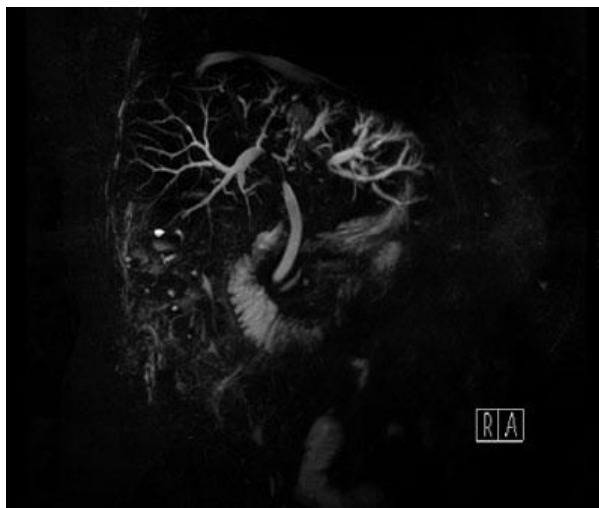


MR Angiography (MRA)

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What is MR Angiography?

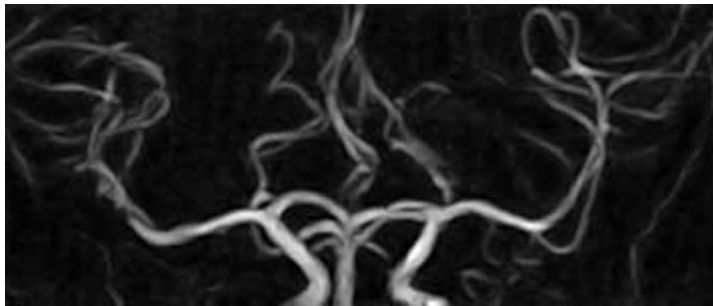
Magnetic resonance imaging (MRI) is a method of producing extremely detailed pictures of body tissues and organs without the need for x-rays. The electromagnetic energy that is released when exposing a patient to radiofrequency waves in a strong magnetic field is measured and analyzed by a computer, which forms two- or three-dimensional images that may be viewed on a TV monitor. MR angiography (MRA) is an MRI study of the blood vessels. It utilizes MRI technology to detect, diagnose and aid the treatment of heart disorders, stroke, and blood vessel diseases. MRA provides detailed images of blood vessels without using any contrast material, although a special form of contrast material is often given to make the MRI images even clearer. The procedure is painless, and the magnetic field is not known to cause tissue damage of any kind.



MRA of heart.

What are some common uses of the MR Angiography?

- Many patients with arterial disease now have it treated in the radiology department rather than undergoing surgery in an operating room. MRA is a very useful way of finding problems with blood vessels and determining how to best to treat those problems.
- The carotid arteries in the neck that conduct blood to the brain are a common site of atherosclerosis, which may severely narrow or block off an artery, reducing blood flow to the brain and even causing a stroke. If an ultrasound study shows that such disease is present, many surgeons will perform the necessary operation after confirmation with MRA, dispensing with the need for catheter angiography.
- MRA has found wide use in checking patients for diseased intracranial (in the head) arteries, so that only those with positive findings will need to undergo a more invasive catheter study.



MRA of brain.

- MRA is also used to detect disease in the aorta and in blood vessels supplying the kidneys, lungs and legs.
- Patients with a family history of arterial aneurysm, a ballooning out of a segment of the vessel wall, can be screened with MRA to see if they have a similar disorder that has not produced symptoms. If an aneurysm is found, it may be eliminated surgically, possibly avoiding serious or fatal bleeding.

How should I prepare for my MR Angiography?

The magnetic field used for MRA will pull on any iron-containing object in the body, such as a heart pacemaker, intrauterine device, vascular access port, metal plate, pins, screws or staples. You will be given a questionnaire to

answer regarding these issues. The radiologist or technologist should know about any such item and also whether you have ever had a bullet in your body, whether you ever worked with metals, or if you have had a joint replacement. If there is any question, an x-ray can be taken to detect metal objects. The radiologist should also know if you have fillings in your teeth, which could distort images of the facial region or brain. Braces make it harder to properly adjust the MRI unit. You will be asked to remove hairpins, jewelry, eyeglasses, hearing aids and any dental work that can be taken out. Some wigs contain metal and must be removed. Red dyes used in tattoos and permanent eyeliner may contain metallic iron, but this is rarely a problem. You should report any drug allergies to the radiologist or technologist and should mention if there's any possibility that you might be pregnant.

You can eat normally before the exam (unless told differently), but a young child should not eat or drink for about four hours if they will receive a sedative. The rules vary at different MRI facilities, so be sure to check with your medical center about eating and drinking before the exam. Medications may be taken as usual. Some patients will feel uncomfortably confined (claustrophobic) when enclosed in an MRI unit. If necessary, you will be given a sedative to help put you at ease, though probably fewer than one in every 20 patients will need this. You will wear a lightweight medical gown for the exam.

How does the MR Angiography work?

Exposing the patient to radio waves in a strong magnetic field generates data that are used by a computer to create images of tissue slices that may be viewed in any plane or from any direction. The magnetic field lines up atomic particles in the tissues called protons, which are then spun by a beam of radiofrequency waves and produce signals that are picked up by a receiver in the imager. It is these signals that are processed by the computer to produce images. The resulting images are very sharp and detailed and are thus able to demonstrate tiny changes from the normal pattern that are caused by disease or injury. Special settings are used to image various structures, such as arteries in the case of MRA.



MRA vascular scan.

How is the MR Angiography performed?

The patient is placed on a special table and positioned inside the opening of the MRI unit. A typical exam consists of two to six imaging sequences, each taking two to 15 minutes. Each sequence provides a specific image orientation and a specified degree of image clarity or contrast. Depending on the type of exam being done, the total time needed can range from 10 to 60 minutes, not counting the time needed to change clothing, have an IV put in and answer questions. When contrast material is needed, a substance called gadolinium is given by IV injection during one of the imaging sequences. It highlights blood vessels, making them stand out from surrounding tissues.

The radiologist and technologist leave the examining room during the actual imaging process, but the patient can communicate with them at any time using an intercom. Some centers permit a friend to stay nearby, or a parent if a child is being examined. When the exam is completed you will be asked to wait to make sure that more images are not needed.

What will I experience during my MR Angiography?

The technologist will make you as comfortable as possible, but at times the magnet may be within a few inches of your face. For those who become very uncomfortable when enclosed in a small space, a mild sedative is nearly always effective. You may notice a warm feeling in the area being studied.

This is normal, but do not hesitate to report it if it bothers you. If you receive a contrast material injection, there may be some local discomfort at the IV site. The loud tapping or knocking noises that are heard during certain parts of the exam disturb some patients; earplugs may help.

What are the benefits vs. risks of MR Angiography?

Benefits

- Detailed images of blood vessels and blood flow are obtained without having to insert a catheter directly into the area of interest, so that there is no risk of damaging an artery.
- The procedure itself and the time needed to recover are shorter than after a traditional catheter angiogram.
- MRA is less costly than catheter angiography.
- There is no exposure to x-rays during an MRI study.
- Even without using contrast material, MRA can provide high-quality images of many blood vessels, making it very useful for patients prone to allergic reactions.
- As with catheter-based angiography or CT angiography, it frequently is possible to defer surgery after getting the results of an MRA study. If surgery remains necessary, it can be performed more accurately.

Risks

- There are no definite side effects from any type of MRI study, including MR angiography. Claustrophobia may be a problem, however. When it is severe and not relieved by giving a sedative, an alternative imaging method may have to be tried. If a metal implant is present but goes undetected, it may be affected by the strong magnetic field to which the patient is exposed. In addition, if the implant is close to the examination site it may be hard to get high-quality images.
- MRI is generally avoided during the first three months of pregnancy. Ultrasound is preferred at this time, unless the woman might have a very serious condition that is best detected with

MRA. The effects of MRI on the fetus, if any, remain to be determined. The general rule for MRI and other diagnostic studies in pregnancy is that they should be avoided unless there is substantial risk from missing the correct diagnosis because the procedure is not done. Women who are breast-feeding should inform the radiologist and ask how to proceed. They may pump breast milk before the exam for use until the gadolinium contrast material has cleared from the body.

What are the limitations of MR Angiography?

MRA does not image calcium, as does CT angiography. The procedure should be avoided in any patient with a pacemaker, implanted neurostimulator, metallic ear implant or metallic object within the eye socket. It should also be avoided if there is a bullet fragment or if the patient has a port for delivering insulin or chemotherapy. For patients who are very claustrophobic, adequate nursing staff must be on hand to monitor sedation.

The clearness of MRA images does not yet match those obtained with conventional angiography. MRI of small vessels, in particular, may not be adequate for diagnosis and treatment planning. Sometimes it may be difficult to separate images of arteries from veins with MRA.