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Evaluation of Functional Outcome of Oncoplastic Breast Surgery for Malignant Tumor in The Upper Half of The Breast

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ABSTRACT

Background: Numerous plastic surgical treatments including volume displacement or replacement techniques vary depending on the tumor position, presence of ptosis, tumor to breast ratio, and surgeon skill

Objectives: This study aimed to compare the viability, cosmoses, postoperative complications, and musculoskeletal functional result of volume displacement procedures and the Latissimus dorsi (LD) flap.

Patients and methods: 64 patients were divided into two groups and underwent conservative breast surgery and reconstruction using either volume displacement procedures or LD flap. Follow-up for 1 year was planned. The mean age in group A was 38.12 ± 4.16 years whereas it was 39.42 ± 5.46 years in group B. The mean operative time was 174.7 ± 13.55 and 139.7 ± 9.64 minutes in group A and group B respectively (P = 0.001*). There was no significant difference between the 2 groups regarding postoperative complications. In groups A and B demonstrated satisfactory results, with 90.6% of the LD flap and 93.8% of them exhibiting "excellent" and "good" outcomes respectively. When compared at 3 and 6 months intervals in group A, patients had shoulder function disability using SPADI and significant improvement with time (P < 0.001). While, group B showed no signs of shoulder dysfunction.

Conclusion: Volume displacement procedures are dependable, more practical, and associated with less postoperative problems than LD flaps. Compared to the LD flap, those procedures offer a much superior cosmetic and, ultimately, functional outcome.

Keywords: Cancer breast, Oncoplastic breast surgery, LD flap.

INTRODUCTION

Conservative surgery and radiation therapy have been used to treat early-stage breast cancer in many studies [(1)]. This method has evolved to achieve oncological safety and satisfactory aesthetic results [(2)]. It is crucial for breast surgeons identify eligible Candidates for breast reconstruction [(3)]. Excision of more than 20% of the breast volume causes a worse cosmetic outcome [(4)].

The idea of combining tumor excision with a safety margin with breast reconstruction gave rise to oncoplastic breast surgery. In order to improve psychological outcomes, [(5)]. In addition to building a mound on the chest wall, the goal of breast reconstruction with various oncoplastic procedures is to achieve symmetry with the native breast [(3)].

Numerous plastic surgical treatments, such as volume displacement or replacement techniques, vary depending on the tumor position, presence of ptosis, tumor to breast ratio, and surgeon skill. These techniques range from local dermo-glandular flaps to reduction mammoplasty and mastopexy. It can be necessary to replace the volume of tiny to medium-sized breasts. The standard procedure for volume replacement in partial breast defect reconstruction was the latissimus dorsi myo-cutaneous flaps (LDMF). But, there is a chance of problems and morbidity [(6, 7)].

Wider excisions of the upper central regions that are a few millimeters from the nipple but do not involve the nipple are performed using Batwing Resection. When the areola is smaller and the tumor is more widespread, breast surgeons typically choose to utilize this procedure, also known as hemibatwing excision, as opposed to crescent mastopexy. Location and indication of hemibatwing resection include wide excision of superior outer periareolar lesions comparable to those at 9–10 (on the right) or 2–3 (on the left) o'clock is the ideal condition for this technique. Due to the potential for noticeable scarring, this approach is not recommended for medial lesions [(6, 8)].

Donut Resection Mastopexy (Round Block Method) is used in treating cancers in the upper and lateral quadrants, surgeons choose this method. For lengthy and narrow segment resections of the breast, it is a useful approach. Its drawback is that when full-thickness skin excision is done, the areolar complex and the nipple-areolar region will be denerved [(6,9)].

However, after using an LD flap, functional impairment has been noted. Numerous studies [(10, 11)] have reported this phenomenon, which manifests as shoulder disability that may impede routine daily tasks. The current study compared the viability, postoperative complications, and musculoskeletal functional result of volume displacement procedures and the LD flap.

PATIENTS & METHODS

Study design: From August 2018 to January 2024, the study was carried out at the University Hospitals' Surgery Departments at Benha Faculty of Medicine and included 64 female patients.

Inclusion criteria: Female patients with upper-breast cancer (T1, T2) who were eligible and motivated for conservative breast therapy and volume replacement or displacement breast reconstruction.

Exclusion criteria: Patients who had inflammatory breast cancer, metastatic disease, locally progressed illness and patients who were contraindicated for

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radiation therapy, or had collagen disorders like scleroderma.

Bilateral mammography, tissue biopsy, comprehensive general and local evaluation, and a thorough history collection were all part of the preoperative evaluation. Additionally, a comprehensive preoperative laboratory and metastasis workup were conducted. Computer-generated random allocation software was used to randomly assign the included patients into two equal study groups, A and B. Conservative breast surgery was performed for patients in both groups. Patients in group A had immediate reconstruction using LD flap, while patients in group B underwent volume displacement procedures.

Preoperative flap design for group A (LD flap) was carried out while the patient was seated by marking a transverse elliptical skin paddle (Figure 1). The skin ellipse's size was modified to allow for primary donor site closure and to correspond with the expected breast defect following conservative breast surgery. The thoracodorsal fascia was deeply dissected until the LD muscle was separated from the paraspinous, trapezius, and serratus anterior muscles. Once the thoracodorsal artery was identified, the LD muscle was detached from the humorous. To transfer the flap into the breast deformity, a subcutaneous tunnel was made. Lastly, direct suturing was used to close the donor site.

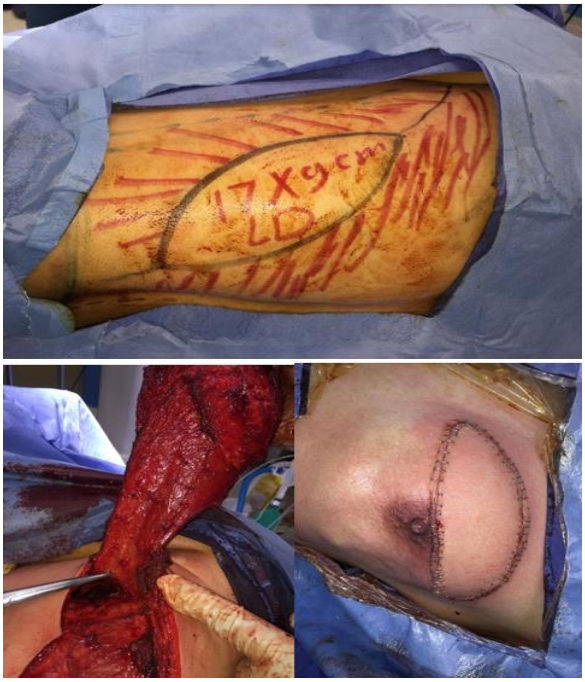

Figure 1: LD Flap.

Group B oncoplastic volume displacement was used including batwing, hemi-batwing, and round block techniques.

Batwing method (Figure 2):
The incision is made after drawing the wings and arches parallel to the areola to create triangular sections on both borders in addition to the two rings found in the crescent incision. The tumor is then included in a full-thickness fibroglandular excision that is prolonged to the chest wall. It is imperative to refrain from suturing the chest wall. Nevertheless, absorbable sutures are used to close the liberated deep tissues on both sides. Similar to a lumpectomy, the superficial tissues are closed. The technique's primary issue is the asymmetry and unilateral nipple elevation. To avoid this issue, the non-cancer breast may undergo the corrective treatments [6, 8].

Hemi-batwing method:
Only one side was excisioned in a triangular fashion. The hemibatwing resection and the batwing resection differ in this way [6, 8].

Donut resection mastopexy (Round block method) (Figure 3):

The ring-shaped skin in between is removed in full or partial thickness after a second circular incision is made in the entrance and surrounding area of the areola. Therefore, subcutaneous release allows access to almost all parts of the breast. Following the necessary resection, the breast parts are closed with a 2-0 absorbable suture. The outside skin incision is closed using subcutaneous purse-string continuous sutures, and the two-incision sections are sutured to create a new areolar boundary [6, 9].

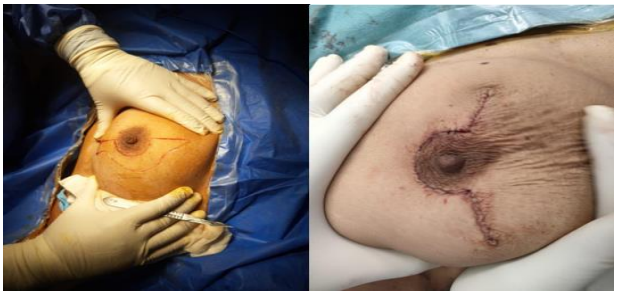

Figure 2: Batwing Technique.

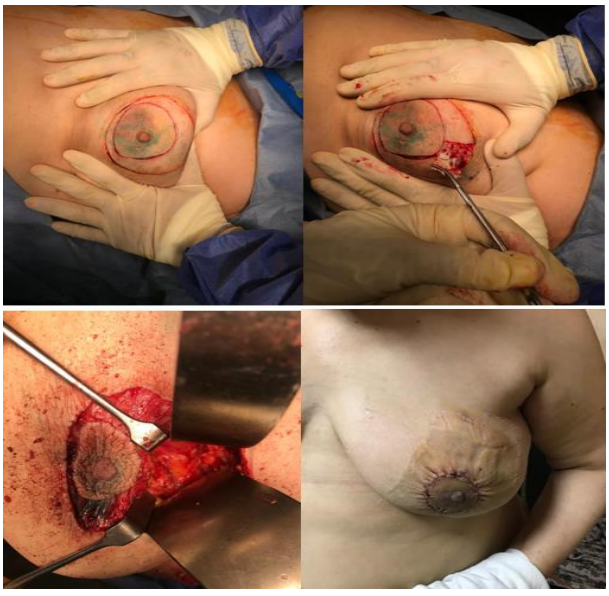

Figure 3: Round block technique.

Prophylactic antibiotic treatment was part of the immediate postoperative care. Following surgery, the flaps' viability was closely monitored right away, and any partial or complete flap loss was documented. All of our patients received postoperative adjuvant therapy, and in order to get the best results, the delivery window was decided to begin between 4 and 6 weeks after surgery. At least a year was spent monitoring shoulder range of motion, patient satisfaction, and early postoperative problems. A patient questionnaire on the symmetry of both breasts, the shape of the scar, the keloid, and lastly the nipple areola complex was used to assess the cosmetic result and patient satisfaction. A 5-point rating system was used to do this (1 being bad, 2 being poor, 3 being fair, 4 being good, and 5 being excellent).

The Shoulder Pain and Disability Index (SPADI) was used to assess the shoulder's functional outcome [12]. Eight questions were used in the assessment to gauge a person's level of difficulty with different daily tasks involving the use of the upper extremities. Patients were instructed to mark each question on a 10-cm visual analogue scale in order to respond to the questions. "No pain at all" and "worst pain imaginable" are verbal anchors for the pain dimension, while "no difficulty" and "so difficult it required help" are verbal anchors for the functional tasks. A total score is calculated by averaging the scores from the two dimensions.

The patient score divided by 80 x 100 is the %, which is the total disability score. Specific cutoff points to categorize the results into limited, medium, high, and extreme handicap are not included in the original SPADI. It is believed that the more severely shoulder function is impaired, the higher the score on each scale. The functional disability score has a low detectable change of 13% at a 90% confidence interval. Three months after surgery, as well as six and twelve months later, this functional result was conducted. There was a comparison between the two groups.

Ethical approval: This study was ethically approved by the Institutional Review Board of the Faculty of Medicine, Benha University. Written informed consents were obtained from all participants. This study was executed according to the code of ethics of the World Medical Association (Declaration of Helsinki) for studies on humans.

Statistical analysis

The Student's t test was used for statistical analysis of quantitative data that were described by mean, SD, and range (minimum and maximum). For qualitative data that were expressed as frequency with percentage, the Chi square test was employed. Version 21 of the Statistical Package for Social Sciences (SPSS-20) was employed. Significant probability values were defined as ≤ 0.05.

RESULTS

The mean age in group A was 38.12 ± 4.16 years whereas it was 39.42 ± 5.46 years in group B. No significant difference between the 2 groups as regards demographic data, comorbidities or tumor characteristics was reported (Table 1).

Table (1): Sociodemographic data and tumor characteristics

Variable	Group A n=32 LD flap	Group B n=32 Volume displacement	P value
Age Mean ± SD	38.12 ± 4.16	39.42 ± 5.46	0.19
BMI Mean ± SD	30.12 ± .2.45	29.19 ± 3.9	0.087
Comorbidities			
DM N (%)	2 (6.25%)	3 (9.4%)	0.067
HTN N (%)	2 (6.25%)	2 (6.25%)	1.00
IHD, N (%)	1 (3.12%)	1 (3.12%)	1.00
Tumor characteristics			
T1 N (%) **T2 N (%)**	6 (18.8 %) 26 (81.2 %)	5 (15.63%) 27 (84.37%)	0.18 0.14
Side N (%) **Right breast** **Left breast**	 12 (37.5%) 20 (62.5%)	 13 (40.6 %) 19 (59.4%)	 0.12 0.16
Safety margin (mm) Mean± SD	12.34 ± 3.4	13.1 ± 2.66	0.092

The mean operative time was 174.7 ± 13.55 and 139.7 ± 9.64 minutes in group A and group B respectively (P = 0.001*). The length of stay in the hospital following surgery was measured from the day of the procedure until the day of discharge. Group A's duration was 7.2 ± 1.22 days, while group B's was 2.81 ± 0.86 days (P = 0.01*) (Table 2).

Table (2): Operative data and postoperative complications

Variable	Group A n=32 LD flap	Group B n=32 Volume displacement	P value
Operative time Mean ± SD (Minutes)	174.7 ± 13.55	139.7 ± 9.64	0.01*
Hospital stay Mean ± SD (Days)	7.2± 1.22	2.81± 0.86	0.001*
Post operative complications			
hematoma	1 (3.12%)	1 (3.12%)	1.00
seroma	4 (12.5%)	3 (9.4%)	0.067
Wound infection	2(6.25%)	2(6.25%)	1.00
Wound dehiscence	2(6.25%)	1 (3.12%)	0.054
Partial Flap loss	1 (3.12%)	0 (0%)	0.046*

As reported in table (3), there was no significant difference between the two groups in terms of patient satisfaction with the cosmetic result. Patients in groups A and B demonstrated satisfactory results, with 90.6% of the LD flap and 93.8% of them exhibiting "excellent" and "good" outcomes, respectively.

Table (3): Assessment of aesthetic outcomes

Variable		Group A n=32 LD flap	Group B n=32 Volume displacement	P-value
Excellent	N (%)	25(78.13%)	27 (84.37%)	0.09
Good	N (%)	4 (12.5%)	3 (9.4%)	0.067
Fair	N (%)	3 (9.4%)	2(6.25%)	0.053
Poor	N (%)	0(0%)	0(0%)	1.00
Bad	N (%)	0(0%)	0(0%)	1.00

When compared at 3 and 6-months intervals in group A, patients had shoulder function disability using SPADI and significant improvement with time (P < 0.001). While, group B showed no signs of shoulder dysfunction (Table 4).

Table (4): Shoulder dysfunctions at 3 & 6 months compared to initial reports postoperatively according to SPADI

Shoulder Functional Disability		Immediate post-operative	After 3 months	After 6 months	P value
Group A n=32 LD flap	**Range**	2-8	0-4	0	
	Mean±SD	6.33±1.33	2.67±0.92	0	< 0.001*
Group B n=32 Volume displacement	**Range**	0	0	0	1.00
	Mean±SD				
P value		< 0.001*	< 0.001*	< 0.001*	

DISCUSSION

An alternative to mastectomy and traditional CBS for the treatment of BC is oncoplastic breast surgery [(3)]. Complete removal of the tumor with -ve resection margins is the ideal oncological result of conservative breast surgery because involved margins are strongly linked to local recurrence [(13, 14)]. Wide resection, however, may result in bilateral asymmetry or breast deformity and jeopardize the cosmetic results. A large excision and a satisfactory esthetic result through partial breast rebuilding are two benefits of oncoplastic breast surgery employing volume replacement techniques [(15)].

In the present study, a large safety margin of resection was attained and there were no surgical margins associated with excised tumors in either group because the oncoplastic surgery was planned for every case in the current investigation. After harvesting LD flaps for breast reconstruction, donor site problems including hematoma and seroma development were quite prevalent. It is anticipated that donor site morbidity will be higher for LD muscle harvesting than for flaps that preserve muscle [(16, 17, 18)]. This has been shown by **Sowa *et al.*** [(19)] who found no statistically significant difference in the amount of seroma that occurred at the donor site of muscle-sparing LD flaps compared to typical LD flaps. This is consistent with the current study's findings, which indicated that group A experienced a higher incidence of hematoma and seroma formation than group B, while the difference was not statistically significant.

According to numerous research, some obese patients had a seroma incidence of 40% to 76% after an LD flap [(20)]. However, the incidence of seroma was significantly lower in the current study. This can be

explained by the fact that, in contrast to the broader flaps utilized in those trials for total breast reconstruction, the planned flap needed for partial breast reconstruction is smaller. It makes perfect sense that the extent of the dead area that remains after harvesting the flap would be closely correlated with the incidence of seroma.

The thoracodorsal artery provides a significant circulatory supply, making the LD flap a very dependable flap with few ischemic problems. The risk of flap necrosis is low. Significant flap necrosis typically results from pedicle thrombosis from the flap twisting on its pedicle or vascular pedicle damage sustained during the surgical dissection [(21)]. Some studies, like the one conducted by **Lee *et al.*** [(22)] found no flap necrosis at all among the included instances. A 7% rate of partial flap necrosis was reported by **Hokin and Silfverskiold** [(23)]. In the current study, there was no total flap loss in group A; however, partial flap loss occurred in 3.25%.

Most people believe that primary closure can be used to address abnormalities after breast conserving surgery, however the cosmetic result might be unpredictable and patients are often unhappy [(24)]. Depending on the size of the removed tissue, breast-conserving surgery may result in variable degrees of volume loss; as a result 10 to 30% of patients may not be happy with the cosmetic result [(25)].

In the present study, the symmetry, wound scar, nipple, and areola were used to evaluate the ultimate cosmetic outcome in both groups. None of the patients thought their results were poor, and 90.6% of the LD flap and 93.8% of the volume displacement group had satisfied aesthetic results. These findings are comparable to those of earlier research that used LD flap [(26)]. In their work, **Dejode *et al.*** [(26)] showed that LD muscle transfer had an impact on the range of motion of the ipsilateral shoulder. The precise functional impairment, however, was still up for discussion. After harvesting LD flap for breast reconstruction, **Garusi e*t al*.** [(27)] reported a percentage of recovery by combining the DASH score with an objective assessment of shoulder functions. They showed up to 80% recovery in a year and very little handicap overall, particularly when participating in sports. According to **Blackburn *et al*.** [(29)] breast reconstruction using the LD had a substantial detrimental effect on patients' shoulder function and certain activities of daily living, as well as on their families.

The need to investigate this field and possibly discover a substitute for muscle harvesting stemmed from the notable functional impairment seen in clinical practice. The results of the current study showed that group B's shoulder functional outcome was noticeably superior to that of the LD flap utilizing SPADI. During the follow-up at 3, 6, and 12 months, the study also showed an inter-periodic significant difference within group A, suggesting that both groups' shoulder function impairments had improved. Even with this improvement in each group, group B's function was noticeably better, which can be explained by the fact that no muscle dissection or transportation was performed on this group, which led to no affection of the shoulder functions.

CONCLUSION

According to our research, volume displacement procedures are dependable, more practical, and associated with less postoperative problems than LD flaps. Compared to the LD flap, those procedures offer a much superior cosmetic and, ultimately, functional outcome. We still need an algorithm for selecting the best oncoplastic approach, and there is still a gray region that needs more research.

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