

## **MRI of the Head**

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### *What is MRI of the Head?*

Magnetic resonance imaging (MRI) uses radio waves and a strong magnetic field rather than x-rays to provide remarkably clear and detailed pictures of internal organs and tissues. This technique has proved very helpful to radiologists in diagnosing tumors of the brain as well as disorders of the eyes and the inner ear. It 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 the MRI of the Head procedure?*

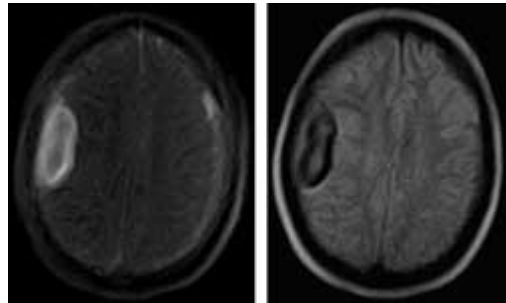
MRI is the most sensitive exam for brain tumors, strokes, and certain chronic disorders of the nervous system such as multiple sclerosis. In addition, it is a useful means of documenting brain abnormalities in patients with dementia, and it is commonly used for patients with disease of the pituitary gland. MRI can detect tiny areas of tissue abnormality in patients with disease of the eyes or the inner ear.

### *How should I prepare for my MRI of the Head?*

Because the strong magnetic field used for MRI will pull on any metal object implanted in the body, MRI staff will ask whether you have a prosthetic hip, heart pacemaker (or artificial heart valve), implanted port, infusion catheter (brand names Port-o-cath, Infusaport, Lifeport), intrauterine device (IUD), or any metal plates, pins, screws, or surgical staples in your body. Tattoos and

permanent eyeliner may also create a problem. 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 such metal objects. Tooth fillings usually are not affected by the magnetic field, but they may distort images of the facial area or brain, so the radiologist should be aware of them. The same is true of braces, which may make it hard to "tune" the MRI unit to your body. You will be asked to remove anything that might degrade MRI images of the head, including hairpins, jewelry, eyeglasses, hearing aids, and any removable dental work.

The radiologist or technologist may ask about drug allergies and whether head surgery has been done in the past. If you might be pregnant, this should be mentioned. Some patients who undergo MRI of the head in an enclosed unit may feel confined or claustrophobic. If you are not easily reassured, a sedative may be administered. Roughly one in 20 patients will require medication.



*MRI of head showing concussion*

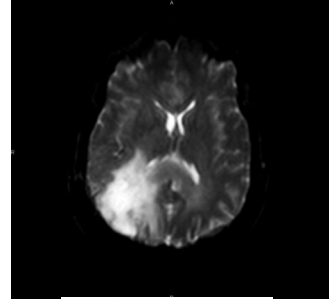
### *How does the MRI of the Head procedure work?*

MRI is a unique imaging method because, unlike the usual radiographs (x-rays), radioisotope studies, and even CT scanning, it does not rely on radiation. Instead, radio waves are directed at protons, the nuclei of hydrogen atoms, in a strong magnetic field. The protons are first "excited" and then "relaxed," emitting radio signals, which can be computer-processed to form an image. In the body, protons are most abundant in the hydrogen atoms of water — the "H" of H<sub>2</sub>O — so that an MRI image shows differences in the water content and distribution in various body tissues. Even different types of tissue within the same organ, such as the gray and white matter of the brain, can easily be distinguished. Typically an MRI exam consists of two to six imaging sequences, each lasting two to 15 minutes. Each sequence has its own degree of contrast and shows a cross section of the head in one of several planes (right to left, front to back, upper to lower).

### *How is the MRI of the Head performed?*

The patient is placed on a sliding table and a radio antenna device called a surface coil is positioned around the upper part of the head. After positioning the patient with the head inside the MRI gantry, the radiologist and

technologist leave the room and the individual MRI sequences are performed. The patient is able to communicate with the radiologist or technologist at any time using an intercom. Also, many MRI centers allow a friend or, if a child is being examined, a parent, into 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. The patient will be asked not to move during the actual imaging process, but between sequence is allowed. Patients are generally required to remain still for only a few seconds at a time. Some patients will require an injection of a contrast material to enhance the visibility of certain tissues or blood 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 is asked to wait until the images are examined to determine if more images are needed.



MRI of head.      ent

### *What will I experience during my MRI of the Head?*

MRI causes no pain, but there may be a feeling of claustrophobia from being closed-in or from the need to remain still. You may notice a warm feeling in the area under examination; this is normal, but if it bothers you the radiologist or technologist should be told. If a contrast injection is needed, there may be discomfort at the injection site, and you may have a cool sensation at the site during the injection. Most bothersome to many patients are the loud tapping or knocking noises heard at certain phases of imaging. Ear plugs may help. When the knocking and the slight vibration that may accompany it stops, you can reposition your arms.

### *What are the benefits vs. risks of MRI of the Head?*

#### Benefits

- Images of the brain and other head structures are clearer and more detailed than with other imaging methods.
- MRI contrast material is less likely to produce an allergic reaction than the iodine-based materials used for conventional x-rays and CT scanning.
- Exposure to radiation is avoided.

- MRI enables the detection of abnormalities that might be obscured by bone tissue with other imaging methods.
- A variant called MR angiography (MRA) provides detailed images of blood vessels in the brain—oftentimes without the need for contrast material. The risk of an allergic reaction from MRA contrast is extremely low and kidney damage does not occur.
- New MRI systems can depict brain function, and in this way detect a stroke at a very early stage.

#### 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.

#### *What are the limitations of MRI of the Head?*

Bone is better imaged by conventional x-rays, and CT is preferred for patients with severe bleeding. MRI may not always distinguish between tumor tissue and edema fluid, and does not detect calcium when this is present within a tumor. In most cases the exam is safe for patients with metal implants but there are a few exceptions, so patients should inform the technician of an implant prior to the test. The exam must be used cautiously in early pregnancy. MRI often costs more than CT scanning.