a sliding table and positioned comfortably for the MRI examination. Then the radiologist and technologist leave the room, and the individual MRI sequences are performed. The patient is able to communicate with the technologist at any time by using an intercom. Also, many MRI centers allow a friend or, if a child is being examined, a parent to stay in the room.

Depending on how many images are needed, the exam will generally take 15 to 45 minutes, although a very detailed study may take longer. You will be asked not to move during the actual imaging process.

For examination of the heart, contrast material may be used to enhance the visibility of the heart’s chambers and major vessels. A small needle connected to an intravenous line is placed in an arm or hand vein. A saline solution will drip through the intravenous line to prevent clotting until the contrast material is injected, about two-thirds of the way through the exam.

When the exam is over, the patient will be asked to wait until the images are examined to determine if more images are needed.

What will I experience during my Cardiac MRI?

MRI causes no pain, but some patients find it uncomfortable to remain still during the examination. Others experience a sense of being closed in, though the more open construction of many new MRI systems has helped reduce that reaction. You may notice a warm feeling in the area under examination; this is normal, but tell the radiologist or technologist if it bothers you.

If a contrast material is used, there may be discomfort at the injection site, and you may have a cool sensation at the site during the injection. The loud tapping or knocking noises heard at certain phases of the imaging exam disturb some patients; earplugs may help.

What are the benefits vs. risks of Cardiac MRI?

Benefits

- Images of soft-tissue structures such as the heart and major vessels are clearer and more detailed than with other imaging methods.
- The detail of MRI makes it an invaluable tool in early detection and evaluation of coronary disease.
- Even without the use of contrast material, MRI often shows sufficient detail of the heart to be valuable in diagnosis and treatment planning.
- When it is used, MRI contrast material is less likely to produce an allergic reaction than the iodine-based materials used for conventional x-rays and CT scanning and does not contain the radioisotopes used in nuclear medicine exams.
- MRI enables the detection of abnormalities that might be obscured by bone tissue with other imaging methods.
- MRI provides a fast, noninvasive and often less expensive alternative to other techniques of cardiac diagnosis.
- MRI can help physicians evaluate the function, as well as the structure, of the heart muscles and valves.

- MRI does not require exposure to radiation or the introduction of radioisotopes to the body.

Risks

- An undetected metal implant may be affected by the strong magnetic field.

- MRI is generally avoided in the first 12 weeks of pregnancy. Doctors usually use other methods of imaging—such as ultrasound—on pregnant women, unless there is a strong medical reason to conduct an MRI exam.

What are the limitations of Cardiac MRI?

In most cases, the exam is safe for patients with metal implants, with the exception of a few types of implants, so patients should inform the technologist of an implant prior to the test. The exam must be used cautiously in early pregnancy.