



Comparison of mammography sensitivity after reduction mammoplasty targeting the glandular and fat tissue

Murat Çakır¹, Tevfik Küçükkartallar¹, Ahmet Tekin¹, Nebil Selimoğlu², Necdet Poyraz³, Mehmet Metin Belviranlı¹, Adil Kartal¹

ABSTRACT

Objective: Mammography may have some limitations in the diagnosis and screening of breast cancer for women who have previously undergone breast reduction surgery. This study aimed to investigate how the structural defects in the breast tissue formed by postoperative changes are reflected on mammography.

Material and Methods: The records of patients who had previously undergone breast reduction surgery and who were requested to undergo mammography for breast cancer screening by the general surgery clinic were retrospectively studied. The patients' ages, surgical procedures, postoperative follow-up periods, amount of removed material, and histopathological and mammographic results were studied. The patients were classified into 3 groups: those older than 40 years who underwent reduction mammoplasty targeting predominantly the glandular tissue (group 1), those younger than 40 years who underwent reduction mammoplasty targeting predominantly the fat tissue (group 2), and those older than 40 years who were diagnosed with breast hypertrophy and were not operated (group 3).

Results: The mean follow-up period of the patients was 6 (2-10) years. The mean value of resected tissue was 1120 g (680-2070) in group 1 and 1220 g (720-1980) in group 2. The mean age at the time of surgery was 45 (40-70) years for group 1 and 35 (24-40) years for group 2. All patients in group 1 were classified in Breast Imaging-Reporting and Data System (BI-RADS) category 1-2; 28 patients in group 2 were classified in BI-RADS 1-2, 4 were classified in BI-RADS 3, and 8 were classified in BI-RADS 0. In group 3, 35 patients were classified in BI-RADS 1-2, 4 were classified in BI-RADS 3, and 1 was classified in BI-RADS 0.

Conclusion: We believe that breast reduction surgery targeting predominantly the glandular tissue in patients older than 40 years increases mammographic sensitivity.

Keywords: Mammography, reduction surgery, breast, cancer

INTRODUCTION

Breast hypertrophy is caused by the hypertrophy of glandular epithelia and breast tissue sensitive to excess hormone. Although hormonal reasons and genetic transfer are mentioned in the etiology, the condition is not clear enough yet (1, 2). Women with macromastia are inclined to have breast reduction surgery because of physiological and psychological reasons. Although the main goal of breast reduction surgery is to reduce breast weight and volume, it is also important to maintain the esthetic outlook and sensual and physiological functions.

In most routine pathological analyses of the tissues removed during breast surgery, there are either no proliferative changes or moderate hyperplastic lesions with no increased risk for breast cancer (3). The most commonly known histopathological diagnoses include breast hyperplasia, fat metaplasia, breast dysplasia, adenosis, fibrocystic disease, and normal breast tissue (3).

Mammography is the most successful diagnostic method in early diagnosis. Its sensitivity in breasts with excess fat tissue is 90-95% whereas it is 60-75% in dense breasts. In general, 5-10% of mammography results are abnormal, and the lesions in 90% of these patients are related to benign diseases (4). Therefore, safe and comprehensive evaluation is of utmost importance.

Fibrosis and the scar formed after breast biopsy have negative effects on the evaluation of radiological screenings. The same problem also arises after breast conserving surgery. There may be difficulties in differentiation between benign and malignant lesions in mammography performed months or years later. When the side effects of radiotherapy are added to this, sometimes unnecessary biopsies or even complementary mastectomy procedures may be performed. In a similar manner, suspicious mammographic findings call for attention when patients who had breast reduction surgeries in plastic surgery clinics are followed-up by general surgery clinics. This is because these mammoplasty procedures cause serious changes in the morphology of the breast whether they are reduction procedures targeting the periglandular fat tissue or the glandular tissue.

¹Department of General Surgery, Necmettin Erbakan University Meram Faculty of Medicine, Konya, Turkey

²Department of Plastic and Reconstructive Surgery, Selçuk University Faculty of Medicine, Konya, Turkey

³Department of Radiology, Necmettin Erbakan University, Meram Faculty of Medicine, Konya, Turkey

Address for Correspondence

Murat Çakır

Necmettin Erbakan Üniversitesi
Meram Tıp Fakültesi, Genel
Cerrahi Anabilim Dalı, Konya,
Türkiye

Phone: +90 505 605 51 58
e-mail: dmmuratcakir@hotmail.com

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Table 1. BI-RADS index and number of patients

Groups	BI-RADS 0	BI-RADS 1	BI-RADS 2	BI-RADS 3	BI-RADS 4	BI-RADS 5	BI-RADS 6
Group 1	0	22	18	0	0	0	0
Group 2	8	15	13	4	0	0	0
Group 3	1	10	15	4	0	0	0

Mammography may have some limitations in the diagnosis and screening of breast cancer for women who have previously undergone breast reduction surgery. This study aimed to investigate how the structural defects in the breast tissue formed by postoperative changes are reflected on mammography.

MATERIAL AND METHODS

The records of patients who had undergone breast reduction surgery at Necmettin Erbakan University, Meram Medical School, Department of Plastic Surgery and Reconstruction between 2000 and 2010 and who were requested to undergo mammography for breast cancer screening by the general surgery clinic were retrospectively studied. The patients' ages, surgical procedure performed, postoperative follow-up period, amount of removed material, and histopathological and mammographic findings according to the Breast Imaging-Reporting and Data System (BI-RADS) index were evaluated. All patients who underwent mammography for screening purposes were aged ≥ 40 years. The patients were classified into three groups:

Group 1: Forty patients older than 40 years of age who underwent reduction mammoplasty targeting predominantly the glandular tissue.

Group 2: Forty patients younger than 40 years of age who underwent reduction mammoplasty targeting predominantly the fat tissue.

Group 3: Thirty patients older than 40 years of age who were diagnosed with breast hypertrophy and were not operated.

Groups 1 and 2 were differentiated according to the surgical procedure performed. The Department of Plastic Surgery and Reconstruction at our hospital performs reduction mammoplasty targeting predominantly the glandular or fat tissue depending on the age of the patient (5, 6). Patients younger than 40 years of age receive surgical excision targeting predominantly the fat tissue preserving the glandular tissue, whereas those older than 40 years of age receive surgical excision targeting predominantly the glandular tissue preserving the fat tissue.

Statistical Analysis

Statistical analyses were conducted by the chi-square test. P-values of <0.05 were considered to be significant.

RESULTS

Of the 120 patients who underwent breast reduction surgery, 80 could be contacted and were included in the study. The mean follow-up period of the patients was 6 (2-10) years. The average amount of removed tissue was 1120 g (680-2070) for

group 1 and 1220 g (720-1980) for group 2. The mean age at the time of surgery was 45 (40-70) years for group 1 and 35 (24-40) years for group 2. The mean age of all groups with mammographic evaluation was 45 (40-70) years. The results of the histopathological study of the removed tissue following surgery are as follows: in group 1, 30 patients had fibrocystic changes, whereas 10 had normal breast tissue; in group 2, 10 patients had fibrocystic changes, 8 had fibrolipomatous breast tissue, 4 had fibroadenoma, 4 had fat necrosis, and 4 had foreign body inflammatory granulation tissue.

All patients in group 1 were classified in BI-RADS 1-2. There were no patients in BI-RADS 0 category. In group 2, 28 patients were classified in BI-RADS 1-2, 4 were classified in BI-RADS 3, and 8 were classified in BI-RADS 0. In group 3, 35 patients were classified in BI-RADS 1-2, 4 were classified in BI-RADS 3, and 1 was classified in BI-RADS 0. No suspicious or inadequate mammography results that would necessitate additional studies were seen in any of the patients in group 1 (Table 1). The patients in BI-RADS 0 category in group 2 underwent magnetic resonance imaging as additional study. Within the framework of the mammographic study of the patients with breast reduction surgery, particularly of those who had reduced fat tissue, statistically significant additional study was needed. Two patients in group 2 had biopsies for malignancy, but the biopsy results turned out to be benign. Compared with the group with no surgery, evaluation of the patients in group 1 was not statistically significant, although it was more objective and revealed clearer results compared with group 2.

DISCUSSION

Since breast cancer will be rare if women who had reduction mammoplasty are not in the high risk group, radiological screening should be performed once a year for women over 40 years of age, ideally during the sojourn period (preclinic period). The sojourn period is an average of 2.7 years. It is 1.9 years between 40 and 49 years of age, 3.1 years between 50 and 59 years of age, and 3.3 years between 60 and 69 years of age. The screening interval should not exceed half of the sojourn period. According to the American Cancer Society, women who are not in the risk group are advised to undergo annual physical examination and mammography within the framework of screening after 40 years of age (7, 8). At our institution, we perform screening beginning with 1 year following surgery and at 2-year intervals for patients who have no complaints and who are not in the risk group. Clinical breast examination and mammography are performed within the framework of screening. Furthermore, we perform additional studies in suspicious cases.

Professional organizations suggest that women between 40 and 50 years of age should undergo screening mammography every 1-2 years. Diagnostic mammography, however, has an

important role in showing non-palpable breast lesions. In general, 5-10% of mammography results are abnormal, and 90% of patients with abnormal mammography results have benign lesions (4). Therefore, precise evaluation without any doubt is of utmost importance.

Mammography reveals the fat tissue, which is one of the three main tissues in the breast, in a radiolucent manner, whereas the connective tissue is seen as radiodense linear images and the glandular tissue is seen as intermediate opacities. Generally, an increase in opacity is seen in the upper outer quadrants depending on the physiological distribution of the parenchymal tissue. It is seen as a thin band not exceeding an average of 1.5 mm with smooth breast skin. Just beneath the skin opacity, there is a smooth radiolucent image related to hypodermic fat tissue. A mass in the fatty breast parenchyma is easily differentiated. The breast tissue can vary among individuals and according to the stage of life in the same individual in terms of the amount, composition, and distribution. There is virtually homogenous opacity in young women because the glandular tissue covers almost the entire breast. It is harder to evaluate such dense breasts. Therefore, mammography is either not recommended or limited during early ages. Because of the involution that starts and subsequently accelerates in the breast structure towards 40 years of age the glandular tissue is replaced by the fat tissue. Thus, a predominantly hypodense condition occurs in the breast during the menopausal and postmenopausal period. Involution enables easier evaluation of the breast, and the sensitivity of mammography in a perfectly involuted fatty breast reaches as far as 100% (9, 10). Based on these findings, we believe that the sensitivity of mammography increases in women who undergo breast reduction surgery targeting the glandular tissue. We found that mammographic evaluation was much more certain without any doubt in patients with breast reduction surgery targeting predominantly the glandular tissue. In patients whose glandular tissue was preserved, however, evaluation became harder (group 2). A significant amount of additional analyses had to be conducted according to the mammographic results of patients in group 2 with preserved glandular tissue; the number of patients in BI-RADS 0 and 3 categories was significantly high in group 2, whereas there were no patients in these categories in group 1. This is because the fat tissue of the breast was reduced and only the glandular tissue remained in the breast. This indicates that the characteristic of the removed breast tissue changes the results of the analysis. As supported by our results, mammographic evaluation can be inadequate and misleading in a breast with previous surgical procedure whose fat, connective, and glandular tissue ratios have changed.

The issue regarding the means by which the changes that take place following breast surgery affect mammographic findings is still controversial. The two primary symptoms of breast cancer are microcalcifications and mass lesions with irregular contours. Calcifications in the breast are frequently seen. They can be brought about by benign causes such as inflammation and trauma; however, they can also accompany breast cancer. Skin calcifications, vascular calcifications, coarse calcifications seen in fibroadenomas, fat necrosis, or neighborhood calcifications that may be seen in cysts are benign types (11). Clustered calcifications that inform the physicians of early-stage cancer should be investigated. Microcalcifications are calcifications

smaller than 0.15 mm in the entire breast area. Calcifications that occupy a small area (1 cm³) in the breast tissue without any masses, are irregular, have a heterogeneous morphology, are generally smaller than 0.5 mm, are ≥ 4 in number, and are clustered should be considered as suspicious (12). Though rarely seen, it should also be remembered that similar calcifications may be formed following breast surgery. But most of the formed calcifications are macro-calcifications. Calcifications seen in the mammography of the patients in both group 1 and group 2 were irregular and coarse. The benign nature of these calcifications could be clearly evaluated through mammographic imaging.

Spiculated lesions, such as postoperative scars, fat necrosis, and radial scars, can also be seen in benign cases other than breast cancer. In spiculated lesions seen in breast cancer, appearance of the mass in the middle section is clearer and the spiculations are shorter. The scars in our patients with previous breast reduction surgery were not sufficient on their own to eliminate malignancy mammographically in group 2 and additional analyses and sometimes biopsy were required. In this regard, malignancy was eliminated for 2 patients in group 2 through biopsy because spicules and calcifications could not be fully evaluated. No suspicious lesions that would necessitate biopsy were seen in group 1.

Several studies have stressed that breast cancer is rare in patients with previous reduction mammoplasty (13, 14). The reason for this has been stated to be linked to the removal of the glandular tissue of the breast. We believe that the risk of breast cancer for patients in group 1 will be lower in their future follow-ups. The reason for this is related to the fact that the amount of glandular tissue that may cause cancer is far more reduced. We also follow the occurrence of breast cancer in these patients.

Reduction mammoplasty is a surgical procedure that is being performed increasingly today. Mammography used in the screening of these patients defines the changes in these patients very well (15). Some studies, however, argue that the changes brought about following surgical procedures such as breast reduction surgery may lead to misevaluation of postoperative mammography (16). This problem is stated to be dependent on the changes in the glandular tissue of the breast, higher location of the nipple, changes in skin thickness in the periareolar area, and the formed scar tissue. The changes in the parenchyma formed by surgery are seen beneath the breast and in the periareolar area. In our study, the postoperative changes were not confused with malignancy in the patients in group 1. Breast lesions that could not be differentiated through mammography were seen in group 2 at a rate of 20%. In spite of this, mammography performed for breast cancer screening despite surgery is still a valuable cancer screening method. Its value increases particularly in patients with previous breast reduction surgery targeting predominantly the glandular tissue.

CONCLUSION

Certain changes are brought about in the breast tissue of patients with previous breast reduction surgery. Although the BI-RADS evaluation following breast reduction surgery targeting the glandular tissue shows normal results, reductions target-

ing predominantly the fat tissue necessitate additional investigation because of the higher number of false-positive results compared with the number of normal results. We believe that breast reduction surgery targeting predominantly the glandular tissue in patients older than 40 years of age increases mammographic sensitivity.

Ethics Committee Approval: Ethics committee approval was received for this study from the ethics committee of Necmettin Erbakan University Meram Faculty of Medicine.

Informed Consent: Informed patient consent form including their treatment protocol was taken from all patients included in this study.

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