

ORIGINAL ARTICLE

Importance of Presurgical Breast MRI in Patients 60 Years of Age and Older

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ABSTRACT

Objective: To demonstrate the importance of presurgical bilateral breast Magnetic Resonance Imaging (MRI) in women 60 years of age and older. **Materials and Methods:** Institutional review board approval was obtained with waiver of informed consent for this retrospective review. From December 2003 to December 2011, all patients 60 years and older who had presurgical bilateral breast MRI were reviewed, revealing 1268 presurgical MRI examinations; 310 had a new lesion identified by MRI. Cases were excluded due to incomplete or missing data, resulting in 243 patients with 272 findings eligible for analysis. Data recorded included patient demographics, core biopsy method and pathology, type of surgery, and surgical pathology results. **Results:** Of 1268 exams performed in this population, 272 (21.5%) patients with suspicious MRI findings underwent needle biopsy. Malignancy was found in 114 (42%), benign findings in 127 (47%), and atypia in 31 (11%). Of the malignancies, 83 were in the ipsilateral breast and 31 in the contralateral breast to the original diagnosis. Of the ipsilateral findings, 47 were in the same quadrant as the primary diagnosis, 28 in a different quadrant, and 8 were metastatic lymph nodes. Of the 31 atypical findings, 14 were contralateral to the primary diagnosis and 17 were ipsilateral. Two hundred and thirty-three patients underwent surgical excision; 111 changed their surgical management as a lesion was seen on MRI and was diagnosed as cancer on needle biopsy. **Conclusions:** Among the patients aged 60 years and above who had presurgical bilateral breast MRI, we found additional cancers in 9.0% ($n = 114/1268$) and atypia in 2.4% ($n = 31/1268$). A change in management as a result of the MRI-detected lesion occurred in 8.8% ($n = 111/1268$). These results demonstrate that performing presurgical bilateral breast MRI is of value in women 60 years of age and above.

Key words: Breast cancer, breast imaging, breast magnetic resonance imaging

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INTRODUCTION

Breast Magnetic Resonance Imaging (MRI) is routinely recommended as a screening tool for women who are at increased risk for breast cancer, due to the high sensitivity (94-100%) of this imaging modality. Over the years, breast MRI has also been utilized to

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evaluate patients presurgically after a breast cancer diagnosis. However recommendations on such use of the technology remain contested. The American Cancer Society (ACS) has issued recommendations on the use of screening breast MRI, supported by the American College of Radiology (ACR) and the Society of Breast Imaging (SBI).^[1] However, the ACS recommendations do not specifically address the use of breast MRI in the presurgical setting. The ACR and the European Society of Breast Imaging have provided guidelines on the recommended indications for use of breast MRI, and the extent of disease evaluation after a newly diagnosed breast cancer is one among these.^[2,3] These recommendations state that MRI determines the extent of disease more accurately than standard mammography and physical examination, though it remains to be shown that there is a reduction in recurrence rates.

Presurgical breast MRI has been shown to detect otherwise occult ipsilateral cancer in 6-27%^[4-6] of patients and contralateral malignancy in 3-9% of patients.^[4,7-10] Contrary to this, studies have argued that presurgical MRI can lead to potentially unnecessary surgery.^[11-18] Houssami has contended in several publications that there is evidence that MRI does change surgical management; however, there is no evidence that it improves surgical treatment or outcomes.^[11,15,17,18]

There is extensive literature on presurgical breast MRI evaluation. However, to our knowledge, only a few studies to date have specifically reviewed the impact on the aging/postmenopausal patient population. A recent article by Fortune-Greeley has shown that obtaining preoperative MRI in patients with invasive lobular carcinoma (ILC) reduces the reoperation rates and overall has mastectomy rates similar to those of patients not undergoing a breast MRI.^[19] Aging women have an increased risk of breast cancer; by 50 years of age, there is a 2.38% risk (1 in 42), and by age of 60 years, there is a 3.56% risk (1 in 28).^[20] Combined with this already increased risk of developing breast cancer, once a woman is diagnosed with breast cancer, her 10-year risk of developing local recurrence can be up to 10%.^[17] Given that the aging patient population has an increased risk of developing breast cancer, and when combining this with the risk of developing another cancer after the original diagnosis, we feel that this population is an important group to evaluate presurgically with breast MRI. Because of this, we reviewed our patient outcomes in order to demonstrate the importance of performing presurgical bilateral breast MRI in women of age 60 years and above.

MATERIALS AND METHODS

Institutional review board approval with waiver of informed consent was obtained for this Health Insurance Portability and Accountability Act (HIPAA) compliant retrospective review. One thousand two hundred and sixty-eight patients of age 60 years and above with a breast cancer diagnosis, either invasive carcinoma (ductal and lobular) or ductal carcinoma *in situ* (DCIS), or an atypical diagnosis (lobular neoplasm, atypical ductal hyperplasia, atypical lobular hyperplasia, papillary neoplasm), undergoing presurgical bilateral breast MRI examination at our community-based private practice from December 2003 to December 2011 were reviewed. Through our outcomes database, we identified 310 new lesions identified on a presurgical breast MRI exam. To be included in this analysis, the criteria were: All patients of age 60 years and above, having had a presurgical bilateral breast MRI exam and a newly discovered and suspiciously enhancing lesion identified on the MRI exam, classified using the ACR's Breast Imaging Reporting and Data System as a BI-RADS 4 or BI-RADS 5, and having undergone additional evaluation and needle biopsy. Upon reviewing the data, 38 findings were excluded due to incomplete or missing data, thus making 243 patients with 272 MRI findings eligible for inclusion in the study analysis. Data recorded included patient demographics, additional findings at MRI, targeted ultrasound findings, core biopsy method and pathology, type of surgery, and open surgical pathology results.

MRI examination

All patients included in this analysis underwent a contrast-enhanced bilateral breast MRI examination, performed using either 1.5 T GE Echospeed or Siemens Symphony 1.5 T utilizing a dedicated breast coil (MRI Devices 4-channel or *in vivo* Breast MRI coil, 7 channel).

The MRI pre-contrast scan consisted of a localizer sequence, bilateral axial T2 stir sequence, followed by a 1-min axial T1 fat-suppressed sequence. Contrast was administered through an upper extremity site. Gadopentetate dimeglumine or gadoteridol at a dose of 0.1 mmol/kg body weight was injected at a rate of 2 ml/sec with a power injector (Solaris; Medrad, Indiana, PA, USA) and was followed by a 20 ml saline flush. A series of five 1-min post-axial T1 fat-suppressed (3D VIBE) images were acquired. Bilateral delayed high-resolution sagittal T1 fat-suppressed images were obtained. The unenhanced images were subtracted from the enhanced images upon completion of the exam. Three-dimensional (3D) Maximum Intensity

Projection (MIP) reconstructions were performed. During the time period of this review, five radiologists specializing in breast imaging reviewed the breast MRI exams. All MRI exams were interpreted with ACR breast MRI lexicon using a Cadstream softcopy workstation (Confirma, Inc, Kirkland, WA, USA).

Targeted ultrasound and image-guided biopsy

Targeted ultrasound was performed to evaluate 188 of the new findings detected on presurgical MRI. In 55 cases, the patient proceeded directly to MRI-guided biopsy; targeted ultrasound was not performed for these at the radiologist's discretion as the MRI enhancement was identified as non-mass or mass enhancement but too small to be identified by ultrasound. In addition, in 21 cases, the area was visualized on mammography in retrospect; thus the patient did not undergo further imaging and proceeded to stereotactic biopsy. Fine needle aspiration cytology was performed for 20 cases. The ultrasound examinations were performed on either Siemens (Sonoline Antares or S2000; Siemens Medical Solutions USA, Inc, Malvern, PA, USA) or Philips (Philips iU22; Philips Healthcare, Bothell, WA, USA) units. Findings were reported according to ACR sonography BI-RADS lexicon. If the area was identified on ultrasound, the lesion was biopsied under ultrasound guidance. If the lesion was not identified on ultrasound, MRI-guided biopsy was recommended.

RESULTS

Out of 1268 presurgical bilateral MRI exams performed in patients aged 60 years and above, there were a total of 272 suspicious MRI findings in 243 patients available for the study and analysis. Average patient age was 68 years (range 60-90 years).

All 272 suspicious MRI findings underwent needle biopsy, giving a resultant biopsy rate of 21.0% (272/1268). Of these biopsies performed, MRI-guided core needle biopsy was performed in 128 (47%), with pathology tests showing 43 malignant, 65 benign, and 20 atypical results. Ultrasound-guided core needle biopsy was performed in 103 (38%), with pathology tests showing 56 malignant, 39 benign, and 8 atypical results. Stereotactic core needle biopsy was performed in 21 (8%), with pathology tests showing 14 malignant, 6 benign, and 1 atypical lesions. Fine needle aspiration was performed in 20 (7%), with pathology tests showing 1 malignant, 17 benign, and 2 atypical results. There was a second look ultrasound correlate in 44.4% (121/272) of which 56 malignancies were identified. Pathology of malignant and atypical lesions are presented in Tables 1 and 2, respectively. A positive predictive value

Table 1: Pathology of new malignant lesions detected on breast MRI

Pathology	Total (%)
Invasive ductal carcinoma	67 (59.0)
Invasive lobular carcinoma	12 (11.0)
Mucinous carcinoma	1 (0.9)
Papillary carcinoma	1 (0.9)
Apocrine ductal carcinoma	1 (0.9)
Metastatic carcinoma	4 (3.5)
DCIS	24 (21.1)
Invasive mammary carcinoma	4 (3.5)

MRI: Magnetic resonance imaging, DCIS: Ductal carcinoma *in situ*

Table 2: Pathology of new atypical lesions detected on breast MRI

Pathology	Total (%)
Atypical lobular hyperplasia	4 (12.9)
Lobular neoplasm	5 (16.1)
Atypical ductal hyperplasia	21 (67.7)
Papillary neoplasm	1 (3.2)

MRI: Magnetic resonance imaging

of 9.0% was found (114/1268); false-positive rate was 10% (127/1268).

Of the 114 malignancies, 83 were in the ipsilateral breast and 31 in the contralateral breast. Of the ipsilateral findings, 47 were in the same quadrant as the primary diagnosis, 28 in a different quadrant, and 8 were metastatic lymph nodes. Of the 31 atypical findings, 14 were contralateral to the primary diagnosis and 17 were ipsilateral (8 in a different quadrant and 9 in the same quadrant).

A total of 234 patients with 262 findings underwent surgical excision. There was a change in surgical management as a result of the newly discovered and suspiciously enhancing finding on the MRI exam for 111 patients (111/1268, 8.8%). Forty-five patients (45/1268, 3.6%) changed management from lumpectomy to mastectomy. Sixty-four patients (64/1268, 5.1%) underwent bilateral surgery. Two patients (2/1268, 0.2%) opted to have a wider lumpectomy procedure. Eight patients (10 lesions) did not undergo surgical excision. For five patients (7 lesions), the new MRI finding was in the contralateral breast and was biopsy-proven benign, so the lesion was not surgically excised. Three patients (3 lesions), who had additional testing preoperatively (by their surgeon), were found to have advanced disease after the MRI examination and underwent treatment other than surgical excision.

One patient did choose to undergo bilateral mastectomy based on a new contralateral MRI finding that was proven to be benign on biopsy.

DISCUSSION

Presurgical breast MRI has the ability to detect otherwise undetected malignancies, which has been demonstrated by many published studies.^[4-10,19-27] In our analysis of women of age 60 years and above undergoing presurgical bilateral breast MRI, we found additional malignancy in 9% of the patients (114/1268). Of these new malignancies, 2.4% were in the contralateral breast. This drastically changes the management of the patient, and is important information to be able to provide to our patients prior to surgery. We found in our patient cohort that 8.8% ($n = 111/1268$) of them had a surgical change in management based on the MRI findings. Despite the ability of presurgical breast MRI to detect new malignancies, there is opposition in the United States to performing breast MRI prior to surgery. It has been reported that there is no consistent evidence that preoperative breast MRI is beneficial to the patient.^[28] It is reported that preoperative MRI can change the management in ways that can ultimately be harmful to patients, such as increased mastectomy rates, increased work-ups, and delays to surgical excision.^[29] In our patient cohort, there was only one case where a benign biopsy result led the patient to undergo more extensive surgery. Most recently, in 2014, Houssami et al., conducted a meta-analysis evaluating the association between preoperative MRI and local recurrence as well as distant recurrence in patients with breast cancer.^[18] Preoperative MRI was not found to reduce the risk of local or distant recurrence, ultimately leading the authors to state that preoperative MRI should not be used routinely, but it would be helpful in certain situations such as evaluating axillary node metastases or unknown primary cancer. However, it is important to note that this meta-analysis only evaluated MRI in the ipsilateral breast and did not review MRI findings in the contralateral breast. Conversely, Fortune-Greeley and colleagues presented evidence supporting the use of preoperative MRI for surgical planning in elderly women with ILC.^[19] They reported that 20.6% of all patients had an additional reoperation after initial breast conserving surgery and those with ILC were found to have the highest percentage of reoperation rates. The study reported, after propensity score adjustments, that having a presurgical breast MRI lowered the odds of having reoperation in this group. Dr. Lehman and colleagues reported on MRI evaluation of the contralateral breast in women with recently diagnosed breast cancer. They evaluated patients in the age group of 18 years and above, with post-menopausal women comprising over half of the group studied (57.2%).^[9] Overall, this study demonstrated the value of performing bilateral presurgical breast MRI in patients with a recently diagnosed breast cancer. In addition, when specifically

reviewing the post-menopausal cohort, it was reported that in 3.1%, MRI detected cancer in the contralateral breast otherwise missed by mammography and clinical examination. The number of cancers detected was not influenced by menopausal status or histological features of the primary tumor. Our study found 31 (2.4%) contralateral breast cancers (31/1268) in patients 60 years and above, demonstrating value in the aging population as well.

Limitations

There were some limitations in our study. We did not evaluate long-term survival rates for our patient cohort, which would have been ideal to fully evaluate the impact that presurgical breast MRI has on patient management and outcomes. In addition, we were not able to determine the number of cases missed by the presurgical MRI study, as we performed a retrospective review. However, we do report on breast MRI exams performed in an 8-year period for presurgical evaluation.

CONCLUSION

Bilateral breast MRI does detect additional malignancies that may otherwise go undetected, ultimately leading to more extensive surgical plans which can eliminate multiple subsequent surgical procedures for the patient. This study shows that performing presurgical bilateral breast MRI is of value in patients 60 years of age and older and for all subtypes of breast cancer.

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