

Magnetic Resonance, Functional (fMRI) – Brain

Alexander Birbrair*,

Department of Pathology, Federal University of Minas Gerais Belo Horizonte, MG, Brazil

*Corresponding author: Dr. Alexander Birbrair, Professor, Department of Pathology, Federal University of Minas Gerais Belo Horizonte, MG, Brazil. Email: birbrair@icb.ufmg.br

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Functional resonance imaging (fMRI) measures the tiny changes in blood flow that occur with brain activity. It may be used to examine the brain's physiological anatomy, evaluate the consequences of stroke or other disease, or to guide brain treatment. fMRI may detect abnormalities within the brain that can't be found with other imaging techniques.

Magnetic resonance imaging (MRI) may be a noninvasive test used to diagnose medical conditions. MRI uses a strong magnetic flux, radio waves and a computer to supply detailed pictures of internal body structures. MRI doesn't use radiation (x-rays).

Detailed MR images allow doctors to look at the body and detect disease. The images are often reviewed on a computer monitor. They may even be sent electronically, printed or copied to a CD, or uploaded to a digital cloud server. Functional magnetic resonance imaging (fMRI) uses MR imaging to measure the tiny changes in blood flow that take place in an active part of the brain.

Unlike x-ray and CT exams, MRI does not use radiation. Instead, radio waves re-align hydrogen atoms that naturally exist within the body. This doesn't cause any chemical changes within the tissues. As the hydrogen atoms return to their usual alignment, they emit different amounts of energy depending on the sort of body tissue they're in. The scanner captures this energy and creates an image using this information.

In most MRI units, the magnetic flux is produced by passing an electrical current through wire coils. Other coils are located within the machine and, in some cases, are placed around a part of the body being imaged. These coils send and receive radio waves, producing signals that are detected by the machine. The electrical current doesn't have available contact with the patient.

A computer processes the signals and creates a series of images, each of which shows a skinny slice of the body. These images are often studied from different angles by the radiologist. MRI is in a position to inform the difference between diseased tissue and normal tissue better than x-ray, CT and ultrasound.

In an fMRI examination, you will perform one or more tasks during the imaging process, such as tapping your fingers or toes, pursing your lips, wiggling your tongue, reading, viewing pictures, taking note of speech and/or playing simple word games. This will cause increased metabolic activity in the areas of the brain responsible for these tasks. This activity, which incorporates expanding blood vessels, chemical changes and therefore the delivery of additional oxygen, can then be recorded on MRI images.

MRI exams could also be done on an outpatient basis.

For fMRI, your head could also be placed during a brace designed to assist hold it still. This brace may include a mask that's created especially for you. You may need special goggles and/or earphones to wear, in order that audio-visual stimuli (for example, a projection from a display screen or recorded sounds) could also be administered during the scan.

Most MRI exams are painless. However, some patients find it uncomfortable to remain still. Others may feel closed-in (claustrophobic) while within the MRI scanner. The scanner can be noisy. Sedation could also be arranged for anxious patients, but fewer than one in 20 require it.

Benefits: MRI is a noninvasive imaging technique that does not involve exposure to radiation. MRI can help physicians evaluate both the structure of an organ and how it is working. MRI can detect abnormalities which may be obscured by bone with other imaging methods. fMRI enables the detection of abnormalities of the brain, also because of the assessment of the traditional physiological anatomy of the brain, which can't be accomplished with other imaging techniques.

Risks: The MRI exam poses almost no risk to the typical patient when appropriate safety guidelines are followed. If sedation is used, there is a risk of using too much. However, your vital signs are going to be monitored to attenuate this risk. The strong magnetic flux isn't harmful. However, it's going to cause implanted medical devices to malfunction or cause distortion of the pictures. Nephrogenic systemic fibrosis may be a recognized, but rare, complication associated with injection of gadolinium contrast. It usually occurs in patients with serious kidney disease. Your doctor will carefully assess your kidney function before considering a contrast injection. There is a really slight risk of an allergy if contrast medium is employed. Such reactions are usually mild and controlled by medication. If you've got an allergy, a doctor is going to be available for immediate assistance. IV contrast manufacturers indicate mothers shouldn't breastfeed their babies for 24-48 hours after contrast medium is given.

High-quality images depend upon your ability to stay perfectly still and follow breath-holding instructions while the pictures are being recorded. If you're anxious, confused or in severe pain, you'll find it difficult to lie still during imaging. A person who is extremely large might not fit into certain sorts of MRI machines. There are weight limits on the scanners. Implants and other metallic objects can make it difficult to get clear images. Patient movement can have the same effect.

A very irregular heartbeat may affect the standard of images. This is because some techniques time the imaging based on the electrical activity of the heart.

MRI is usually not recommended for seriously injured patients. However, this decision is based on clinical judgment. This is because traction devices and life support equipment may distort the MR images. As a result, they need to be kept faraway from the world to be imaged. Some trauma patients, however, may need MRI.

Functional MRI is still evolving and improving. While it appears to be as accurate find the situation of brain activity as the other method, overall there's less experience with fMRI than with many other MRI techniques. Your physician may recommend additional tests to confirm the results of fMRI if there are critical decisions to make (such as in planning brain surgery).