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Role of Magnetic Resonance Imaging in Detection of Subtle Masses in Women with Breast Cancer

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Abstract

Background: Magnetic resonance imaging of the breast is becoming a useful adjunct to mammography and sonography for the detection of breast lesions. However, it is not yet accepted as a routine examination for all breast cancer patients due to the lack of data regarding whether breast magnetic resonance imaging impacts recurrence or survival. This trial examines the use of magnetic resonance imaging for detection of additional lesions in patients with dense breasts and its effect on surgical treatment.

Methods: Between November 2011 and November 2012, 51 patients with a confirmed diagnosis of breast cancer and dense breasts underwent bilateral breast magnetic resonance imaging. Cases were reviewed to determine if the breast magnetic resonance imaging detected additional masses, changed the preoperative clinical staging, the operation plan, or prompted additional testing.

Results: Magnetic resonance imaging detected 37 additional masses in 19 patients that were not detected by mammography. Cancer occult to mammography was detected by magnetic resonance imaging in one woman. Breast magnetic resonance imaging upstaged the cancer in 7 (13.72%) out of 51 patients. Magnetic resonance imaging impacted surgical treatment in 4(7.84%) out of 51 patients.

Conclusions: Magnetic resonance imaging is effective in the identification of additional masses in dense breasts that are not visualized on mammography. Of the 51 patients, 4 (7.84%) who underwent magnetic resonance imaging altered their surgical management due to the magnetic resonance imaging findings. Further studies should be undertaken to show that breast magnetic resonance imaging can change local recurrence and survival.

Keywords: Breast cancer, Magnetic resonance imaging, Staging

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Introduction

Breast cancer is the most common cancer among women and also the most prevalent etiology of death in females between 40-44 years of age.[1] Thus early diagnosis and proper treatment is critical. In women with dense breasts, detection of a mass or masses by mammography may be difficult. Breast magnetic resonance imaging (MRI) can demonstrate both ipsilateral and contralateral breast masses that are missed using ultrasound and mammography alone.[2,3] Disadvantages of breast MRI include cost, anxiety and delays in the onset of treatment, variable specificity, the need for additional biopsies, the need for a radiologist specialized in interpreting the images, and the lack of definitive data that demonstrates better local and survival recurrence after MRI.[4-7] The role of routine MRI in management of breast cancer is questionable.

This study analyzed the role of breast MRI in the detection of additional masses and the need to perform additional biopsies in early breast carcinoma cases and in women with dense breast parenchyma. Its subsequent effect on surgical treatment was also evaluated.

Materials and Methods

This was a cross-sectional study performed at the Breast Clinic, Faghihi Hospital, Motahhari Clinic, a tertiary healthcare center affiliated with Shiraz University of Medical Sciences, Shiraz, Iran. During a 12-month period from November 2011 to November 2012, all female patients with known diagnoses of breast cancer and dense breasts (Breast Imaging Report and Data System: BIRADS; 2-3), who were less than 65 years old, with clinical stage 1-2 and no contraindications for MRI were referred to the MRI Center at Faghihi Hospital for breast MRIs. All mammography and MRIs were reported by a skilled radiologist specialized in interpreting the breast imaging studies. New breast lesions detected by MRI were managed by BIRADS classification. BIRADS I-II lesions had no changes to their surgical planning or any additional biopsy and follow up. Lesions classified as BIRADS III were followed every 3 months, then every 3-6 months for 1-2 years. BIRADS IV-V lesions underwent reevaluation by sonography in order to detect the lesion(s).If observed; a biopsy was performed under sonographic guidance. If no lesion was observed, an MRI-guided needle biopsy was performed. The MRI-guided breast biopsy technique was not available in our center, hence a mastectomy was performed if the lesion not detected by sonography. Each patient's course of treatment was then evaluated to determine whether or not the breast MRI caused any change in surgical plan or required additional workup, such as imaging studies or biopsies. After surgery, specimens were reported by a pathologist. Patients whose surgical plans had changed had a correlation performed between their breast MRI and the final pathology to see if the change in surgical treatment was warranted.

Results

A total of 51 adult females with definite breast cancer stages 1-2 and dense breasts were included in this study. The average age of the patients was 44.56 years (range: 28-63 years). There was no detectable mass observed in two patients who suffered from bloody nipple discharge. There was a documented family history of breast cancer in 15.68% patients. In 49 patients who underwent Fine Needle Aspiration Biopsy (FNA), 60.07% were positive for malignancy. Another patient underwent an incisional biopsy. Final pathology

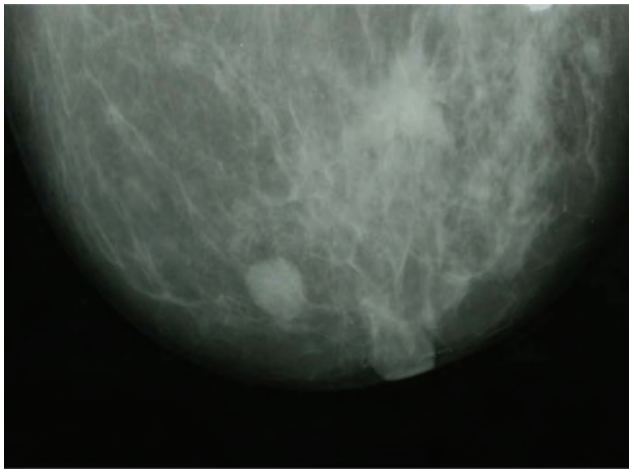

Figure 1. Left breast mammography shows the presence of one mass.

reports following surgery reported invasive ductal carcinoma in 94.11% of patients and invasive lobular carcinoma in 5.88%.

No masses were detected by mammography in 31.38% of patients, nor in 5.88% of cases who underwent sonography and in 5.88% of those who underwent mammography and sonography. However MRI detected all of the masses.

Finally, MRI detected the presence of 75 masses, mammography detected 38 masses and sonography detected 51 masses. MRI detected 37 additional masses that were classified as BIRADS I (n=3) , BIRADS II (n=5) , BIRADS III (n=14), BIRADS IV (n=9) and BIRADS V (n=6) in 19 patients. These masses were not detected by mammography and were either an additional lesion in the ipsilateral breast or a new lesion in the contralateral breast. Of these 37 additional lesions, 2 were analyzed by sonography which resulted in the detection of a new lesion in 1 patient.

There were 7 (13.72%) out of 51 patients with multifocal masses. In 8 (15.68%) out of 51 patients, multicentric masses were detected. Contralateral lesions were detected in 6 (11.76%) patients, from which 4 had BIRADs III lesions and were followed by close observation. One patient had a second mass detected that was classified as BIRADS V. This patient had an FNA performed under sonographic guidance. The mass was malignant (Figures 1,2). In one patient, a BIRADS IV lesion was discovered that was not seen on sonography. The patient refused a mastectomy.

After breast MRI, the breast cancer stage was changed in 7 (13.72%) out of 51 patients. The surgical plan changed in 4 (7.84%) patients. Plan changes were attributed to multicentric disease in 3 patients and the presence of a contralateral occult mass in 1 patient. The final pathology in these patients was documented as invasive ductal carcinoma.

Mastectomies were performed in 25 (49.02%) patients and 26 (50.98%) patients chose breast conserving therapy. For patients, the mean interval between the MRI and surgery was 6.78 days (range: 2-13 days).

Discussion

In a comparison between other imaging modalities, breast MRI has the highest sensitivities ranging from 86% to 100%.[8,9] This high sensitivity is tempered by imperfect specificity due to overlap in the features of benign and malignant lesions. Use of breast MRI to detect breast cancer has generated significant debate.

Identification of the extent and potentiated multifocality of breast cancer are crucial in surgical decision planning. Findings of an additional lesion in the contralateral breast would also play a significant role in determining the best option for surgical treatment. The MRI dose appears to be a promising method for preoperative breast cancer staging, to exclude multifocal or multicentric lesions, as well as lesions in the contralateral breast.[10]

Fischer et al. examined 463 patients and concluded that MRI might reveal unsuspected multifocal, multicentric, or contralateral breast cancer and could have effect on decisions regarding therapy for breast cancer patients. They found that owing to MRI findings, the therapy was changed in 66 (14%) patients. MRI showed multifocality in 30 (9%) patients, multicentricity in 24 (7%) patients, and contralateral carcinoma in 15 (5%).[8]

Furman et al. studied 76 patients and observed that surgical management was altered in 10 (13%) patients due to the MRI findings. MRI detected multifocal or multicentric lesions in 12%, whereas

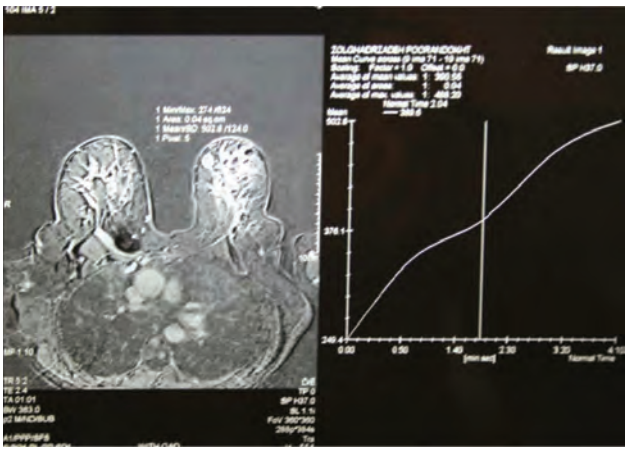

Figure 2. MRI detected two masses, one was classified as BIRADs III and the second mass was considered to be BIRADs IV. Sonography guided biopsies revealed malignant lesions.

a contralateral lesion was discovered in 16% of patients.[10]

Ciocchetti et al. reported that 38 (50%) patients underwent follow-up imaging and 22 (29%) out of 76 patients underwent additional biopsies. The breast MRI upstaged the cancer in 14 (18%) out of 76 patients. There was a change in surgical planning in 19 (25%) patients, all of whom had more extensive surgery than previously planned.[11]

In our study, MRI detected 100% of the masses in the study patients. MRI also detected 37 additional masses in 19 patients that were not detected by mammography, either as an additional lesion in the ipsilateral breast or a new lesion in the contralateral breast. A total of 7 (13.72%) patients had multifocal masses, whereas 8 (15.68%) had evidence of multicentric masses. In 6 (11.76%) patients there were contralateral breast lesions.

In the current study, there were less additional biopsies performed compared with other studies; only 2 (3.92%) patients underwent additional biopsies according to BIRADS classification.

Changes to the surgical plan in the current study occurred less frequently than other studies. Only 4 (7.84%) patients had changes to their surgical plans. This might be attributed to limitations in patient selection (stages 1, 2 and dense breasts).

In a study by Francesco, there was a 22.4 day delay in treatment.[12] In our study, the mean interval between the MRI and surgery was 6.78 days (range: 2-13 days). This might be due to less additional biopsies and exclusion of the patients if MRI spent more time to do.

In a retrospective review of 756 patients treated for recently diagnosed breast cancer, 215 patients had breast MRI as part of their initial evaluation. The eight-year rates of any local failure or local-only first failure were 3% and 4% with and without MRI, respectively. The rates were similar in women who had intraductal or invasive cancers. There were no differences in eight-year rates of overall or cause-specific survival.[13]

Thus, the use of pre-operative breast MRI in evaluation of patients newly diagnosed with breast cancer and in patients with dense breast parenchyma can lead to the discovery of additional masses which are undetectable by mammography and ultrasound. According to high rate of false positives and avoidance of additional sampling, BIRADS classification can be very helpful both in terms of decreased cost and earlier treatment. MRI is useful in the detection of additional ipsilateral and contralateral masses in breast cancer patients with dense breasts. However the cost of MRI and time demands are two controversial limitations. In addition also effect on recurrence rate and survival benefit is unclear. In cases planning for breast conservation surgery, MRI can be helpful to detect additional pathology which would change the surgical plan to a mastectomy. Further studies should be performed to clarify the role of breast MRI and its effectiveness on local recurrence and survival.

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Conflict of Interest

No conflict of interest is declared.

References

1. Brunicardi F, Anderson D, Billiar T, Dunn D, Hunter J, Matthews J, et al. The Breast. Schwartz`s Principles of Surgery, 9th ed. New York: McGraw Hill; 2010:440-2.
2. Orel SG, Schnall MD. MR imaging of the breast for the detection, diagnosis, and staging of breast cancer. *Radiology* 2001;220(1):13-30.
3. Liberman L, Mortis EA, Kim CM, Kaplan JB, Abramson AF, Menell JH, et al. MR imaging findings in the contralateral breast of women with recently diagnosed breast cancer. *Am J Roentgenol* 2003;180:333-41.
4. Brennan M, Spillane A, Houssami N. The role of breast MRI in clinical practice. *Aust Fam Physician* 2009;38(7):513-9.
5. Day D. Breast MRI: opportunities and challenges. *Minn Med* 2009;92(12):45-8.
6. Bleicher RJ, Ciocca RM, Egleston BL, Sesa L, Evers K, Sigurdson ER, et al. Association of routine

pretreatment magnetic resonance imaging with time to surgery, mastectomy rate, and margin status. *J Am Coll Surg* 2009;209(2):180-7.
7. Houssami N, Hayes DF. Review of preoperative magnetic resonance imaging in breast cancer: should MRI be performed on all women with newly diagnosed, early stage breast cancer? *CA Cancer J Clin* 2009;59(5):290-302.
8. Fischer U, Kopka L, Grabbe E. Breast carcinoma: effect of preoperative contrast enhanced MR imaging on the therapeutic approach. *Radiology* 1999; 213(3):881-8.
9. Lee SG, Orel SG, Woo IJ, Cruz-Jove E, Putt ME, Solin LJ, et al. MR imaging screening of the contralateral breast in patients with newly diagnosed breast cancer: preliminary result. *Radiology* 2003;226(3):773-8.
10. Furman B, Gardner M , Romilly P, Clark J, Stowell N, Green B, et al. Effect of 0.5 Tesla magnetic resonance imaging on the surgical management of breast cancer patients. *Am J Surg* 2003;186(4):344-7.
11. Ciocchetti JM, Joy N, Staller S, Warmack J, Mann A, Moore JT, et al. The effect of magnetic resonance imaging in the workup of breast cancer. *Am J Surg* 2009;198(6):824-8.
12. Francesco S. Overview of the role of pre-operative breast MRI in the absence of evidence on patient outcomes. *Breast* 2010;19(1):3-6.
13. Up to date: Diagnostic evaluation of women with suspected breast cancer [Internet]. Philadelphia: Wolters Kluwer Health, Inc; [cited 2013 Mar 1]. Available from: htpp://www.uptodate.com/.