Breast MRI: The Radiologist's Perspective

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Increasing experience with magnetic resonance imaging (MRI) has raised important questions about how it should be used in breast cancer screening, and for presurgical evaluation and posttherapy follow-up of women with this disease. Overall, the availability of MRI as an adjunct to mammography and ultrasound offers clear clinical benefit to women at increased risk of breast cancer development due to BRCA1 and BRCA2 mutations, and to women presenting with axillary adenopathy and an occult primary breast tumor. In contrast, its benefit for routine selection of breast conservation or further assessment of lobular carcinoma in women of average risk has not been demonstrated. This article reviews the use of MRI in these settings, with an emphasis on the clinical outcomes that have been observed to date.

Dr. Bleicher and Morrow have written a review on the use of breast magnetic resonance imaging (MRI) from the surgeon’s perspective, with an emphasis on clinical outcomes. They give an overview of the clinical uses where breast MRI has been shown to contribute to the diagnosis and work-up of breast cancer, such as high-risk screening and axillary adenopathy of an unknown primary. On the other hand, they raise concern about the use of breast MRI in patients with a recent diagnosis of breast cancer. This commentary will focus on screening the high-risk woman and evaluating the breasts of women with a new breast cancer diagnosis.

When reviewing the literature on breast MRI, it should be recognized that the field is not static, and the breast MRI of just 5 years ago is not the same as that of today. There have been significant advances in technique over the past 5 years, with the advent of newer sequences (such as parallel imaging) that allow fast simultaneous acquisition of both breasts using high resolution. These improvements in technique translate into improved image quality, allowing easier clinical use and more precise interpretation. Perhaps the most important development has been the ability to percutaneously vacuum biopsy suspicious findings, so that a surgical procedure is not required for diagnosis. These advances have allowed breast MRI to be used much more easily in the clinical setting.

Accreditation Standards and Guidelines
Along with the advances in technique, the American College of Radiology (ACR) has taken a leadership role and convened a committee to establish an accreditation process to standardize technique and ensure the quality of breast MRI. In order for a facility to be accredited, image quality needs to pass rigorous standards, ability to biopsy suspicious lesions must be demonstrated, and ongoing training and interpretation of a minimal number of cases are mandatory for interpreting radiologists. As with other areas of breast imaging such as mammography, oversight is required. In this regard, patients will be assured of receiving a high-quality examination, and interpreting radiologists will be able to provide referring physicians with completed work-ups. Along with these improvements in the field, numerous instructional courses sponsored by the College have been started over the past few years to train radiologists in interpretation and MR intervention. Despite all these improvements, there are still debates over which clinical situations warrant evaluation with breast MRI. Current clinical guidelines for breast MRI from the ACR address high-risk screening, extent of disease evaluation in the preoperative setting of both breasts in a new breast cancer diagnosis, postoperative evaluation for positive margins following lumpectomy, and response of breast cancer to neoadjuvant chemotherapy. Other indications include axillary node metastasis of an unknown primary, Paget’s disease, evaluation of suspected recurrent cancer and an abnormal mammogram or physical examination that cannot be resolved by conventional imaging.[1]

High-Risk Screening
Numerous trials have shown that annual breast MRI can detect occult cancer in high-risk women. The American Cancer Society has therefore recommended annual screening with MRI in women with a
BRCA1 or BRCA2 mutation, an untested first-degree relative of a known carrier, prior mantle radiation for Hodgkin's disease, and a greater than 20% cumulative life-time risk of breast cancer. Patients with rare syndromes such as Li-Fraumeni and Cowden are also recommended to undergo annual MRI screening.[2]

The recommendation to screen with MRI was made without evidence from randomized controlled trials demonstrating mortality benefit. Even though mortality benefit is the ultimate standard for a screening test, it is highly unlikely that such a trial could be mounted today. We live in a world of rapidly expanding technology and innovation, where newer diagnostic technologies are often quickly evaluated and adopted. Surrogate markers such as small tumor size and negative nodal status (markers that are responsible for reducing the mortality seen with screening mammography) have been used to justify recommendations. No data suggest that cancer detected by MRI is any different than cancer detected by mammography, and therefore, the detection of small node-negative cancer is adequately compelling evidence to recommend screening.

The authors are correct in emphasizing that screening with MRI is an added level of surveillance above and beyond mammography, resulting in its own possibility of call-backs and biopsy for suspicious findings. Therefore, the decision to screen with MRI is not one to be taken lightly. Call-back rates and biopsy rates with breast MRI appear reasonable in high-risk groups where the cancer yield is high.

**Areas of Controversy**

The issue about MRI causing too many false-positives needs to be addressed. If one looks at the literature, the positive biopsy rate of MR biopsy ranges from 25% to 50%.[3-5] certainly equal to or better than the positive biopsy rate with mammography, which is estimated at 25% to 35%.[6] In addition to cancers found at MR biopsy, a large percentage of high-risk lesions are also found—approximately 10% to 15%.[5] Any test is bound to produce false-positive biopsies, yet the rate associated with MRI is not excessive when one considers the cancer detection rate as well as the high-risk lesion rate. Additionally, most high-risk women who know that traditional imaging has limitations are more than willing to undergo additional testing, and most are relieved by the additional test,[7] contrary to what Bleicher and Morrow cite.

It appears that the most controversial area related to the use of breast MRI is in the realm of evaluating the patient with a new diagnosis of breast cancer. The authors argue that the recurrence rate is low enough that the detection of additional cancer is probably not clinically important. The authors cite a recurrence rate of 7% adjuvant therapy trials, and it is true that over time recurrence rates have dropped with more appropriate patient selection and improved therapies. Still, even this optimal rate of 7% is too high. Many women these days don't want to accept the possibility of recurrence and are opting for more aggressive surgery.[8] Other centers have reported higher recurrence rates.[9] In less specialized centers, recurrence rates may be much higher. Moreover, the idea that recurrence doesn't affect overall survival is disputed. The temporal relationship of the recurrence is important,[10] and it is postulated that early recurrence likely has a deleterious mortality effect, whereas late recurrence may not affect the overall mortality of the patient.[11] The attendant psychological costs of having a cancer recur—not to mention the economic costs of mastectomy and reconstruction (which is much harder following radiation)—are just not acceptable. Even reducing the recurrence rate a few percentage points would be worthwhile and justify the use of MRI in the preoperative setting.

We know that leaving disease behind in the breast with close or positive margins can result in a recurrence rate of up to 20% which is deemed unacceptable and recurrence is associated with number of reexcisions.[12] Therefore, surgical reexcision, often performed without guidelines, is done to obtain negative margins. Clear margins are the hallmark of successful conservation. We hope the disease left behind is eradicated by radiation. For the most part, it is, as radiation will treat areas of ductal carcinoma in situ and small invasive cancers. The question is, why would we ignore the information on MRI and willingly leave behind larger disease that would likely not respond to radiation? Using MRI to detect true cases of multicentricity or cases that would not benefit from lumpectomy would be the ideal role of the procedure. There is no doubt that MRI is well poised to detect this additional bulky disease.

**Breast-Conserving Therapy**

The area where MRI may be in a sense “too sensitive” for our current breast treatment algorithms, is in detecting disease that can be adequately treated with radiation. It appears that disease under 5
mm seen on MRI likely responds to radiation and possibly could be safely ignored. The role of ipsilateral staging then would be to identify bulky additional disease greater than 5 mm that would benefit from additional surgery and may result in early recurrence. Trials involving radiologists, surgeons, and radiation oncologists would help resolve these questions. The authors rightly point out that there is little solid data to definitively relate the additional disease detected on MRI with recurrence. These studies must be done.

Breast-conserving therapy is a multistep process, and although the final outcome to establish success has been the presence or absence of recurrence, there are other markers, such as positive-margin rates and reexcision rates, that are largely ignored and often undocumented. In some reports the reexcision rates can be astonishingly high.\[13\] A return trip to the operating room to attempt to obtain negative margins is not an inconsequential event, as a repeat operation is expensive and it doesn't always guarantee that margins will be negative—the surgeon is largely without guidance as to where and how much disease is left behind. Studies evaluating the positive impact that preoperative MRI can have on margin rates and return trips are currently underway, though for the most part they are being conducted at individual centers, and no multicenter trial has yet to be proposed. The results of these studies are eagerly awaited.

A Bilateral Disease
Probably the most compelling reason to stage with MRI is the evaluation of the contralateral breast. The very high incidence of occult synchronous cancers (3%-5%)\[14,15\] justifies this approach so that all tumors can be detected and treated at once. The authors postulate that chemotherapy may treat the contralateral cancer, but the chance that the chemotherapy may not adequately treat the unknown tumor is probably a chance that most patients and clinicians will not want to take. Breast cancer is a bilateral disease and to ignore potential significant findings of malignancy in the contralateral breast doesn't make any sense, particularly if the tumor subtype is different and may be of higher stage. A single-stage procedure to treat both tumors simultaneously would decrease the expense of surgery, chemotherapy, and radiation therapy.

If MRI is performed for the contralateral breast, the ipsilateral breast must be dealt with. It would not make any clinical sense to look at only the contralateral breast by MRI and ignore the breast with the known cancer just because we are uncertain how to manage the information. The information provided by MRI shouldn't necessarily cause alarm. In the future the identification of additional ipsilateral cancer on MRI may lead to more surgical options such as removal of all tumors with negative margins, followed with radiation, so that the breast could be conserved. Perhaps our treatment algorithms may allow more women to be conserved with the information on MRI. MRI may be able to identify patients who may not require radiation therapy following surgery. The surgical and radiation treatment approach could be more or less tailored for each individual patient.

Newer partial breast radiation techniques are already in use. The treatment of breast cancer involves multiple specialties that are all working to give the patient the best possible outcome. Breast MRI has the potential to contribute information to surgeons and radiation oncologists to improve outcome. It certainly has shown itself to have a role in multiple applications. The last hurdle is in the assessment of the ipsilateral breast with known cancer.

Conclusions
Based on the cited data, it is understandable that the authors want to proceed with caution in the use of MRI in certain clinical applications such as the staging of breast cancer. Both the technology and the understanding of the information provided by breast MRI have improved dramatically, and with that we need newer clinical trials to examine the impact that MRI can have on the ipsilateral breast. During this transition period, there will be those who embrace the technology and those who reserve judgment. The bottom line is that we have a test that shows cancer better than we have ever seen it with mammography, yet our algorithms are based on data from the mammography era. The fact that a cancer shows up on mammography should in no way be more compelling than if it shows up on MRI. The question is whether we are ready to modify our algorithms to incorporate this information to potentially improve patient care and outcomes.

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Disclosures: The author has no significant financial interest or other relationship with the manufacturers of any products or providers of any service mentioned in this article.
References:


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