Standardized Preoperative MRI Pathway Aimed at Improving Surgical Planning in Breast Malignancy

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Background

At our comprehensive breast cancer center, bilateral breast magnetic resonance imaging (MRI) with and without intravenous (IV) contrast, as well as computer-aided detection (CAD) are routinely ordered as part of the preoperative evaluation for localized invasive breast cancer and ductal carcinoma in situ (DCIS). However, the National Comprehensive Cancer Network (NCCN) does not currently support routine preoperative MRI in patients with DCIS. For locally advanced disease, breast MRI is recommended as an optional modality to define disease extent and assess response before and after neoadjuvant systemic therapy. This study aimed to evaluate the accuracy of MRI in preoperative staging of breast cancer by comparing tumor dimensions on MRI, mammography, and ultrasound to the final surgical pathology report. Other objectives included assessing the rate of re-excision for positive margins and the rate of additional biopsies indicated after MRI. We also assessed whether the inclusion of MRI in standardized preoperative workflows contributed to delays in time to surgery.

Methods

1 Study Design
- 377 patients, single institution (2014–2024)
- Preoperative MRI for invasive breast cancer/DCIS
- Excluded: neoadjuvant chemotherapy recipients

2 Imaging vs. Pathology
- MRI, mammography, ultrasound vs. surgical pathology
- Histology: IDC, ILC, or DCIS
- Assessed over/under/accurate estimation

3 Concordance Analysis
- Intraclass Correlation Coefficient (ICC)
- Bland–Altman plots for agreement
- Post-MRI biopsy rate and accuracy

4 Surgical Benchmarking
- Diagnosis-to-resection time
- Re-excision rate for positive margins
- Compared with national benchmarks

Conclusions

Preoperative breast MRI showed greater concordance with surgical pathology compared to mammography and ultrasound, particularly for invasive cancers, which may translate into more informed operative planning, supporting the role of MRI in the preoperative phase. MRI led to additional biopsies in 11.4% of patients, with more than one third of patients having meaningful changes in surgical management based on MRI findings. The re-excision rate of 14% compares favorably with national benchmarks of less than 20% (approximately 1 in 5 women) for margin-positive reoperation after breast-conserving surgery. This suggests MRI may help reduce incomplete resections. However, given the rates of false positives and indeterminate findings with MRI, any MRI-detected lesion should be pathologically confirmed prior to altering the surgical plan. The limited accuracy of MRI in pure DCIS and its potential to increase interventions underscore the need for selective use. Overall, MRI for preoperative surgical planning provides the greatest benefit in invasive disease when integrated thoughtfully into preoperative workflows.

Results

Table 1. Preoperative MRI concordance by tumor category. Invasive tumors showed better reliability (ICC = 0.74) vs. pure DCIS (ICC = 0.48); invasive-only tumors had the highest concordance (ICC = 0.83).

Tumor Category	n	ICC
Invasive only (no DCIS)	120	0.827
Invasive with DCIS	201	0.656
DCIS only (no invasive)	68	0.477
All invasive (± DCIS)	321	0.734

Table 2. Post-MRI Outcomes and Management

11.4% (n=43)	additional biopsies prompted by preoperative MRI
39.5% (n=17)	of MRI-directed biopsies changed surgical management
14.0% (n=53)	returned to surgery for re-excision (positive margins)

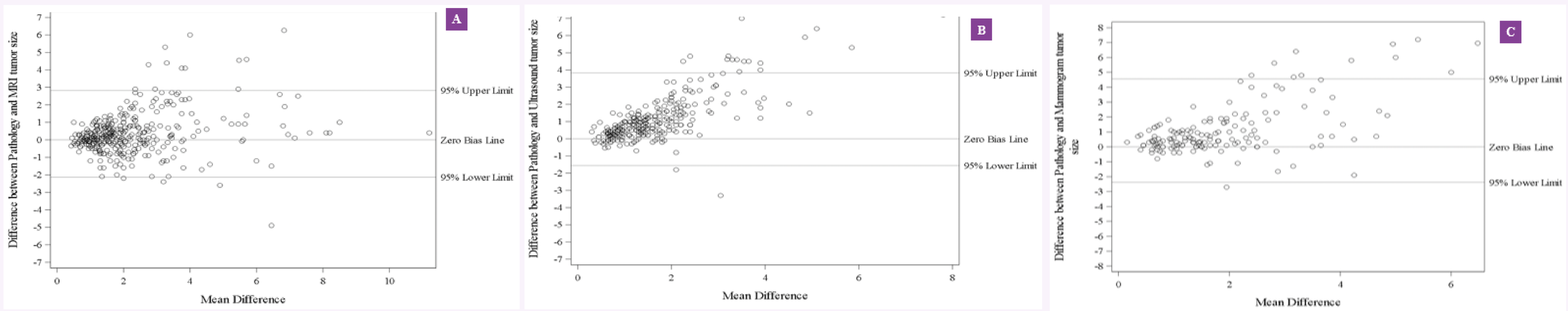


Figure 1A–C. Bland–Altman plots comparing tumor size measured by (A) MRI, (B) ultrasound, and (C) mammogram to surgical pathology. MRI demonstrated moderate reliability (ICC = 0.70), while ultrasound (ICC = 0.12) and mammography (ICC = 0.18) showed poor reliability.