



New Guidelines for Breast MRI

- In March 2007, the American Cancer Society (ACS) published new guidelines for breast screening with MRI
- Screening breast MRI is now recommended annually, as an adjunct to mammography, for high risk women including:
 - Women who carry a BRCA mutation,
 - Untested women with a first degree relative who has a BRCA mutation,
 - Women with >20-25% estimated lifetime risk of developing breast cancer
- Diagnostic bilateral breast MRI is indicated for women with newly diagnosed breast cancer, particularly women with a diagnosis of lobular cancer or those with mammographically dense breast tissue, to evaluate for tumor extent and for the presence of additional tumors
- Diagnostic breast MRI may also be recommended if other breast imaging tests are inconclusive

Evidence from recently published clinical trials on the use of breast MRI has demonstrated its value in detecting cancers that are not apparent by clinical examination or mammography. Conversely, it should be noted that mammography can detect some cancers not detected by MRI. Therefore, the American Cancer Society has published new updated guidelines for screening high risk women which now includes an annual MRI in addition to annual mammography. However, MRI is not recommended as a screening tool for the general population due to the large number of false positive findings and negative biopsies that result from the examination, particularly in women of average risk of developing breast cancer.

New evidence also demonstrates that diagnostic MRI of the contralateral breast in women with newly diagnosed breast cancer detects additional cancers not detected by other means. MRI of the ipsilateral breast is also useful for the evaluation of tumor extent that could affect patient management. These MRI applications are particularly useful in women with lobular cancer and/or mammographically dense breast tissue. Other established uses of breast MRI include cases in which other imaging is inconclusive and for monitoring neo-adjuvant chemotherapy.

Screening Breast MRI for High Risk Patients

What defines a high risk patient? Several models have been developed to assess the risk of a woman developing cancer in her lifetime, based on family history of breast and/or ovarian cancer, the presence of certain gene mutations, and personal history. Several newer models of risk assessment, such as BRCAPRO (a statistical software that calculates the probability of breast cancer risk), incorporate detailed family history to assess risk. Although estimates of risk are somewhat imprecise, it is well established that some genes

Table 1. Recommendation Criteria for Breast MRI Screening as an Adjunct to Mammography

Documented BRCA mutation
Untested women with first degree relative with BRCA mutation
Life-time risk of developing cancer >20-25% calculated from family and personal history
Radiation to chest between age 10 and 30 yrs
First-degree relative with pre-menopausal breast cancer

including BRCA1 and BRCA2 confer significantly elevated risk and that carriers of these genes account for about 50% of families with an inherited pattern of breast cancer. These women often develop cancer at an earlier age than most and have aggressive forms of cancer. The prevalence of the BRCA1 and BRCA2 mutations is between 1/500 and 1/1000 in the general population but approaches 1/50 in women of Jewish ethnicity. Other genetic components can also contribute to the development of breast cancer but, in most cases, the development of breast cancer is a sporadic event. Therefore, having a single relative with breast cancer usually does not significantly alter an individual's risk. The exception is a woman with a first-degree relative who has a history of pre-menopausal breast cancer; these women are at sufficiently increased risk that adjunctive screening with MRI should be considered.

In addition to these familial factors, there is a consensus that therapeutic radiation to the chest between the ages of 10 and 30, such as occurs in the treatment of Hodgkin's disease, also significantly increases the risk of developing breast cancer. Table 1 shows the clinical criteria for high risk that warrant annual MRI screening for breast cancer.

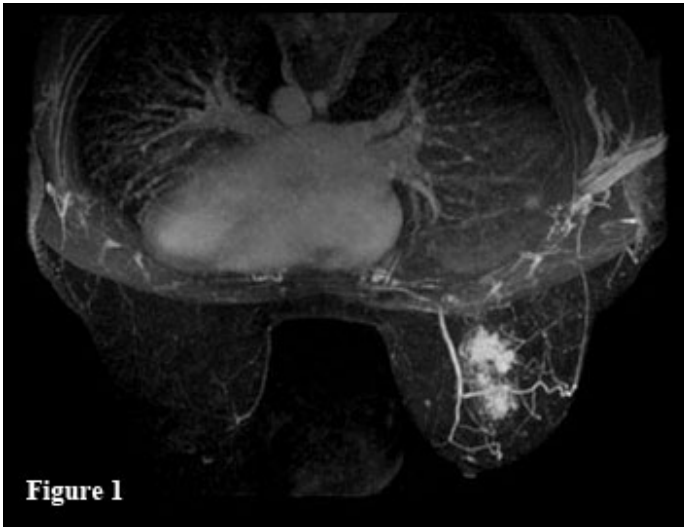


Figure 1

Figure 1. Lobular carcinoma of the right breast.

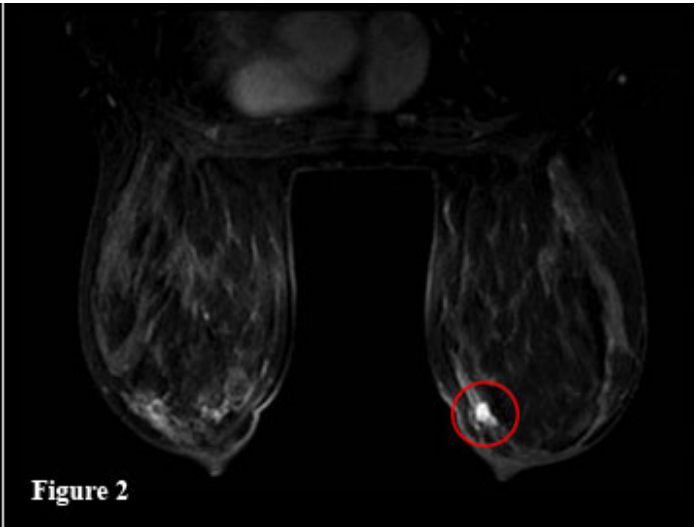


Figure 2

Figure 2. Small invasive ductal carcinoma found on MRI screening (mammogram was negative) in a high-risk patient (cancer is circled).

Diagnostic Breast MRI for Women with Recently Diagnosed Cancer

In addition to screening, breast MRI is used to help with diagnosis and management. In a recent study in which Lehman and colleagues evaluated 969 women with newly diagnosed unilateral breast cancer, 3% were found to have cancer in the contralateral breast that was detectable by MRI but not by mammography or clinical examination. The estimated sensitivity and specificity of MRI in this setting were 91% and 88%, respectively. The negative predictive value was 99% and the positive predictive value was 21%. Although the specificity was significantly higher in postmenopausal than pre- or perimenopausal women, the other values did not vary significantly with menopausal status, breast tissue density, or histological features of the index cancers. In this series, all of the occult cancers detected by MRI were node-negative. Because simultaneous cancer in the contralateral breast is associated with a high risk of metastasis (16%) and fatality (7%), patients whose cancers are detected early may benefit from prompt treatment.

MRI also detects the presence of a second ipsilateral cancer not apparent by mammography or clinical examination in about 10% of women with recently diagnosed breast cancer. This additional information regarding the extent of a patient's cancer can alter surgical management; if the two malignancies exist within different quadrants of the breast, mastectomy (rather than lumpectomy) may be recommended. While it is recognized that some of these previously undiagnosed cancers may not be lethal, there is currently no way to judge an individual tumor's potential for lethality and thus all breast cancers are treated as potentially lethal.

MRI is useful in management because it shows more extensive disease than was initially suspected in about 20% of women. Therefore, without MRI, these patients

are at risk of incomplete surgical removal of tumors and may have to return for additional surgery if pathologic examination determines that the margins are not clear of evidence of malignancy.

MRI has also been shown to be useful in detection of a primary breast malignancy in women presenting with metastatic disease in the axillary nodes in the setting of a negative mammogram. The identification of the primary breast tumor by MRI may allow breast conservation in these women who would otherwise have had to undergo mastectomy in the treatment of their disease.

Diagnostic Breast MRI to Monitor Neo-adjuvant Chemotherapy

In patients with more advanced cancers, neo-adjuvant chemotherapy is often recommended to shrink the tumor before surgery. In these patients, MRI may be used to assess the response of the tumor to chemotherapy treatment. If MRI indicates that the chosen therapy has not resulted in tumor shrinkage after a course of treatment, then an alternative therapy may be selected.

Other Conditions in Which Breast MRI May be Recommended

Women who have had previous surgery for breast cancer, have silicone implants, or have radiographically dense breasts may have inconclusive results from clinical examination, mammography, and ultrasound. When these methods of evaluation are inconclusive, the radiologist may recommend an MRI if it is likely to provide more diagnostic information. Breast MRI can often distinguish between scar tissue and recurrent cancer and its image quality is not significantly impaired by dense tissue or implants. If a clinical suspicion of silicone implant rupture exists, breast MRI is the most accurate test for evaluation.

MRI Quality Standards

Dedicated breast MRI coils are necessary to obtain high quality MR images of the breasts. It is critical that breast MRI be performed in a center with access to adjunctive breast imaging tools and where there are radiologists with expertise in all aspects of breast imaging, including MRI-guided biopsy, to ensure that a patient can receive comprehensive evaluation and care.

Scheduling

Breast MRI can be scheduled through the Radiology Order Entry System (<http://mghroe>) for Mass General Imaging Chelsea and the Main Campus.

Further Information

For further questions, please contact, Elizabeth Rafferty, M.D., Director of Breast Imaging in the Avon Foundation Comprehensive Breast Evaluation Center, at 617-726-3093.

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- BRCAPRO Risk Assessment Software can be found at: <http://astor.som.jhmi.edu/BayesMendel/brcapro.html>

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