

Original Article: Complications and risks of MRI



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Citation A Hassan Ali, **Complications and risks of MRI**, *EJCMPR* . 2024; 3(5): 33-45.

<https://doi.org/11253227>

Article info:

Received: 02 September 2024

Accepted: 09 November 2024

Available Online:

ID: EJCMPR-2411-1253

Checked for Plagiarism: Yes

Peer Reviewers Approved by:

Dr. Amir Samimi

Editor who Approved Publication:

Dr. Frank Rebout

Keywords:

Tumor, tissue body, MRI, chewing
Avoid chewing gum

ABSTRACT

Anywhere in the body may undergo extensive changes and be at risk of developing a tumor. Magnetic resonance imaging can be performed on the liver, bile, pancreas, spleen, uterus, ovary, and prostate and can reveal many problems in the body. Because radio waves are used in magnetic resonance imaging, the side effects of MRI are usually not significant. However, sometimes contrast dye can cause side effects such as skin rashes, headaches, and dizziness. For the following groups, this type of imaging is not prescribed and is dangerous: Normal imaging in pregnant women (in the first trimester) and the use of contrast material during pregnancy is prohibited; People who have had an allergic reaction to contrast material in the past; People who have any kind of metal in their body. In order to be able to examine how MRI is performed, we simultaneously examine care in three time periods, before, during, and after MRI: If you have a question about what to eat before MRI, pay attention to the fact that you should be completely fasting for about 4 hours before the imaging (the meaning of "Unknown" is that you should even refrain from drinking water, smoking, and chewing Avoid chewing gum too). In some cases, you may be asked not to eat or drink anything for 4 hours before the scan. Sometimes you may be asked to drink a lot of water before the scan, depending on the opinion of the doctor and imaging technician. You will usually be asked to stop taking medications in consultation with your doctor.

Introduction

This type of magnetic resonance imaging provides detailed images of the structures inside the chest cavity, including the mediastinum, chest wall, pleura, and heart and blood vessels (from almost any angle) [1-3]. MRI also provides sequential film-like imaging of the cardiovascular system, which is important for assessing the health and function of these structures (heart, valves, great vessels, etc.) [4].

When is a chest MRI performed?

Magnetic resonance imaging of the chest is performed for:

- When the aim is to investigate abnormal masses that cannot be evaluated with other imaging methods (usually CT scan) [5];
- When it is necessary to determine the size, extent and extent of tumor spread to adjacent structures [6];

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- When there is a need to evaluate the anatomy, function of the heart and its constituent structures (valves, etc.) [7];
- When it is necessary to evaluate myocardial perfusion (blood flow to the heart) and myocardial infarction (scarring in the heart muscle due to blockage of blood flow) (myocardial infarct) [8];
- When it is necessary to examine the dynamics of blood flow in the vessels and chambers of the heart [9];
- When showing lymph nodes and blood vessels (including vascular and lymphatic abnormalities of the chest) is necessary;
- When evaluation of disorders of the chest bones (vertebrae, ribs and sternum) and soft tissue of the chest wall (muscles and fat) is necessary;
- When evaluation of pericardial disease (the thin sac around the heart) is necessary;
- A special form of magnetic resonance imaging called magnetic resonance angiography is useful for evaluating the vessels of the chest cavity [10-16] (arteries and veins). MRA can also show an aneurysm, blockage of a vessel or thrombosis, or a tear in the inner lining of an artery [17].

MRI of the rest of the body

- ❖ Usually, some people (people over 40 years old and people with a history of infectious diseases, kidney and diabetes) are asked to bring the results of the creatinine test with them on the day of the test [18].
- ❖ When you arrive at the hospital, you will usually be asked to fill out a questionnaire about your health and medical history. This helps medical staff make sure you have the scan safely.

- ❖ Once you have completed the questionnaire, you will usually be asked to provide your signed consent to be scanned.
- ❖ Because the MRI scanner produces strong magnetic fields, it is important to remove any metal objects (watches, jewelry such as earrings and necklaces, pendants, dentures, hearing aids, wigs with metal parts) from your body [19].
- ❖ Depending on which part of your body is being scanned, you may need to wear a hospital gown during the procedure. Otherwise, you should wear clothing without metal zippers, fasteners, buttons, belts, or buckles.
- ❖ If you have a history of allergic reactions or any blood clotting problems before the injection, you must inform the technician.
- ❖ Magnetic resonance imaging is a painless procedure, so anesthesia (painkillers) is usually not required. If you are claustrophobic, you can use a mild sedative after consulting your doctor [20].
- ❖ In the pediatric MRI department, general anesthesia may be prescribed for infants and young children before the MRI scan [21-25]. This is because it is important to remain still during the scan, and staying still is something that babies and young children are usually unable to do when they are awake [26].

Magnetic resonance imaging in order to examine the tissue of the heart and its blood vessels can help in the following cases

- The condition of heart valves and their function;
- The thickness and movement of the heart walls and the amount of damage caused by heart attacks;
- Problems in the aorta;

- Any inflammation or blockage of blood vessels [27].

MRI of bones and joints

This type of magnetic resonance imaging depicts the following abnormalities:

- Joint abnormalities, cartilage and ligament tears;
- Disc abnormality in the spine;
- Presence of any type of infection or tumor in the bone or joint [28].

What happens during an MRI?

An MRI scanner is a short cylinder with two open ends. Therefore, you first need to lie down on a bed that moves inside the scanner and put your head or feet into the scanner [29-35], depending on which part of the body is being scanned. In some cases, a frame may be placed over the part of the body being scanned (such as the head or chest). This frame contains receptors that receive the signals sent by your body during the scan and can help create a better-quality image [36-39]. A computer is used to operate the MRI scanner, which is located in a separate room to keep it away from the magnetic field produced by the scanner. To avoid blurring of the images, it is very important to keep the part of your body being scanned still throughout the scan [40-45]. A scan may take from a few seconds to 3 or 4 minutes. You may be asked to hold your breath during short scans. The entire process takes 15 to 90 minutes, depending on the size of the area being scanned and the number of pictures that will be taken [46].

Care after MRI

Magnetic resonance imaging is usually performed as an outpatient procedure. After the scan, you can immediately resume your normal activities [47-51]. Driving and working with heavy machinery and drinking alcoholic beverages for 24 hours after taking a sedative are not recommended [52].

MRI interpretation

In order to interpret the results of the MRI, it must first be determined which part of the body needs to be imaged [53-60], and according to that, the radiologist technician interprets the results and provides them to the doctor after the imaging [61].

How long does the MRI take?

The results of the MRI scan should be reviewed by the radiologist and possibly discussed with the MRI specialist and other specialists [62-68]. This means that it is unlikely that the results of the scan will be provided at the same time. The audiologist writes a report for the doctor who ordered the scan, and it usually takes some time to get the final results.

Does MRI have any special side effects?

Considering that in this type of imaging (as opposed to scanning that uses X-rays), radio waves are considered, no special complications have been raised. However, pregnant women, people who are previously allergic to injected substances, and people who have metal in their body, should not apply for MRI [69].

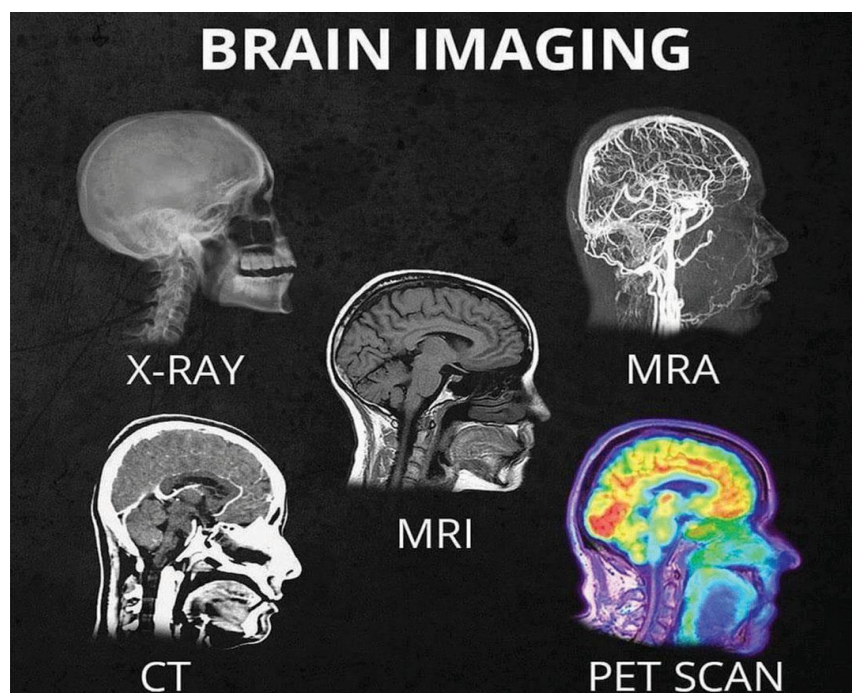


Figure 1. What's the difference between all the different head scans

How much does an MRI cost?

The cost of MRI varies according to the organ from which this imaging is performed. On the other hand, to know the exact cost, you should also pay attention to the amount of your insurance coverage. Brain MRI is an imaging method that uses strong magnets and radio waves to create images of the brain and its surrounding nervous tissue. MRI is used more than CT scan. Because this method can easily detect problems in soft tissue. It is also safe to use during pregnancy [70].

Tests that may be performed instead of a brain MRI include:

- CT scan of the brain;
- Positron emission tomography (PET) of the brain.

Brain MRI is done in hospitals or imaging centers. You lie on a narrow bed that moves into a large tunnel-like machine. Some brain MRIs require a special dye called contrast. Contrast is usually injected through a vein in your hand or arm and helps the radiologist see some parts of the brain more clearly. During an MRI, the person operating the machine monitors you

from another room. This imaging usually takes between 10 and 15 minutes, but it may take longer.

What are the preparations for this shooting?

You may be asked to fast for 4 to 6 hours before the scan. If you have a fear of closed spaces (claustrophobia), you may be given medication to make you drowsy and reduce your anxiety. Or, your doctor may recommend an open MRI, where the machine is not completely wrapped around your body [71-3]. You may be asked to wear a hospital gown or clothing without metal straps (such as sweatshirts and T-shirts). Some types of metals can blur images.

Before imaging, tell your doctor if you have:

- Brain aneurysm clips;
- Artificial heart valve;
- Defibrillator or pacemaker;
- Inner ear implants;
- Kidney disease or the need for dialysis (you may not be able to use contrast);
- Recently placed artificial joint;
- Blood artery stent [74];

- Have worked with sheet metal in the past (you may need to have tests done to check for metal in your eyes).

MRI has strong magnets. Metal objects are not allowed to enter the MRI machine room. These include

- Pens, pocket knives and glasses;
- Objects such as jewelry, watches, credit cards, and hearing aids;
- Pins, hairpins, metal zippers and similar metal objects;
- Any removable metal piece used for dental work [75].

Why is brain MRI performed?

Brain MRI is used to diagnose or control many diseases and complications that affect the brain. Including:

- Birth defect;
- Bleeding (subarachnoid hemorrhage or bleeding in the brain tissue itself);
- Family history of atherosclerosis;
- Infection such as brain abscess;
- Tumor (cancerous or non-cancerous);
- Hormonal disorders (such as acromegaly, galactorrhea, Cushing's syndrome) [76];
- MS;
- Stroke.

Head MRI can also determine the origin of the following

- Muscle weakness or numbness and murmuring;
- Change in thinking or behavior;
- Deafness;
- Headache when other signs or symptoms have occurred;
- Difficulty speaking;
- Vision problems;
- Mental deterioration.

A special type of MRI called MR angiography (MRA) may be used to evaluate blood vessels in the brain.

What do the abnormal results of this imaging mean?

Abnormal reporting may be the result of:

- Abnormal blood vessels in the brain;
- Tumor of the nerve that connects the ear to the brain;
- Bleeding inside the brain;
- Brain infection [75];
- Swelling of brain tissue;
- Brain tumor;
- Brain damage as a result of injury;
- Accumulation of fluid around the brain;
- Infection of skull bones;
- Brain tissue analysis;
- MS [76];
- Stroke or transient ischemic attack (TIA);
- Structural problems in the brain [77].

Conclusion

MRI does not use radiation. So far, no side effects of magnetic fields and radio waves have been reported. The most common type of contrast used is gadolinium. This substance is very safe. Allergic reaction to this substance is very rare. However, gadolinium can be harmful to people with kidney problems and dialysis. If you have kidney problems, tell your doctor before the imaging. Strong magnetic fields during an MRI can cause pacemakers and other implants to malfunction. This field can also cause a piece of metal to move inside your body. Brain MRI is a very accurate scan that is used to examine brain tissue, diseases related to brain tissue, and other cases for which no complications or harm have been recorded so far. Magnetic resonance imaging is a scan that uses a large magnet that produces magnetic waves, as well as radio waves and a computer to record and process the images. This non-invasive and painless imaging

technology technique, without the use of ionizing radiation, can provide clear images of the structures inside the brain. This test is used to detect any abnormalities in the brain or its surrounding tissues. For example, by using brain MRI, structures such as cerebral cortex (outer shell of the brain), deep nuclei of the brain, central nervous system, blood vessels and blood flow distribution in the brain can be observed. This technique is also capable of diagnosing diseases and brain disorders such as stroke, tumors, vascular disorders and schizophrenia.

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