

Use of fMRI to Prepare for Brain Surgery in Epilepsy

This information sheet is provided to help you understand the evidence regarding use of functional magnetic resonance imaging (fMRI) to prepare for brain surgery in epilepsy. This sheet is a service of the American Academy of Neurology (AAN).

The AAN is the world's largest association of neurologists and neuroscience professionals. Neurologists are doctors who identify and treat diseases of the brain and nervous system. The AAN is dedicated to promoting the highest quality patient-centered neurologic care.

Experts from the AAN carefully reviewed the available scientific studies on use of fMRI to prepare for brain surgery in epilepsy. The following information* is based on evidence from those studies. The information summarizes the main findings of the 2017 AAN guideline on use of fMRI in preparing for brain surgery in epilepsy. This guideline was published in *Neurology*® online on January 11, 2017. It appears in the January 24, 2017, *Neurology* print issue.

To read the full guideline, visit AAN.com/guidelines.

Overview

fMRI is a way of finding out where control of certain functions happens in the brain. It is sometimes used in planning brain surgery in people with epilepsy who do not get relief with medicines.

According to the guideline, fMRI may help to find which side of the brain controls language and memory. This can help predict risk to the brain from brain surgery in epilepsy. In some situations, fMRI may be a better choice than the intracarotid amobarbital procedure (IAP) for this purpose.

fMRI is less invasive than IAP. This means fMRI does not involve cutting into or placing anything inside the body. In IAP, the doctor cuts into the body and places a tube that is later removed.

What is fMRI?

In fMRI, an MRI machine creates images of the brain that show changes in blood flow.

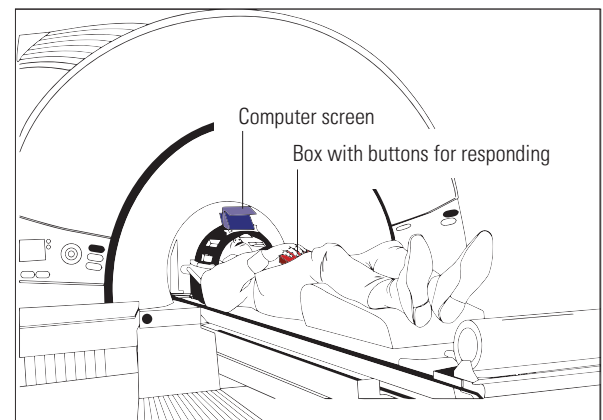
In the brain, blood flow is linked to the activity of nerve cells. When blood flow increases in an area of the brain, it is a sign that the cells in that area are active. This suggests the area is busy with an activity, such as recalling a memory.

In epilepsy, fMRI is done before brain surgery to find which side of the person's brain—right or left—controls language and memory activities. The area of the brain where these happen can differ from person to person. Having this information can be helpful in planning surgery. The surgeon will know to avoid cutting or removing areas if doing so could negatively affect your language or memory abilities.

- You will lie flat on a long, thin table. You will wear earphones and hold a small box with buttons for answering yes or no during testing.
- Your head will be placed in a device that looks like a bucket with an opening for your eyes. Through the opening, you will see a computer screen.
- You will be moved partway into a large tube in the MRI machine. You will be asked to lie quietly there for a while without moving. While you lie there, you will hear loud bangs or knocks. This is a normal part of testing and will not harm you.

During the fMRI procedure, you will be asked to do certain activities. These may include:

- Moving parts of your body
- Looking at letters, words, or objects on the computer screen and communicating what you see or hear by pressing buttons for yes or no on the box in your hands
- Listening to a story read forward and then backward



MRI machine with computer screen and box for responding

What is IAP?

IAP is another way of measuring brain functions. It also looks at blood flow in the brain to find where certain activities happen. IAP is also known as the Wada test.

- A small cut will be made in your body. A thin tube will be pushed into the cut, through your body, and into the main artery in your neck. This artery carries blood from your heart to your neck, face, and brain.
- You will get a shot of a dye through the tube. The dye makes it easier to see structures and fluids on x-rays. The dye will move through the tube and up to your brain.
- An x-ray will be taken of your head. The dye from the shot will help show the flow of blood in your brain on the x-ray.
- You will be given a shot of medicine through the tube. The medicine will travel to the side of your brain—right or left—that your doctor is studying. The medicine will put that side of the brain to sleep. Half of your body may feel weak. You may also have trouble speaking or understanding what you hear.
- These steps will be repeated to test the other side of your brain.

During IAP, you will be asked to do certain activities. These may include:

- Moving parts of your body
- Looking at pictures, words, or objects the doctor shows you and saying what you see
- Looking at pictures the doctor shows you and then describing them later from memory
- Hearing words the doctor says and then repeating them later from memory

Does the evidence show that fMRI helps to plan brain surgery in epilepsy? How does fMRI compare with IAP?

In clinical studies of medical procedures, experts look at whether the procedure works for their purpose. This usually is to diagnose a disease or predict an outcome. Strength of evidence* refers to how well a clinical study is designed. Studies that are designed well help the clinician be more sure of whether the procedure works.

There is evidence that fMRI may help to find which side of the brain controls language and memory. This can help predict risk to the brain from brain surgery in epilepsy. Evidence also suggests that fMRI may be a better choice than IAP for this purpose.

The evidence strength* for these findings is mainly weak. This does not mean that fMRI does not work. Instead, it suggests that the experts need more information from better designed studies.

The guideline did not look at the evidence for the IAP (Wada test) alone.

Are there risks to fMRI or IAP?

There are no known risks to fMRI. But people with certain medical devices in their bodies should not have fMRI.

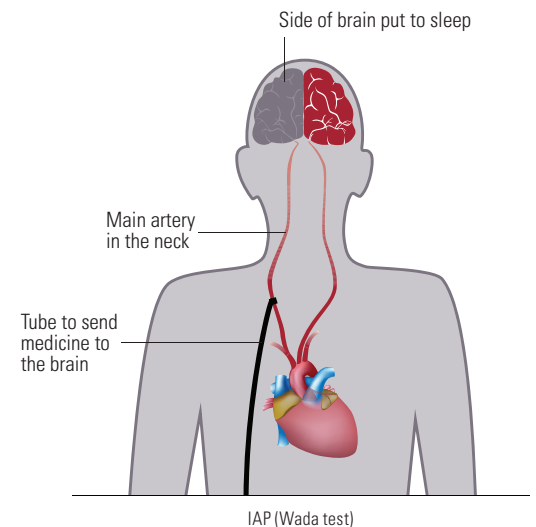
IAP has some rare but serious risks. These include:

- Stroke
- Injury to the main artery in the neck
- Allergic reaction to the dye used to show images on the x-ray

How can I know which test is right for me, fMRI or IAP?

The choice of fMRI or IAP can vary from person to person. Some medical centers may not have MRI machines. Also, fMRI use requires a level of skill that can vary between medical centers. In some situations, IAP may be a better choice than fMRI. Be sure to talk with your doctor about which procedure is right for you.

This guideline was endorsed by the American College of Radiology and the American Epilepsy Society.



***Key to Evidence Levels**

After the experts review all of the published research studies, they describe the strength of the evidence supporting each recommendation:

Strong evidence = more than one high-quality scientific study

Moderate evidence = at least one high-quality scientific study or two or more studies of a lesser quality

Weak evidence = the studies, while supportive, are weak in design or strength of the findings

Not enough evidence = either different studies have come to conflicting results or there are no studies of reasonable quality

This statement is provided as an educational service of the American Academy of Neurology. It is based on an assessment of current scientific and clinical information. It is not intended to include all possible proper methods of care for a particular neurologic problem or all legitimate criteria for choosing to use a specific procedure. Neither is it intended to exclude any reasonable alternative methodologies. The AAN recognizes that specific patient care decisions are the prerogative of the patient and the physician caring for the patient, based on all of the circumstances involved.

The AAN develops these summaries as educational tools for neurologists, patients, family members, caregivers, and the public. You may download and retain a single copy for your personal use. Please contact guidelines@aan.com to learn about options for sharing this content beyond your personal use.

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