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Evaluating the Role of Preoperative Breast MRI in Improving Diagnostic Accuracy of Breast Cancer Patients

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PURPOSE

Preoperative breast MRI is often used as an adjunct to mammography and ultrasound to guide diagnostic and surgical management of breast cancer patients. Given the high cost and performance time of MRI, it is important to identify which patients would benefit most from preoperative MRI evaluation. The purpose of our study is to assess the value of preoperative MRI in characterizing the extent of cancer, identify risk factors associated with additional MRI lesions not visualized on prior imaging, and evaluate the impact on patient management.

MATERIALS AND METHODS

A retrospective chart review was conducted on 199 patients with biopsy-proven breast cancer who underwent preoperative MRI between January 2014 and February 2018. We evaluated the accuracy of MRI at predicting the extent of disease, the frequency of additional lesions detected on MRI, and the changes in surgical management. Statistical analysis of associated risk factors was performed with the Chi-Square test and Fisher's exact test, with a P-value <0.05 considered statistically significant.
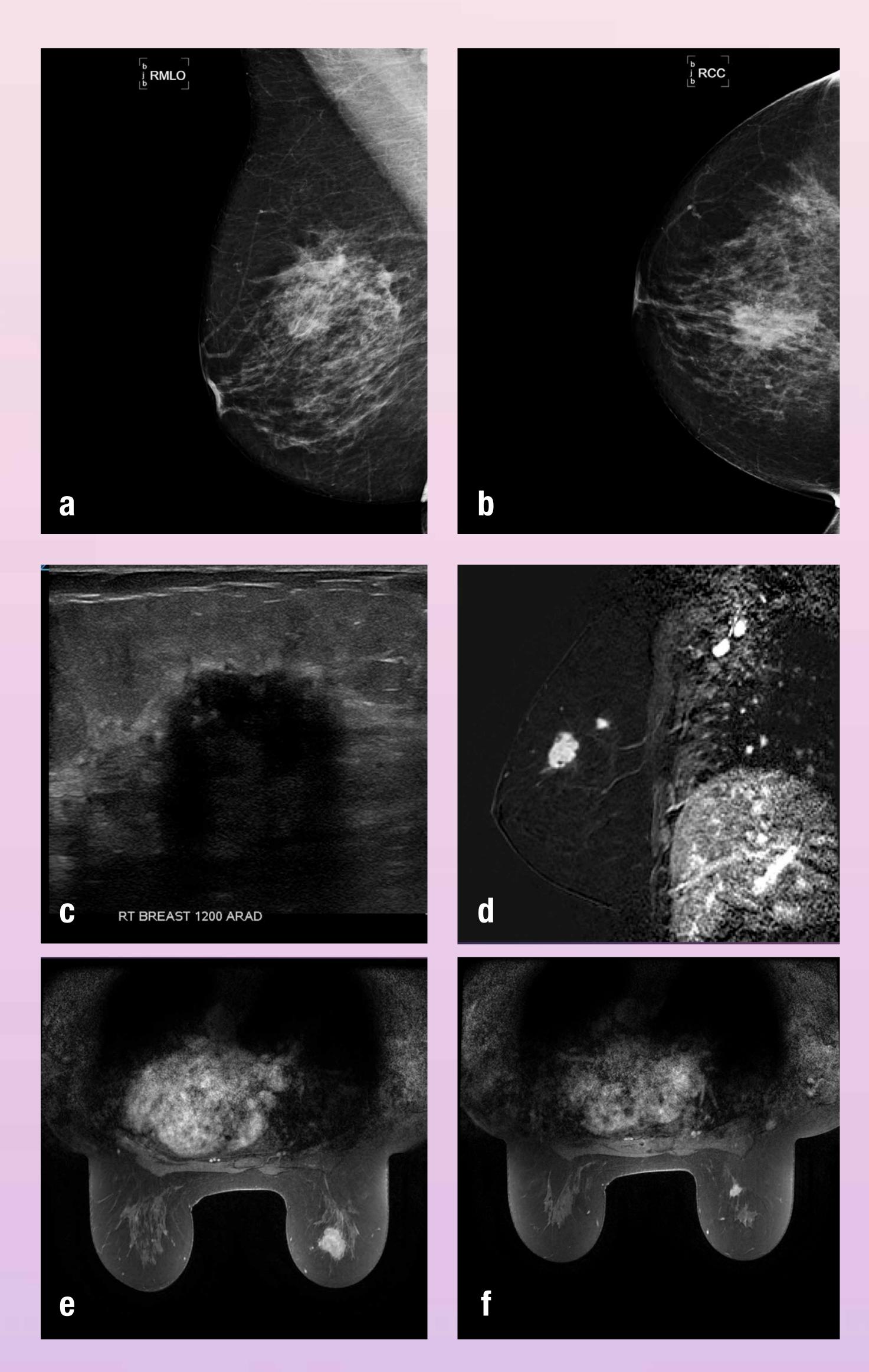

Figure 1. Detection of additional lesion on breast MRI.

Right mediolateral oblique (**a**) and craniocaudal (**b**) views of a mammogram from an outside institution demonstrated a right breast mass at 12 o'clock. Right breast ultrasound from the same day (**c**) redemonstrated this mass, located 5 cm from the nipple, found to be invasive ductal carcinoma. Sagittal (**d**) and axial (**e, f**) MRI images from our institution showed an additional mass at 1 o'clock, approximately 7-8 cm from the nipple. Second-look ultrasound confirmed the presence of this additional mass. Subsequent ultrasound-guided core biopsy of this mass demonstrated an additional focus of invasive ductal carcinoma.

TABLE 1. RISK FACTORS ASSOCIATED WITH ADDITIONAL LESIONS ON MRI

RISK FACTOR	ADDITIONAL FINDINGS (N=91)	NO ADDITIONAL FINDINGS (N=108)	p
Age			0.0041[a]
<50	46 (58.2)	33 (41.8)	
≥50	45 (37.5)	75 (62.5)	
Race			0.8642[a]
White	75 (45.5)	90 (54.6)	
Non-white	16 (47.1)	18 (52.9)	
Breast Density			0.5807[b]
Low density	26 (41.9)	36 (58.1)	
High density	63 (47.0)	71 (53.0)	
Density cannot be determined	2 (66.7)	1 (33.3)	
Type of Breast Cancer			0.6504[b]
IDC	66 (46.5)	76 (53.5)	
ILC	20 (41.7)	28 (58.3)	
Mixed ILC/ID	3 (75.0)	1 (25.0)	
Other	2 (40.0)	3 (60.0)	
Hormone Receptor Status[c]			0.4048[b]
ER/PR+	85 (47.0)	96 (53.0)	
HER2+	10 (38.5)	16 (61.5)	
Triple negative	2 (25.0)	6 (75.0)	
BRCA Positivity			0.6618[b]
Positive	3 (60.0)	2 (40.0)	
Negative	88 (45.4)	106 (54.6)	

Data are n(%) unless otherwise stated; percentages might not add to 100% due to rounding.
[a]Chi-Square test was used to calculate p-value
[b]Fisher's exact test was used to calculate p-value
[c]N for analysis was 215; additional findings n=97, no additional findings n=118

RESULTS

The cohort included 199 patients with known breast cancer, with a median age of 52 and range of 33-79. The sensitivity of MRI in detecting breast cancer was 98%. MRI predicted tumor size within 10 mm of the pathological tumor size in 155 (78%) patients. 72 (36%) MRIs detected additional lesions, which led to additional biopsy-proven sites of cancer in 37 (19%) patients. Surgical management was altered in 33 (17%) patients from either a lumpectomy to mastectomy, or mastectomy to bilateral mastectomy. Younger age (<50 years) was associated with increased frequency of additional lesions detected on MRI (P = 0.004). Risk factors such as race, breast density, histopathology, hormone receptor status, and BRCA positivity did not have a significant association with additional lesions detected on MRI.

CONCLUSION

Preoperative MRI is a useful adjunct to conventional breast imaging in characterizing the extent of breast cancer and detecting additional lesions, particularly in younger patients, resulting in clinically relevant changes in patient management.

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