MRI-Guided Breast Biopsy

This information is reviewed by a physician with expertise in the area presented and is further reviewed by committees from the American College of Radiology (ACR) and the Radiological Society of North America (RSNA), comprising physicians with expertise in several radiologic areas.

What is MRI-Guided Breast Biopsy?

Lumps or abnormalities in the breast are often detected by physical examination, mammography, or other imaging studies. However, it is not always possible to tell from these imaging tests whether a growth is benign or cancerous.

A breast biopsy is performed to remove some cells—either surgically or through a less invasive procedure involving a hollow needle—from a suspicious area in the breast and examine them under a microscope to determine a diagnosis. Image-guided needle biopsy is not designed to remove the entire lesion, but most of a very small lesion may be removed in the process of biopsy.

Image-guided biopsy is performed when the abnormal area in the breast is too small to be felt, making it difficult to locate the lesion by hand (called palpation).

In MRI-guided breast biopsy, magnetic resonance imaging is used to help guide the radiologist's instruments to the site of the abnormal growth.

What are some common uses of the procedure?

An MRI-guided breast biopsy is most helpful when MR imaging shows a breast abnormality such as:

- a suspicious mass not identified by other imaging techniques
- an area of distortion
- an area of abnormal tissue change

MRI guidance is used in four biopsy procedures:

- fine needle aspiration (FNA), which uses a very small needle to extract fluid or cells from the abnormal area.
- core needle (CN) which uses a large hollow needle to remove one sample of breast tissue per insertion.
- vacuum-assisted device (VAD) which uses a vacuum powered instrument to collect multiple tissue samples during one needle insertion.
- wire localization, in which a guide wire is placed into the suspicious area to help the surgeon locate the lesion for surgical biopsy.

How should I prepare?

You may be asked to wear a gown during the exam or you may be allowed to wear your own clothing if it is loose-fitting and has no metal fasteners.

Guidelines about eating and drinking before an MRI exam vary with the specific exam and also with the facility. For some types of exams, you will be asked to fast for 8-12 hours. Unless you are told otherwise, you may follow your regular daily routine and take medications as usual.

Some MRI examinations may require the patient to swallow contrast material or receive an injection of contrast into the bloodstream. The radiologist or technologist may ask if you have allergies of any kind, such as allergy to iodine or x-ray contrast material, drugs, food, the environment, or asthma. However, the contrast material used for an MRI exam, called gadolinium, does not contain iodine and is less likely to cause side effects or an allergic reaction.

The radiologist should also know if you have any serious health problems or if you have recently had surgery. Some conditions, such as severe kidney disease may prevent you from being given contrast material for an MRI.

Women should always inform their physician or technologist if there is any possibility that they are pregnant. MRI has been used for scanning patients since the 1980's with no reports of any ill effects on pregnant women or their babies. However, because the baby will be in a strong magnetic field, pregnant women should not have this exam unless the potential benefit from the MRI is assumed to outweigh the potential risks.

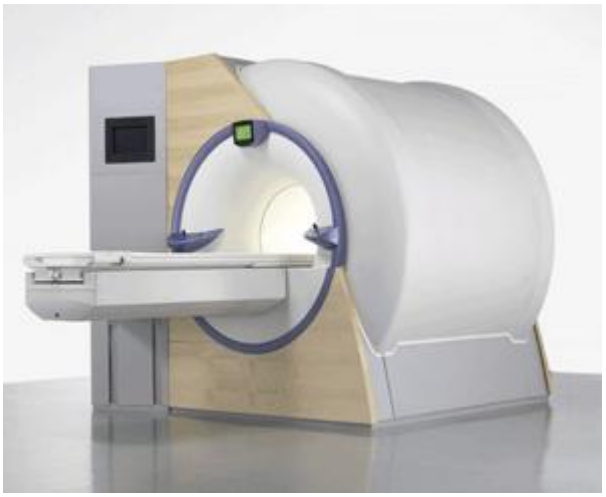
Prior to a needle biopsy, you should report to your doctor all medications that you are taking, including herbal supplements, and if you have any allergies, especially to anesthesia. Your physician will advise you to stop taking aspirin or a blood thinner three days before your procedure.

Also, inform your doctor about recent illnesses or other medical conditions.

You may want to have a relative or friend accompany you and drive you home afterward. This is recommended if you have been sedated.

There are other important guidelines for patients to follow prior to undergoing MR imaging..

What does the equipment look like?



The traditional MRI unit is a large cylinder-shaped tube surrounded by a circular magnet. You will lie on a moveable examination table that slides into the center of the magnet.

Some MRI units, called short-bore systems, are designed so that the magnet does not completely surround you; others are open on the sides ("low-strength" open MRI). These units are especially helpful for examining patients who are fearful of being in a closed space and for those who are very obese.

Newer open MRI units may provide high quality images for many types of exams; however, open MRI units with older magnets may not provide this same quality. Certain types of exams cannot be performed using open MRI. For more information, consult your doctor.

The computer workstation that processes the imaging information is located in a separate room than the scanner.

The majority of MRI-guided breast biopsies are currently performed in closed MRI systems with a specially modified exam table. This moveable examination table allows your breasts to hang freely into cushioned openings, which contain wire coils that send and receive radio waves to help create the MR images.

One of four instruments will be used:

- A fine needle attached to a syringe, smaller than needles typically used to draw blood.
- A core needle, also called an automatic, spring-loaded needle, which consists of an inner needle connected to a trough, or shallow receptacle, covered by a sheath and attached to a spring-loaded mechanism.
- A vacuum-assisted device (VAD), a vacuum powered instrument that uses pressure to pull tissue into the needle.
- A thin guide wire, which is used for a surgical biopsy.

Other sterile equipment involved in this procedure includes syringes, sponges, forceps, scalpels and a specimen cup or microscope slide.

How does the procedure work?

Unlike conventional x-ray examinations and computed tomography (CT) scans, MRI does not depend on ionizing radiation. Instead, while in the magnet, radio waves redirect the axes of spinning protons, which are the nuclei of hydrogen atoms, in a strong magnetic field.

The magnetic field is produced by passing an electric current through wire coils in most MRI units. Other coils, located in the machine and in some cases, placed around the part of the body being imaged, send and receive radio waves, producing signals that are detected by the coils.

A computer then processes the signals and generates a series of images each of which shows a thin slice of the body. The images can then be studied from different angles by the interpreting physician.

Overall, the differentiation of abnormal (diseased) tissue from normal tissues is often better with MRI than with other imaging modalities such as x-ray, CT and ultrasound.

Using MRI guidance to calculate the position of the abnormal tissue and to verify the placement of the needle, the radiologist inserts the biopsy needle through the skin, advances it into the lesion and removes tissue samples. If a surgical biopsy is being performed, MRI may be used to guide a wire into the mass to help the surgeon locate the area for excision.

How is the procedure performed?

Image-guided, minimally invasive procedures such as MR-guided breast biopsies are most often performed by a specially trained breast radiologist.

Breast biopsies are usually done on an outpatient basis. You will lie face down on a moveable exam table and the affected breast or breasts will be positioned into openings in the table.

A nurse or technologist will insert an intravenous (IV) line into a vein in your hand or arm and the contrast material gadolinium will be given intravenously.

Your breast will be gently compressed between two compression plates (similar to those used in a diagnostic MRI exam), one of which is marked with a grid structure. Using computer software, the radiologist measures the position of the lesion with respect to the grid and calculates the position and depth of the needle placement.

A local anesthetic will be injected into the breast to numb it. A very small nick is made in the skin at the site where the biopsy needle is to be inserted.

The radiologist then inserts the needle, advances it to the location of the abnormality and MR imaging is performed to verify its position. Depending on the type of MRI unit being used, you may remain in place or be moved out of the center or bore of the MRI scanner.

Tissue samples are then removed using one of three methods.

- In a fine needle aspiration, a fine gauge needle and a syringe withdraw fluid or clusters of cells.
- In a core needle biopsy, the automated mechanism is activated, moving the needle forward and filling the needle trough, or shallow receptacle, with ~~"c~~ores" of breast tissue. The outer sheath instantly moves forward to cut the tissue and keep it in the trough. This process is repeated three to six times.
- With a vacuum-assisted device (VAD), vacuum pressure is used to pull tissue from the breast through the needle into the sampling chamber. Without withdrawing and reinserting the needle, it rotates positions and collects additional samples. Typically, eight to 10 samples of tissue are collected from around the lesion.

After this sampling, the needle will be removed. If a surgical biopsy is being performed, a wire is inserted into the suspicious area as a guide for the surgeon. A small marker may be placed at the site so that it can be located in the future if necessary.

Once the biopsy is complete, pressure will be applied to stop any bleeding and the opening in the skin is covered with a dressing. No sutures are needed.

A mammogram will usually be performed to confirm that the marker is in the proper position.This procedure is usually completed within 45 minutes.

What will I experience during and after the procedure?

You will be awake during your biopsy and should have little or no discomfort. Most women report little or no pain and no scarring on the breast.

Some women find that the major discomfort of the procedure is from lying on their stomach for the length of the procedure, which can be reduced by strategically placed cushions.

When you receive the local anesthetic to numb the skin, you will feel a slight pin prick from the needle. You may feel some pressure when the biopsy needle is inserted.

The area will become numb within a short time. You must lie still while the biopsy is performed. As tissue samples are taken, you may hear clicks from the sampling instrument

If you experience swelling and bruising following your biopsy, you may be instructed to take an over-the-counter pain reliever and to use a cold pack. Temporary bruising is normal.

You should contact your physician if you experience excessive swelling, bleeding, drainage, redness or heat in the breast.

If a marker is left inside the breast to mark the location of the biopsied lesion, it will cause no pain, disfigurement or harm.

You should avoid strenuous activity for 24 hours after returning home, but then usually will be able to resume normal activities.

Manufacturers of intravenous contrast indicate mothers should not breast feed their babies for 24–48 hours after contrast medium is given. However, both the American College of Radiology (ACR) and the European Society of Urogenital Radiology note that the available data suggest that it is safe to continue breast-feeding after receiving intravenous contrast. The Manual on Contrast Media from the ACR states:

"Review of the literature shows no evidence to suggest that oral ingestion by an infant of the tiny amount of gadolinium contrast medium excreted into breast milk would cause toxic effects. We believe, therefore, that the available data suggest that it is safe for the mother and infant to continue breast-feeding after receiving such an agent.

If the mother remains concerned about any potential ill effects, she should be given the opportunity to make an informed decision as to whether to continue or temporarily abstain from breast-feeding after receiving a gadolinium contrast medium. If the mother so desires, she may abstain from breast-feeding for 24 hours with active expression and discarding of breast milk from both breasts during that period. In anticipation of this, she may wish to use a breast pump to obtain milk before the contrast study to feed the infant during the 24-hour period following the examination."

Who interprets the results and how do I get them?

A pathologist examines the removed specimen and makes a final diagnosis. Depending on the facility, the radiologist or your referring physician will share the results with you.

What are the benefits vs. risks?

Benefits

- The procedure is less invasive than surgical biopsy, leaves little or no scarring and can be performed in less than an hour.
- MRI is a noninvasive imaging technique that does not involve exposure to ionizing radiation.
- MRI-guided breast biopsy using a core needle is considered both safe and accurate.
- The speed, accuracy and safety of MRI-guided vacuum-assisted breast biopsy are as good as MR-guided wire localization without the associated complications and cost of surgery.
- Compared with stereotactic biopsy, the MRI-guided method avoids the need for ionizing radiation exposure.
- MRI-guided breast biopsy, using either the core needle method or the vacuum-assisted device, takes less time than surgical biopsy, causes less tissue damage, and is less costly.
- Recovery time is brief and patients can soon resume their usual activities.

Risks

- Because the vacuum-assisted device removes slightly larger pieces of tissue than other types of needles, there is a risk of bleeding and forming a hematoma, or a collection of blood at the biopsy site. The risk, however, appears to be less than 1 percent of patients.
- An occasional patient has significant discomfort, which can be readily controlled by non-prescription pain medication.
- Any procedure where the skin is penetrated carries a risk of infection. The chance of infection requiring antibiotic treatment appears to be less than one in 1,000.
- Doing a biopsy of tissue located deep within the breast carries a slight risk that the needle will pass through the chest wall, allowing air around the lung that could collapse a lung. This is a very rare occurrence.

What are the limitations of MRI-Guided Breast Biopsy?

MRI-guided tissue sampling is limited by the position of the abnormality in the breast. Breast lesions located in the back of the breast or small abnormalities can be difficult or impossible to accurately target using MR.

Breast biopsy procedures will occasionally miss a lesion or underestimate the extent of disease present. If the diagnosis remains uncertain after a technically successful procedure, surgical biopsy will usually be necessary.

The MR-guided breast biopsy method cannot be used unless the mass can be seen on an MRI exam. Calcifications within a cancerous nodule are not shown as clearly with MR as with x-rays. Small lesions may be difficult to target accurately by MR-guided breast biopsy.

The widespread use of this technique is limited by its high cost, availability, and length of the procedure. MR-guided biopsy should not be considered if the lesion can be seen on mammography or on ultrasound, where the biopsy can be performed more easily with less patient discomfort. In those cases, stereotactic biopsy or ultrasound-guided biopsy are the more appropriate methods of tissue sampling.

MRI scan of the breast

Disclaimer:

This information is copied from the RadiologyInfo Web site (http://www.radiologyinfo.org) which is dedicated to providing the highest quality information. To ensure that, each section is reviewed by a physician with expertise in the area presented. All information contained in the Web site is further reviewed by an ACR (American College of Radiology) - RSNA (Radiological Society of North America) committee, comprising physicians with expertise in several radiologic areas.

However, it is not possible to assure that this Web site contains complete, up-to-date information on any particular subject. Therefore, ACR and RSNA make no representations or warranties about the suitability of this information for use for any particular purpose. All information is provided "as is" without express or implied warranty.

Please visit the RadiologyInfo Web site at *http://www.radiologyinfo.org* to view or download the latest information.

Note: Images are shown for illustrative purposes. Do not attempt to draw conclusions or make diagnoses by comparing these images to other medical images, particularly your own. Only qualified physicians should interpret images; the radiologist is the physician expert trained in medical imaging.

Send comments via email to: *webmast2@rsna.org*