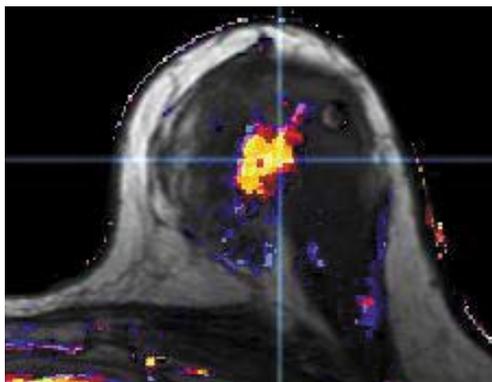


**BREAST
MRI**



RADIOLOGY: THE BASIC MODALITIES
Part Five: MRI Mammography

How It Works. Breast MRI is a test that uses a large magnet and a radio wave to differentiate the various tissues within the breast. It does not expose the breast to any damaging radiation and detects cancers more accurately than mammography. (We'll go into more detail about magnetic resonance imaging in future issues.)

Given these facts, why doesn't every woman get breast MRI for screening? There are several reasons:

- **Breast MRI is much more expensive and takes much longer than conventional x-ray mammography.** While a mammogram can be completed in less than 15 minutes, a breast MRI usually takes about an hour.
- **Because breast MRI is so sensitive, it often detects masses that are not cancerous – as does conventional mammography.** This can lead to an unnecessary biopsy – a procedure in which a needle is used to collect a piece of a mass to determine if it is cancerous. One study showed that about 8% of women who get breast MRIs end up getting biopsies, while only about 2% of women who get mammograms get biopsies. Because of our readers' experience, however, we have been able to decrease the biopsy rate by 20% by using breast MRI.^{1,2,3}

How It's Done. First, a set of MRI pictures of the breasts is taken. Then a contrast agent is injected into the patient's vein, and another set of pictures of the breasts is taken. The first set of images is subtracted from the contrast-enhanced images, creating a set of pictures ("subtraction images") that accentuate the areas that take up more of the contrast solution.

This helps the radiologist distinguish tumors from normal breast tissue, because contrast is carried to the tissue by blood vessels. This means that the amount of contrast that appears in a tissue or tumor is dependent on its vascularity. In a malignant tumor, the blood vessels are more numerous, more tortuous, and are dysplastic with leaky membranes. For this reason, flow and perfusion to a cancer is higher than normal tissue, and the leakage of contrast into the cancer is faster. This allows a radiologist to analyze the perfusion curve of a mass, to determine whether it is malignant.

INDICATIONS FOR BREAST MRI

- Screening women at high risk for breast cancer (because of family history or genetic abnormality)
- Screening women with a previous history of breast cancer
- Looking for other sites of cancer in the same breast and other breast in women with known breast cancer
- Monitoring cancer's response to treatment
- Clarifying indeterminate results of mammogram or ultrasound

RESEARCH USES OF BREAST MRI

- Measurement of tumor angiogenesis (new vessel production)
- Monitoring chemotherapy response
- Tumor volume and multiplicity
- Tumor permeability for chemotherapy delivery
- Oxygen consumption of tumor
- Diffusion characteristics of tumor
- Tumor elasticity
- Tumor chemistry (choline content)

NEXT WEEK: BREAST ULTRASOUND AND BIOPSY

SOURCES

1. Lehman CD, Gatsonis C, Kuhl CK, et al. MRI evaluation of the contralateral breast in women with recently diagnosed breast cancer. *NEJM* 2007;356(13):1295-1303.
2. Lehman CD, Blume JD, Weatherall P, et al. Screening women at high risk for breast cancer with mammography and magnetic resonance imaging. *Cancer* 2005;103(9):1898-1905.
3. Lehman CD, Isaacs C, Schnall MD, et al. Cancer yield of mammography, MR, and US in high-risk women. *Radiology* 2007;244:381-389.