Magnetic Resonance Imaging in Patients with Ductal Carcinoma in Situ: Routine, Selective, or not at all?

Julie A. Margenthaler, MD

Department of Surgery, Washington University School of Medicine, Siteman Cancer Center, Saint Louis, MO

Breast magnetic resonance imaging (MRI) has become a frequently used imaging modality for the evaluation of local extent of disease in patients with a known diagnosis of breast cancer. The sensitivity and specificity have been shown to be 93–100 and 26–91 %, respectively.^{1–3} While specific guidelines exist regarding the utility of screening breast MRI for high-risk patients,⁴ no such guidelines are available for patients with newly diagnosed breast cancer. As a result, the inclusion of a breast MRI as part of the diagnostic workup of patients with breast cancer occurs at variable rates and for variable indications. Most commonly, MRI is being used both to define the extent of disease in the ipsilateral breast and to determine the presence of contralateral disease.

In the setting of patients with ductal carcinoma in situ (DCIS), MRI has been shown to be more sensitive than mammography.^{5,6} Thus, one might conclude that locoregional treatment of patients with DCIS may be more accurately planned and assessed by MRI, resulting in better outcomes and lower rates of locoregional recurrence. Pilewskie et al.⁷ report their retrospective analysis of 2,321 women who underwent breast-conserving surgery for DCIS, with or without preoperative MRI, and the resultant locoregional recurrence rates. They identified several factors associated with locoregional recurrence, including age, menopausal status, margin status, adjuvant radiation therapy, and adjuvant endocrine therapy. However, the use of preoperative MRI did not result in lower locoregional recurrence rates, regardless of the receipt of adjuvant

radiation therapy. There also was no difference in the rates of contralateral breast cancer diagnoses.

There are a couple of limitations inherent to their study. Because of the retrospective nature of the study, the actual intent of a chosen diagnostic test or the choice of a specific treatment course is difficult to determine. What remains unknown is why the physician ordered a preoperative MRI in the 596 patients who had it. Perhaps the patient was at higher risk secondary to underlying BRCA or other hereditary cancer syndromes or there was a clinical concern for multifocality or multicentricity based on standard imaging. The authors controlled for multiple variables in their analysis, but this is not one of them.

A larger limitation is the fact that we do not know the true denominator cohort. Only patients who underwent breast-conserving surgery were included. What is missing is whether there was a separate cohort of patients who had preoperative MRI for DCIS, who were found to have multifocal or multicentric disease prohibitive of breast-conserving surgery, and who then proceeded directly to mastectomy. Pilewskie et al.⁸ previously published their findings on a cohort of 352 DCIS patients, 217 of whom received preoperative MRI. They found that the additional biopsy rate in the MRI group was significantly greater (38 %) compared with the no-MRI group (7 %), resulting in additional cancer findings in 26 % of the MRI group and 33 % of the no-MRI group. Furthermore, 11.5 % of the MRI group had a change in surgical plan, predominantly from breast-conserving surgery to mastectomy. However, this only translated to a beneficial change in surgical plan for 8 of 217 (3.4 %) women in the total cohort and, conversely, a nonbeneficial (i.e., overtreatment) change in surgical plan for 17 of 217 (7.8 %).

The impact on surgical decision-making and the trend towards higher mastectomy rates in patients with DCIS who undergo MRI mirrors that observed in patients with invasive breast cancers. Although the sensitivity of breast

MRI is quite high, there also is significant potential for false positives. In our own institutional data on 441 patients, we found a change in surgical decision-making in 29 % of patients undergoing MRI and significantly increased rates of mastectomy compared with those who did not undergo MRI (44 vs. 32 %, $p < 0.05$).⁹ Berg et al.² demonstrated that 12 % of women with likely benign lesions on MRI elected to proceed with mastectomy rather than breast conservation therapy or interval follow-up MRI based on these imaging findings alone. The reasons for these decisions are likely attributed to the breast cancer patient's fear of additional cancer lesions, fear of future failure of breast conservation, and fear of delay in treatment that would be necessary to investigate fully and/or biopsy the additional observed MRI abnormalities. These data raise an important point. For those clinicians who choose to utilize preoperative MRI, patients must be counseled before obtaining the test. If you fall in the camp that believes MRI is a beneficial diagnostic tool, why order it at all if you are not going to adhere to some type of algorithm for management of additional visualized lesions that is meaningful and based on pathology assessment?

Similar to the current Pilewskie et al. study, these data raise the question of the benefit of breast MRI at all, especially when one considers data from the NSABP B-06 study¹⁰ demonstrating equivalent outcomes when comparing breast conservation with mastectomy in the pre-MRI era. In theory, if the addition of MRI to standard imaging was detecting clinically significant disease, the patients randomized to mastectomy should have had an improved outcome due to patients with missed multicentric disease in the breast conservation arm. To date, data are insufficient to support the use of MRI as a determinant in outcome (in terms of recurrence rates, disease-free survival, and overall survival) in patients who have multifocal or multicentric lesions seen on MRI.^{7,11,12} The lack of a clear locoregional recurrence or survival benefit for MRI is unlikely to be seen, in part, due to the current high overall survival rates and low local recurrence rates. In addition, the efficacy of adjuvant systemic therapy and radiation therapy may obviate the need to surgically remove small multifocal or multicentric lesions that are being identified on MRI. As adjuvant systemic therapy becomes more

tailored to individual patients and the use of partial breast irradiation increases, identifying occult multicentricity may have more of an impact on outcomes. Until such time, routine use of preoperative MRI for patients with newly diagnosed DCIS is not supported by the literature.

REFERENCES

1. Hollingsworth AB, Stough RG, O'Dell CA, Brekke CE. Breast magnetic resonance imaging for preoperative locoregional staging. *Am J Surg*. 2008;196:389–97.
2. Berg WA, Gutierrez L, Ness-Aiver MS, et al. Diagnostic accuracy of mammography, clinical examination, US, and MR imaging in preoperative assessment of breast cancer. *Radiology*. 2004;233:830–49.
3. Pediconi F, Catalano C, Padula S, et al. Contrast-enhanced magnetic resonance mammography: does it affect surgical decision-making in patients with breast cancer? *Breast Cancer Res Treat*. 2007;106:65–74.
4. Saslow D, Boetes C, Burke W, et al. American Cancer Society guidelines for breast screening with MRI as an adjunct to mammography. *CA Cancer J Clin*. 2007;57:75–89.
5. Menell JH, Morris EA, Dershaw DD, et al. Determination of the presence and extent of pure ductal carcinoma in situ by mammography and magnetic resonance imaging. *Breast J*. 2005;11(6):382–90.
6. Kuhl CK, Schrading S, Bieling HB, et al. MRI for diagnosis of pure ductal carcinoma in situ: a prospective observational study. *Lancet*. 2007;370(9586):485–92.
7. Pilewskie M, Olcese C, Eaton A, et al. Perioperative breast MRI is not associated with lower locoregional recurrence rates in DCIS patients treated with or without radiation. *Ann Surg Oncol*. doi:10.1245/s10434-013-3424-5.
8. Pilewskie M, Kennedy C, Shappell C, et al. Effect of MRI on the management of ductal carcinoma in situ of the breast. *Ann Surg Oncol*. 2013;20:1522–9.
9. Pettit K, Swatske ME, Gao F, et al. The impact of breast MRI on surgical decision-making: are patients at risk for mastectomy? *J Surg Oncol*. 2009;100(7):553–8.
10. Fisher B, Anderson S, Bryant J, et al. Twenty-year follow-up of a randomized trial comparing total mastectomy, lumpectomy, and lumpectomy plus irradiation for the treatment of invasive breast cancer. *N Engl J Med*. 2002;347:1233–41.
11. Solin LJ, Orel SG, Hwang Wei-Ting, et al. Relationship of breast magnetic resonance imaging to outcome after breast-conservation treatment with radiation for women with early-stage invasive breast carcinoma or ductal carcinoma in situ. *J Clin Oncol*. 2008;26:386–91.
12. Fischer U, Zachariae O, Baum F, et al. The influence of preoperative MRI of the breast on recurrence rate in patients with breast cancer. *Eur Radiol*. 2004;14:1725–31.