MR Angiography (MRA)



MR angiography (MRA) uses a powerful magnetic field, radio waves and a computer to evaluate blood vessels and help identify abnormalities. This exam does not use radiation and may require an injection of contrast material. The contrast material used for MRA is less likely to cause an allergic reaction than the contrast material used for computed tomography (CT).

Tell your doctor about any health problems, recent surgeries, 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 technologist if you have any devices or metal in your body. Sometimes, your doctor will give you a card with information about your implant. Give this to the technologist. Guidelines about eating and drinking before your exam vary between facilities. Unless your doctor tells you otherwise, take your regular medications as usual. Leave jewelry at home and wear loose, comfortable clothing. You may be asked to wear a gown. If you have a fear of close spaces or anxiety, consider asking your doctor for a mild sedative prior to the exam.

What is MR Angiography?

Doctors use angiography to diagnose and treat blood vessel-related diseases. Angiography exams produce pictures of major blood vessels throughout the body. In some cases, contrast material (http://www.radiologyinfo.org) is used.

Doctors perform angiography using:

- fluoroscopy (x-rays (http://www.radiologyinfo.org)) to help place catheters into blood vessels and inject contrast to help visualize them
- computed tomography (CT)
- magnetic resonance imaging (MRI)

In magnetic resonance angiography (MRA), a powerful magnetic field, radio frequency waves and a computer are used to evaluate blood vessels and help identify abnormalities. This exam, like all MR-based exams, does not use radiation.

An MRA exam may or may not use contrast material. If needed, an injection of a gadolinium (http://www.radiologyinfo.org) - based contrast material may be used. Gadolinium is less likely to cause an allergic reaction than the iodinated contrast material used in CT angiography. The doctor or the technologist will usually administer the contrast material by placing a small intravenous (IV) catheter in a vein in your arm.

What are some common uses of the procedure?

Doctors use MRA to examine blood vessels in key areas, including the:

- brain
- neck

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- heart
- chest
- abdomen (such as the kidneys and liver)
- pelvis
- legs and feet
- arms and hands

Doctors use MRA to:

- identify abnormalities, such as aneurysms, (http://www.radiologyinfo.org) in the aorta, both in the chest and abdomen, or in other arteries.
- detect atherosclerotic (http://www.radiologyinfo.org) (plaque) disease in the carotid artery of the neck, which may limit blood flow to the brain and cause a stroke.
- identify an arteriovenous malformation (http://www.radiologyinfo.org) inside the brain or elsewhere.
- detect plaque disease that has narrowed the arteries to the legs and help prepare for angioplasty/stent placement or surgery.
- detect disease in the arteries to the kidneys or visualize blood flow to help prepare for a kidney transplant or stent placement.
- guide interventional radiologists and surgeons making repairs to diseased blood vessels, such as implanting stents (http://www.radiologyinfo.org) or evaluating a stent after implantation.
- detect injury to one or more arteries in the neck, chest, abdomen, pelvis, or limbs following trauma.
- evaluate arteries feeding a tumor prior to surgery or other procedures such as chemoembolization or selective internal radiation therapy.
- identify dissection (http://www.radiologyinfo.org) or splitting in the aorta in the chest or abdomen or its major branches.
- help evaluate the heart and the large vessels around it. Detailed imaging of the coronary arteries themselves is more difficult with MRA than with other exams, so cardiac CT or a catheter procedure is used more often for this purpose. Your doctor may still use MRA to help plan treatment, such as a coronary bypass (http://www.radiologyinfo.org) and stenting.
- examine pulmonary arteries in the lungs to detect pulmonary embolism (https://www.radiologyinfo.org/en/info/pulmonary-embolism) (blood clots, such as those traveling from leg veins) or pulmonary AVMs. For a suspected blood clot in the lungs, CT angiography is usually the first test. MRA is generally used when CT is not a good option for you, and at centers experienced with this exam.
- look at congenital abnormalities in blood vessels, especially arteries in children (e.g., malformations in the heart or other blood vessels due to congenital heart disease).
- evaluate stenosis (http://www.radiologyinfo.org) and obstructions of vessels.
- screen individuals for arterial disease, especially patients with a family history of it.

MRA is also used as a substitute for CT angiography when iodinated contrast material cannot be used.

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?

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Benefits

- MRI is a noninvasive imaging technique that does not involve exposure to radiation.
- Detailed images of many blood vessels and blood flow can be obtained without having to insert an IV catheter into the blood vessels. When needed, a small IV catheter is inserted into a small vein in the arm so that there is no risk of damaging a major blood vessel.
- An MRA scan may take less time than traditional catheter angiography and requires no recovery period, unless sedation was provided. If no sedation was used, you may return to your normal daily activities immediately following the MRA exam.
- MR angiography is less costly than catheter angiography.
- Even without using contrast material, MRA can provide useful high-quality images of many blood vessels. This makes it very valuable for patients prone to allergic reactions or with reduced kidney or liver function.
- 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.

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 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 MR Angiography?

Unlike CT angiography (http://www.radiologyinfo.org) , MRA is not able to see and capture images of calcium deposits within the blood vessels.

MRA images of some arteries may not be as clear as catheter angiography images. MRA evaluation of small vessels, in particular, may be difficult. Sometimes it may be difficult to create separate images of arteries and veins with MRA.

Patients who cannot lay still or on their backs may have poor quality MRA images. Some tests involve monitoring the heartbeat or require patients to hold their breath for 15 to 25 seconds at a time in order to get high quality pictures. Any type of motion, such as patient movement, breathing motion, cardiac motion, or other involuntary movements can decrease the image quality and

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potentially limit diagnosis.

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.

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.

Doctors usually avoid contrast injections during pregnancy unless they are absolutely necessary for medical treatment.

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