

Approach to Breast Magnetic Resonance Imaging Interpretation

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KEYWORDS

• Breast cancer • Magnetic resonance imaging • BI-RADS

KEY POINTS

- A systematic and organized approach to the interpretation of breast magnetic resonance (MR) images should be used to improve diagnostic accuracy. Radiologists should develop a consistent viewing protocol and review all images.
- The breast MR imaging reporting should include the clinical history, MR imaging techniques, comparison with prior studies, findings, and the overall Breast Imaging-Reporting and Data System (BI-RADS) assessment.
- Any suspicious morphologic feature should prompt biopsy regardless of the kinetic features.
- The margins of a mass and the type of initial increase of enhancement are two features that strongly predict the likelihood of malignancy.

INTRODUCTION

Dynamic contrast-enhanced (DCE) breast magnetic resonance (MR) imaging is established as an important tool for the detection of mammographically occult cancers and for the evaluation of breast lesions.^{1–9} It is used in all aspects of patient management, including preoperative staging for extent of disease, evaluation of treatment response, and continued surveillance for recurrence.^{10,11} Breast MR imaging also has emerged as a powerful tool in screening high-risk women, with cancer detection yields of up to double that of mammography and even of mammography and ultrasonography combined.^{6,8,12–16} Screening MR imaging has led to the detection of mammographically occult, early stage breast cancers. These breast cancers tend to be small, node-negative tumors with good prognoses.^{7,12,14,16}

The success of DCE breast MR imaging interpretation is based, in part, on the reader's ability to correctly detect, assess, and manage suspicious findings. As multiple studies have shown, breast MR imaging is highly sensitive compared with conventional mammography (77%–91% for MR imaging vs 32.6%–50% for mammography), but with lower specificity (81%–97.2% across screening studies for MR imaging vs 93%–99% for mammography).^{4,5,7,14,15} Part of the goal of improving interpretation relies on maximizing pre-test probability, through patient selection, obtaining all relevant clinical history and reviewing prior imaging and histopathology reports. In addition, interpretation relies significantly on the images, which demand optimal technique. With the images obtained, a systematic and organized approach to interpretation should be used to assess all the

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images. This article discusses practical approaches to breast MR imaging interpretation and reporting.

BEFORE THE EXAMINATION

Current Indications for Breast MR Imaging

The American College of Radiology (ACR) guidelines for the performance of DCE breast MR imaging outline the role the examination plays in breast cancer screening and diagnosis.¹⁷ A common diagnostic indication is preoperative staging to assess the extent of disease in women with invasive carcinoma and ductal carcinoma in situ (DCIS). The sensitivity of MR imaging in detecting in situ and invasive breast cancer is high (between 94% and 100%).^{2,3,14} Breast MR imaging is also helpful in the evaluation of residual disease in postlumpectomy women with positive margins and in the detection of a recurrence. Other diagnostic indications include evaluation of treatment response in women undergoing neoadjuvant chemotherapy, detection of an occult primary breast carcinoma in women presenting with a metastatic axillary adenopathy, and lesion characterization when other imaging studies and physical examination are inconclusive. At the authors' institution, breast MR imaging for screening purposes is the most commonly used indication and is summarized briefly here.

In 2007, the American Cancer Society (ACS) issued guidelines for breast cancer screening with MR imaging as an adjunct to mammography.¹⁸ The guidelines stratify asymptomatic women into 3 groups: high, intermediate, and low risk. The ACS recommends annual screening MR imaging for women at high risk for breast cancer. This category includes women who are BReast CAncer genes 1 and 2 (BRCA1 or BRCA2) mutation carriers or who have a first-degree relative with a known BRCA mutation. In addition, first-degree relatives and carriers of the PTEN or TP53 genetic mutations are considered to be at high risk of breast cancer. They include women with Li-Fraumeni syndrome, Cowden syndrome, or Bannayan-Riley-Ruvalcaba syndrome. In addition, women who have undergone radiation therapy to the chest between the ages of 10 and 30 years are also considered high risk. By definition, the high-risk group has a greater than 20% lifetime risk of breast cancer and, as such, should undergo annual screening breast MR imaging and mammography.

The ACS guidelines state that there is insufficient evidence to recommend for or against annual screening MR imaging in women categorized as moderate/intermediate risk for breast cancer.¹⁸

Women with a lifetime risk of 15% to 20% are placed in this category. They include women with a personal history of lobular carcinoma in situ, atypical lobular hyperplasia, or atypical ductal hyperplasia. Also, women with a personal history of breast cancer, including DCIS, may also benefit from annual screening MR imaging. In addition, women with mammographically dense breasts are considered at moderate risk. It is recommended that the groups of women listed earlier speak with their doctors about the benefits and limitations of supplemental MR imaging screening in addition to mammography. In addition, annual MR imaging screening is not recommended for women whose lifetime risk of breast cancer is less than 15%.

In order to calculate a woman's lifetime risk for breast cancer, various risk models have been proposed. The initial ACS guidelines for screening MR imaging recommended the use of the BRCAPRO (A computer program that uses statistics to predict whether a person has an inherited mutation [change] in the BRCA1 and BRCA2 genes), Claus, or Tyrer-Cuzick models.¹⁸ In 2012 the ACS published a review of current cancer screening guidelines and further discussed the choice of these models.¹⁹ They highlighted the importance of including both maternal and paternal first-degree and second-degree relatives. However, these three models identify different populations deemed eligible for MR imaging screening.²⁰

Patient Information Gathering

Once the appropriate patients are selected for breast MR imaging, it is important to obtain the clinical history (ie, the reason for the breast MR imaging). Before the examination, the patient's personal history should be reviewed. It is imperative to learn whether the patient has undergone prior breast procedures, such as biopsies and surgeries, which can help explain imaging findings. The dates and reports for all prior biopsies and surgical excisions should be available. In addition, history of radiation, recent trauma, or certain medications (such as hormonal therapy) lend context to image interpretation. Prior imaging studies should similarly be reviewed at the time of MR imaging interpretation. Often, it is a prior mammogram or ultrasonography result that was the impetus for the MR imaging study. Other times, the prior study may provide additional clues that compliment the patient's history. For instance, a prior mammogram may more readily show a biopsy clip or fat necrosis. The radiologist can then approach the MR images with the knowledge of where to look for a correlate.

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