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The Use of Breast MRI for Patients With Preoperative Breast Cancer in an Underserved Population

Elizabeth Warnack, MD, Shubhada Dhage, MD, Elaheh Johnson, PA, Elizabeth Horowitz, PA, and Kathie Ann Joseph, MD, MPH*

NYU School of Medicine, Department of Surgery, New York, New York

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ABSTRACT

Background: Use of MRI for preoperative evaluation of newly diagnosed breast cancer has become more common, despite questionable impact on outcomes. We sought to determine how often and in what manner preoperative breast MRI changed surgical management in an underserved patient population.

Materials and methods: We examined the use of preoperative MRI at Bellevue Hospital Center (BHC), a public, tertiary hospital in lower Manhattan with a large underserved population. The BHC breast clinic database was used to identify patients who received preoperative MRI for breast cancer between January 2015 and December 2016. MRI was defined as changing surgical management in a positive manner if an MRI-detected abnormality had verification of malignancy in the final surgical specimen, confirming the MRI indication for wider excision or mastectomy, while MRI was defined to change surgical management in a negative manner if final pathology was discordant with MRI. Chi-square test was used to analyze characteristics of those who received MRI *versus* those who did not.

Results: A total of 208 patients underwent breast surgery at BHC, and 62 patients underwent MRI for preoperative planning purposes. There were significant differences between the MRI and no MRI group in terms of ethnicity ($P = 0.05$), age ($P < 0.01$), and type of surgery ($P = 0.03$). 50% of the biopsies performed as a result of MRI were benign. MRI changed surgical management in 35 % of patients, most commonly by converting lumpectomy to mastectomy. Of cases in which MRI changed surgical management, most were positive changes. However, 4 patients underwent surgery and 11 patients underwent biopsy for benign pathology as a result of MRI findings.

Conclusions: MRI requires significant hospital and patient resource utilization. Especially in an underserved population, decision for MRI must be individualized, taking into account the risks and benefits of ordering this test.

* *Corresponding author*. NYU School of Medicine, Bellevue Hospital Center, Department of Surgery, 462 First Avenue, New York, NY 10016. Tel.: +(212) 562 3917; fax: +(212) 263 8640.

E-mail address: elizabeth.warnack@nyulangone.org (E. Warnack).

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Introduction

One of every eight women in America will develop invasive breast cancer over the course of her lifetime, and in 2017, an estimated 252,710 new cases of invasive breast cancer will be diagnosed in the United States.[1] Breast MRI has been used as an adjunct imaging modality for screening and preoperative planning, and its use has increased over time. One retrospective cohort study found that breast MRI use has increased more than 20 fold, from 6.5 per 1000 women in 2000 to 130.7 per 10,000 in 2009.[2] However, there is a lack of evidence that preoperative MRI is beneficial in the patient with newly diagnosed breast cancer.[3] While MRI may cause lumpectomy to be converted to mastectomy or contralateral prophylactic mastectomy, it is unclear if this results in decreased cancer recurrence, and studies have shown that preoperative MRI may not lead to long-term disease-free survival.[4,5]

We sought to explore the utility of preoperative MRI in an underserved population. Low-income patients and racial minorities have been shown to have lower breast cancer screening rates and lower adherence to timely follow-up after an abnormal finding.[6] This is multifactorial and may be secondary to lower education level, poor health literacy, or cultural beliefs related to cancer. Preoperative breast MRI can lead to delays in surgical management, as many trips to the hospital may be necessary if biopsy is warranted based on MRI findings. Additional hospital visits and procedures may be prohibitively expensive and time-consuming for an underserved patient and may lead to further delays in management.

We examined the use of preoperative MRI at Bellevue Hospital Center (BHC), a public, tertiary hospital in lower Manhattan with a large underserved population. At BHC, decision to order breast MRI is a multidisciplinary process. New cancer cases are discussed once a week at tumor board; after careful consideration of a patient's history and imaging, a consensus is made on whether further imaging is needed, such as MRI. If MRI is obtained and is abnormal, this may warrant a second-look ultrasound, followed by an ultrasound-guided biopsy. If the lesion cannot be visualized by ultrasound, an MRI-guided biopsy is usually performed. We sought to determine how often and in what manner preoperative breast MRI changed surgical management. Our secondary objective was to examine characteristics of patients who underwent preoperative MRI.

Materials and methods

Institutional IRB approval with waiver of consent was granted before analysis. The BHC breast clinic database was used to identify patients who underwent surgery for breast cancer between January 1, 2015, and December 31, 2016. Males and patients with stage IV breast cancer were excluded. From this group, patients who underwent MRI for preoperative planning purposes were identified. Decision to obtain an MRI image is based on a multidisciplinary weekly tumor board meeting, involving breast surgeons, breast radiologists, and medical oncologists. Two breast surgeons, surgeon A and surgeon B, operate on all patients with breast cancer at our institution. Generally, MRI is ordered if the patient is young (under the age of 50 years), has a strong family history of breast or ovarian cancer, has dense breast based on BIRADS classification, or has a mammogram-occult tumor.

Characteristics of patients who underwent MRI, including ethnicity, age, stage at presentation, and type of surgery, were compared against patients who did not undergo MRI, using chi-square analysis. Wilcoxon rank-sum test was used to compare nonparametric quantitative variables. Median time to surgery, from biopsy demonstrating cancer to definitive operation, was calculated for both groups. Thirty-nine patients who received neoadjuvant chemotherapy were excluded from this calculation. "Abnormal MRI" was defined as any MRI that demonstrated a suspicious area or mass not previously seen on mammogram or other imaging studies, or if greater extent of disease was demonstrated on MRI than was previously appreciated.

Chart review was used to ascertain if MRI changed surgical management (i.e., if the initial surgical plan as documented in clinical notes changed as a result of MRI findings). MRI changed surgical management in a "positive" manner if an MRI-detected abnormality had verification of malignancy in the final surgical specimen, confirming the MRI indication for mastectomy or wider or separate excision. MRI was defined to change surgical management in a "negative" manner if final surgical pathology showed that the abnormal area seen on MRI was benign and discordant. SPSS (IBM, version 23) was used to analyze data, with P values ≤ 0.05 set for significance.

Results

A total of 208 patients underwent breast surgery at BHC over a 2-year period. A minority of patients was Caucasian (23 patients, 11.1%). Most patients were in the 40-50 (52 patients, 25%) or 50-60 (56 patients, 26.9%) years age group. Most patients in the study received Medicaid (138 patients, 66.3%). The most common stage at presentation was stage 2 (67 patients, 32.2%), followed by stage 1 (66 patients, 31.7%). Overall, the most common surgery was lumpectomy (61.5%), followed by mastectomy (33.1%). Median time to surgery for all patients was 42 days, IQR [30-56] (Table 1).

Sixty-two patients underwent MRI for preoperative planning purposes. There were significant differences between the MRI and no MRI group in terms of ethnicity ($P = 0.05$), age ($P < 0.01$), and stage ($P = 0.05$). White and Asian patients were most likely to undergo MRI (39% of white patients and 38% of Asian patients underwent MRI), whereas black patients were least likely (13%, $P = 0.05$). Patients who underwent MRI were more likely to receive mastectomy (43.5% mastectomy rate in MRI group *versus* 28.7% in no MRI group) ($P = 0.03$). In addition, patients who underwent MRI were more likely to receive genetic testing ($P < 0.001$). Excluding the 39 patients who received neoadjuvant chemotherapy, median time to surgery was longer by 3 days in those who underwent MRI (44 days) *versus* those who did not (41 days) ($P < 0.01$) (Table 1). Of the 62 patients who underwent MRI, 28 (45.1%) underwent biopsy as a result of MRI findings. Half of these biopsies (14, 50%) were benign. MRI changed surgical management in 22 patients