

## Magnetic Resonance Imaging (MRI)

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Magnetic resonance imaging is another way to take clear pictures of the heart and surrounding blood vessels and measure heart function. The MRI uses painless magnet waves to evaluate the heart and the blood vessels connected to the heart and lungs. Often a small IV will need to be placed in the hand to give medications that show the blood flow in the heart or to give medications for sedation.

The test usually requires 30–60 minutes to perform and your child must be perfectly still for the test. For this reason infants and young children need to be placed under general anesthesia for the test. During the test your child will be placed on a table within the magnet. Most of your child's body will be within a small tunnel in the center of the magnet. This can be disturbing even for older children and adults, but many centers have special headphones and video masks that can help to keep your child calm during the test.

Sometimes the test is done instead of or in addition to the cardiac catheterization and angiogram. Your pediatric cardiologist will decide if your child needs either test, or both.

### **What is magnetic resonance imaging (MRI)?**

MRI is an imaging method that produces pictures of the body using a magnet and radio waves. Using special antennas, the machine (called "MRI scanner") receives radio waves from the body and processes the signals in its computer to generate very clear pictures of the anatomy.

### **Why is it necessary?**

MRI is done to evaluate the structure and function of the heart and blood vessels. Your/your child's cardiologist (heart doctor) has requested this test to find out information on the anatomy and function of the cardiac chambers and blood vessels. MRI may provide your/your child's cardiologist with information that cannot be obtained by other tests such as an X-ray picture of the chest, ECG, echocardiogram (cardiac ultrasound) or other tests.

### **Is MRI painful?**

No. MRI is considered a "non-invasive" test because the machine takes pictures without touching the body. There is no pain associated with an MRI examination. The MRI machine makes loud banging, buzzing and clicking noises during most of the exam. The technologist will give you/your child earplugs to soften the noise.

**Is MRI harmful?**

No. MRI is not harmful because it does not use X-rays or any radioactive radiation. Experience with many millions of MRI scans over more than 25 years has shown no known harmful effects.

**Can all patients have MRI?**

No. Most centers currently recommend that patients who have a pacemaker, a defibrillator or a permanent pacemaker lead do not have an MRI. Pregnant women may not undergo MRI during the first trimester (three months) of pregnancy. If you think you may be pregnant, please discuss this with your cardiologist or local MRI specialist before the scheduled test.

Before the examination, you will be asked to fill out a questionnaire asking you about any implants or surgeries you may have had. Most implants used in heart patients (e.g., sternal wires, stents, occluding devices, coils, most heart valves, etc.) are considered permissible for an MRI examination.

Some patients have implants that are not related to the heart and blood vessels. If you have any questions or concerns regarding whether an implant or an operation you or your child had may interfere with an MRI examination, consult with your local MRI specialist.

**Anxiety and Claustrophobia**

Some patients may experience anxiety inside the MRI scanner (claustrophobia). Most of the time this feeling disappears after they get used to the machine. If you feel that you or your child might have claustrophobia, please let your doctor know so he/she can prescribe a medication that relieves anxiety (such as Valium or a similar medication). In general, this option may be considered in adolescents and adults and should be discussed well in advance with your cardiologist. Please remember that you cannot drive after receiving Valium or a similar medication.

**Sedation or Anesthesia**

To obtain clear pictures of the heart and blood vessels, the patient needs to remain still in the MRI scanner during the test. Most babies and young children and some older patients who are unable to lie still or are too afraid of the machine need to be asleep during the examination. In most young children with heart problems, either sedation or general anesthesia may be used to maintain sleep inside the MRI machine.

**Intravenous Line (IV) and Contrast Dye**

Many patients receive a contrast dye, called *gadolinium*, during the exam to help obtain a better picture of blood vessels. The dye is given through an intravenous line (IV) placed before the examination. A cream that numbs the skin may be applied before the IV is placed. Check with your local MRI department on information about IV placement and the use a numbing cream.

**Eating and Drinking Instructions**

Patients who are scheduled for anesthesia or sedation: Consult your physician or nurse for specific instructions well in advance of the scheduled exam. In general, patients receiving sedation or anesthesia must not eat or drink for several hours before the procedure.

Patients who do not receive anesthesia or sedation: You should avoid food or drink one hour before the scheduled exam in order to avoid a visit to the bathroom during the scan.

**Preparation**

For children, it is helpful to explain in an age-appropriate way why the MRI is needed and what to expect. Let your child know that you will be nearby during the scan. Bring a favorite storybook or toy for the waiting time.

**Before the Exam Begins**

After you fill out a screening form, a technologist will explain the exam, answer your questions and let you know if you need to change into a hospital gown. You/your child will be asked to remove watches, credit cards and all jewelry, except 14k gold.

A nurse or technologist will then put ECG leads (stickers) on you/your child's chest or back. All patients who need gadolinium (contrast dye), anesthesia, or a drug test require an intravenous line (IV).

**Description of the Examination**

The MRI machine sits in a large room and looks like a tunnel. The patient lies down on a table that slides into the tunnel.

A technologist operates the MRI machine from outside the room behind a glass window. He or she talks and listens to you/your child through an intercom and can see you through the glass window and through a closed circuit video system. The technologist will help you if you need anything during the exam.

Most institutions allow a parent, spouse, or friend to remain in the MRI room during the exam. If you are a mother who is pregnant, you may not stay in the room for safety reasons but may bring another adult to stay with your child.

MRI examination of the heart usually lasts 45-90 minutes.

During the exam you/your child may be asked to hold your breath for brief periods (10-20 seconds). This helps create clearer pictures of the heart. The technologist will check with you/your child before the test begins whether you feel comfortable holding your breath.

**During the Scan**

In some MRI scanners, you may listen to music or a radio program during the test. Check with your local MRI department if you can bring your own CD with you.

**After the Exam**

Children who receive sedation or anesthesia are observed until they are fully awake and can drink. This usually takes about 1-2 hours.

Patients who receive anesthesia, sedation or Valium (or a similar medication) must have a responsible adult with them when they leave the hospital. Any patient who receives sedation will not be allowed to drive home. If a ride has not been arranged, the procedure will be rescheduled.

**When will the results be available?**

When the MRI scan is completed, the cardiac MRI specialist will review the images. He or she will report the results to your or child's cardiologist who will call you with the results, usually within several days.