The role of preoperative breast MRI for surgical decision in patients undergoing therapeutic mammoplasty

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Received 01 April 2019
Accepted 10 June 2019

Journal of Current Medical Research and Practice
September-December 2019, 4:368–372

Aim
The aim of this study was to assess the role and contribution of MRI in preoperative planning of patients with breast cancer who are considered potentially suitable for therapeutic mammoplasty.

Patients and methods
A total of 30 female patients with breast cancer undergoing breast surgery were divided into two groups based on preoperative MRI findings: in one group, the surgical plan was changed, and in the other one, the surgical plan remained unchanged.

Results
Final surgical decision was changed in most patients (53.3%) owing to additional suspicious breast lesions detected on preoperative breast MRI, whereas the final surgical decision was the same in 14 (46.7%); the initial decision was unchanged.

Conclusion
Preoperative breast MRI may be helpful in surgical decision for patients considered for therapeutic mammoplasty.

Keywords:
mammoplasty, MRI, surgical decision

J Curr Med Res Pract 4:368–372

2357-0121

Introduction

The primary aim of surgical oncology is complete removal of tumor with clear margins. In breast surgery, the realization that adequate oncological margins could be obtained without full amputation of the breast was first put forward by Keynes [1].

With the addition of irradiation of the breast for control of local recurrence in 1939, a fundamental change was brought about in the approach to the breast cancer. With time, breast surgery has become less and less radical. The Halstead radical mastectomy and the Patey modified radical mastectomy are now largely confined to the history books, and we are without question in an era when most patients can have 'breast-conserving surgery' [2].

With the refinement of breast-conserving surgical techniques, combined with the development of specialist breast surgeons training in reconstructive and esthetic breast surgery, the place of cosmoses in the surgical management of breast cancer has gained increasing attention. There is evidence that removal of greater than 10–20% of breast volume is associated with unacceptable cosmetic appearance and poor psychological adjustment after surgery [3].

Therefore, the role of oncoplastic surgery in breast cancer has progressively increased in importance since a relative infancy in the 1990s, with an evolution in oncoplastic techniques for the breast, especially the use of reduction mammoplasty approaches to breast cancer management [3]. Although breast reduction in breast cancer management has been in use since the 1980s, it is only since 1998 with its introduction by Audretsch *et al.* [4] that therapeutic mammoplasty (TM) has been clearly defined [5].

TM aims to overcome some of the problems associated with breast-conserving surgery such as long-term asymmetry, deformity, and technically difficult irradiation of large, ptotic breasts. It may even be of functional benefit to women with macromastia who would otherwise be suitable for reduction mammoplasty [5–7]. MRI is accepted to have a role in the assessment of high-risk women, the characterization of uncertain lesions, and in the evaluation of residual disease after lumpectomy [8,9].

Within the preoperative planning of women suitable for TM, the surgeon must consider breast size, tumor location, and tumor size and how the breast will be

reconstituted in terms of its shape and the choice of pedicle [6]. In women with an appropriate starting point for TM, it is worthwhile noting that breast-conserving surgery can be considered even for tumors larger than 4 cm using this technique.

Although MRI in breast cancer shows a high sensitivity of 98% for detecting invasive carcinoma and 80% for detecting ductal carcinoma *in situ* [8,10], and also, because the principle of MRI is based on the dynamics of contrast enhancement, a specific tumor subtype should sensitively respond to the imaging process.

In this study, we investigated the patterns of change between the initial and final decisions regarding surgical management based on routine mammography, ultrasonography (US), and preoperative breast MR findings and also analyzed the association between the presence of additional suspicious lesions on breast MRIs and histopathological results.

Patients and methods

This study was conducted during the period from May 2017 to May 2018.

This study was performed at Assiut University Hospital, General Surgery Department. A total of 30 female patients with breast cancer were enrolled in this study. All patients were seeking health care at General Surgery Department, and the treatment strategy, with initial decision of TM, was taken depending on clinical examination and findings of mammography and US.

Then patients were also assessed by preoperative breast MRI, and the final surgical decision was maintained or changed according to the results of MRI.

When initial decision was the same as the final decision, the patient was assigned to the unchanged group; however, if the final differed from the initial surgical decision, the patient was assigned to the changed group.

Definitive management for breast lesions was done, and imaging findings were correlated with histopathological results.

Inclusion criteria

The following were the inclusion criteria:

(1) Female patients with operable breast cancer (stages 1 and 2).
(2) Age between 25 and 70 years.
(3) Patients who meet the criteria of TM.

Exclusion criteria

The following were the exclusion criteria
(1) Inoperable breast cancer (stages 3 and 4)
(2) Previous radiotherapy
(3) Local recurrence after previous breast conservation surgery
(4) Male breast cancer.

Sample size calculation

The sample size was calculated using G power. (Hylown Consulting, LLC, Atlanta, GA) The study needed 30 patients.

The study is cross-sectional (validating study):
(1) The size, number, and location of breast cancer lesions were identified on US and mammography.
(2) Moreover, the size, number, location, pattern of enhancement and presence or absence of intraductal component have been evaluated by preoperative MRI.
(3) The surgical plane has been decided based on US and mammography findings.
(4) The final decision has been based on MRI findings.
(5) When the initial surgical decision was the same as the final decision, the patient was assigned to the unchanged group.
(6) However, if the final decision differed from the initial surgical decision, the patient was assigned to the changed group.

Statistical analysis

Data were collected and analyzed using statistical package for the social science, version 20 (IBM Corp., Armonk, New York, USA). Continuous data were expressed in the form of mean ± SD or median (range), whereas nominal data were expressed in the form of frequency (%).

χ^2-test was used to compare the nominal data of different groups in the study, whereas Student's *t*-test was used to compare the mean of the two different groups. *P* value was significant if less than 0.05.

The research was approved by medical ethics committee with no: 17100223.

Results

A total of 30 patients were included in this study, with a mean age of 46.33 ± 8.85 years and age range between 32 and 63 years.

Regarding histopathological results, ductal carcinoma presented in 22 patients (73.3%), whereas lobular carcinoma presented in eight patients (26.7%).

Regarding the initial surgical decision based on routine imaging (mammography and breast US), the most frequent initial decision was mammoplasty (60%), neoadjuvant therapy then mammoplasty (33.3%), and local wide excision was the decision in only two patients (6.7%) (Table 1 and Fig. 1).

Regarding the final surgical decision based on preoperative breast MRI, we found that the final decision was the same as the initial one in 14 patients (46.7%), whereas in the other 16 patients (53.3%), the initial decision was changed.

The causes of change of the surgical decision were multicentricity of the tumor seen in 11 patients (36.7%), affection of the other side in three patients (10%), and presence of nipple invasion in 2 patients (6.7%) (Table 2 and Figs. 2–6).

Discussion

Breast-conserving surgery followed by radiotherapy is considered the standard treatment in patients with early breast cancer, with oncologic outcomes equivalent to other breast cancer treatments [11].

Oncoplastic breast surgery considered this as another surgical concept for breast cancer with oncologic safety and a good cosmetic outcome [12].

The most important clinical factor for success of breast cancer surgery is complete removal of breast cancer with adequate safety margin, as margin positivity is associated with local failure of surgical treatment of breast cancer [13].

Preoperative imaging findings provide important information about tumor characteristics and its margins. However, the sensitivity of detecting multicentricity and multifocality is only 20–60% when mammography and US are performed as standard imaging modalities for breast cancer diagnosis [14].

Table 1 Initial decision based on routine imaging

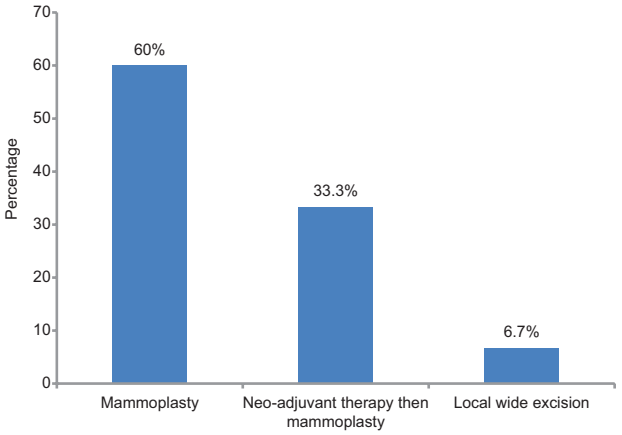
	n=30 [*n* (%)]
Neoadjuvant therapy, then mammoplasty	10 (33.3)
Mammoplasty	18 (60)
Local wide excision	2 (6.7)

Table 2 Final decision based on MRI findings

	n=30 [*n* (%)]
The same as the initial decision	14 (46.7)
Changed	16 (53.3)
Cause of change	
Multicentricity of tumor	11 (36.7)
Affection of other side	3 (10)
Detection of nipple invasion	2 (6.7)

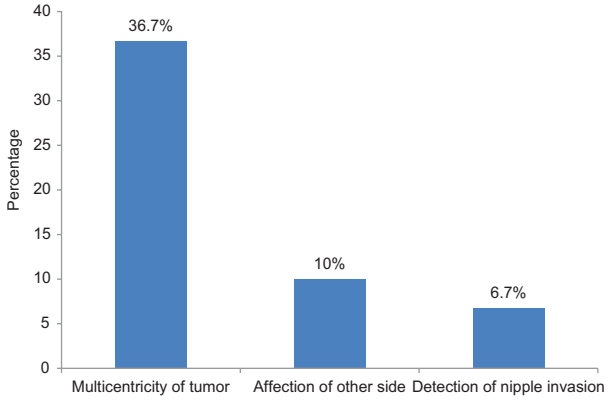
Breast MRI detects breast cancer with greater sensitivity than does sonomammography. In fact, the sensitivity of breast MRI for detection of invasive cancer reached 98%, and 81% for detection of extensive intraductal components, which are considered

Figure 1



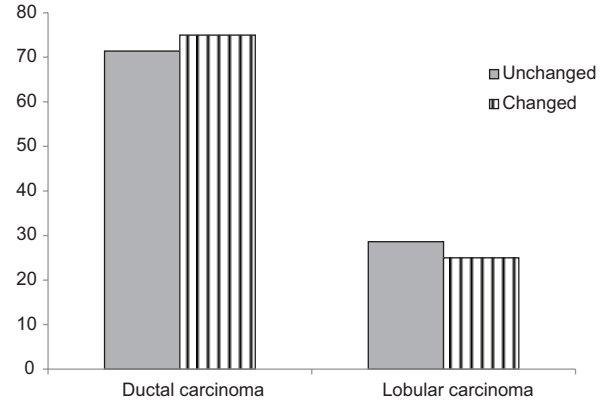
The initial decision in the studied patients based on routine imaging.

Figure 2



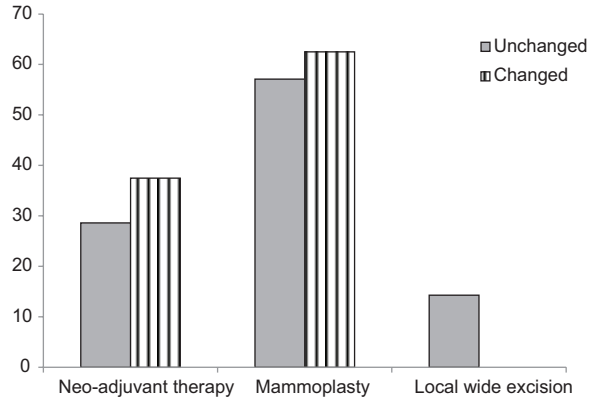
Causes of surgical decision change in the studied patients based on MRI.

Figure 3



Histopathology in both studied groups.

Figure 4

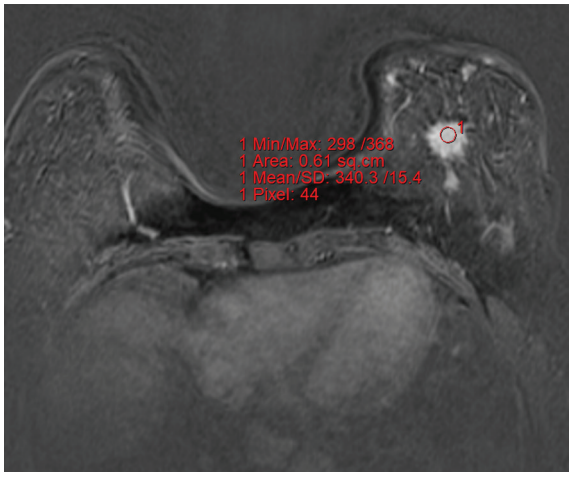


Initial decision in both studied groups.

Figure 5

A 55-year-old female patient with right breast lump who underwent inferior pedicle mammoplasty (intraoperative and 15 days postoperative). MRI did not change the surgical decision in this case.

Figure 6



A 37-year-old female patient, with left breast lump. Contrast-enhanced MRI revealed speculated outline intensely enhanced left breast mass. We have changed the surgical decision from superior pedicle mammoplasty to modified radical mastectomy.

important prognostic factors for local recurrence after breast-conserving surgery [15].

In this study, we investigated the patterns of change between initial and final decisions regarding the surgical management based on routine mammography, US, and preoperative breast MRI findings and analyzed the association between the presence of additional suspicious lesions on breast MRI and the histopathological results.

Our results have shown that MRI correlates more closely with the final histopathological findings than mammography and US in the assessment of extensive intraductal components and ductal carcinoma *in situ*.

Among the 30 patients of this study, the final surgical decision was changed in 16 (53.3%). Regarding the cause of surgical decision change, we found 11 patients (36.7%) with additional lesions, three patients (10%) with contralateral malignancy, and 2 patients (6.7%) had nipple invasion.

In another study, multicentricity of the tumor was detected in 43.4%, larger size of the tumor on preoperative MRI in 40.2%, affection of the other side in 7.2%, and invasion of nipples was detected in 2.1% [16].

However, although breast MRI was beneficial for this group of patients, there are other cases in which the benefit may be questionable.

As in our study, the size of the tumor between changed and unchanged groups was insignificant ($P > 0.05$).

We changed the surgical decision to more radical procedures in eight of the 16 cases of the changed group, for whom modified radical mastectomy was performed. We also have changed the technique of mammoplasty in six cases (lateral mammoplasty and skin sparing mammoplasty), and gave neoadjuvant therapy in two cases. These additional procedures can delay the definitive surgical treatment and cause anxiety for the patient, which may affect the surgical decision of the patient.

The limitations of this study were the small sample size and the lack of follow-up of the patients.

Conclusion

Additional preoperative breast MRI may be helpful in surgical decision for patients considered for TM.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

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