VER
Vascular & Endovascular Review

Evaluation of Pedicled Descending Branch Latissimus Dorsi Mini Flap as an Immediate Reconstructive Technique Post Conservative Breast Surgery Regarding Cosmetic and Oncological Outcomes.

Hossam Abdelrahman Abdelrahman Yassin Elkaialy[1]*, Ashraf Abdelmoghny Mostafa[2], Ahmed Gamal Elden Othman[2], Dina Mohamed Hanafy [2], Mohamed Hamdy Zaid [2]

[1]*Assistant Lecturer of General Surgery, Faculty of Medicine, Ain Shams University
[2]Academic Position: Professor of General Surgery, Department: Faculty of Medicine, Ain Shams University

***Corresponding author:**
Hossam Abdelrahman Abdelrahman Yassin Elkaialy

ABSTRACT

Background: Oncoplastic surgery combines tissue displacement or volume replacement to improve aesthetics after partial mastectomy. It is now favored over mastectomy, especially for large volume defects, when followed by radiation. This study aimed to evaluate the use of the latissimus dorsi muscle mini-flap (LDMF) as a volume replacement technique for large breast defects following wide local removal in various quadrants of the breast and to assess its effectiveness in terms of aesthetic results, procedure-related complications, case satisfaction, and oncologic safety, including the flap's ability to tolerate postoperative radiotherapy.

Patients and methods: This is a prospective cohort study including 25 cases who were admitted at Ain Shams University Hospitals within one year, from April 2023 until March 2024. It was conducted on patients undergoing breast-conservative surgery. Patients with early breast cancer were enrolled and assigned either to neoadjuvant chemotherapy or to upfront surgery and immediate oncoplastic reconstruction according to the MDT evaluation of the cases. This is followed by close monitoring to outcomes in follow up visits. The EORTC-QLQ C30 and EORTC-QLO BR23 questionnaires and the Japanese Breast Cancer Society (JBCS) Cosmetic Evaluation Scale were the methods used to assess the quality of life and the cosmetic outcome, respectively. Range of motion (ROMs) of bilateral shoulders was assessed by disabilities of the arm, shoulder and hand (DASH) questionnaire. Moreover, Vas (visual assessment score) and sensory preservation questionnaire were given for all participants. Three surgeon assessment questionnaire was given to doctors who were not involved in the surgery. Thereafter, data including operative time, early postoperative complications and aesthetic evaluation scores were collected and analyzed using appropriate computer based statistical methods.

Results: Of the 25 candidates, sixteen patients (64%) had N1 disease, seventeen (68%) were estrogen receptor–positive, six (24%) were HERII-positive and two (10%) were triple negative. Sixteen patients (32%) received neoadjuvant chemotherapy, of which five (62.5%) had good pathological response, ten (62.5%) had poor response and one (0.06%) had no response. Eventually, Nine (56.25%) patient had upfront surgery, WLE (wide local excision) with SLN (sentinal lymph node) and immediate reconstruction, as their tumor was T1N0M0 with a pathology molecular subtype luminal A or their tumor size in relation to breast cup size was large. Of the sixteen patients who took neoadjuvant chemotherapy five had underwent targeted axillary therapy with SLN successful in three (60%) and conversion to ALND (axillary lymph node dissection) in two (40%). The other eleven patients (68%) underwent WLE and ALND with WBRT (whole breast radiation). On the postoperative follow up visits, it was seen that the body image perception and nausea/vomiting score were significantly satisfying postoperatively whereas physical function score was not satisfying among the patients having shoulder pain and stiffness. Of the 25 patients, three (12%) had difficulty to resume to their daily activities and pain in shoulder. This was recorded during the 1-month follow-up; however, in the 3-month later visit none complained any difficulty in returning to their work (p=0.074). The mean operative time was 177 minutes, including the time needed for WLE and frozen section analysis. No significant relation between operative time in minutes and shoulder stiffness after angle of 150 degrees. Negative correlation between operative time and sensory preservation score (p=0.045). The median sensory preservation score was 8.00, with a range from 7.00 to 9.00; the median VAS score was 8.00, with a range from 8.00 to 9.00; and the median three-surgeon assessment score was 9.00, with a range from 8.00 to 9.00. Three patients (12%) had a complain of shoulder pain at side of operation. Of the 25 participants, five (20%) had wound infection and other 5 (20%) had seroma. Later on, wound infection was treated by antibiotics and daily dressing. Consequently, it wasn't recorded in the 1-month follow up visit, which was statistically significant (P=0.018). Minor bleeding was recorded postoperatively in one (0.04%) patient. Adjuvant radiotherapy showed no affection to flap viability.

Conclusion: The LDMF as a volume replacement procedure post BCS (brest conservative surgery) offers an effective and safe oncoplastic option for early breast cancer patients particularly those with lateral breast tissue masses, post chemotherapy, weather was with good response or poor one, and patients with large defects left behind after removal of masses with size range of two to five centimeters in small to average sized breasts. Our study revealed manageable minimal postoperative complications, good

patient satisfaction scores and agreeable cosmetic outcomes throughout the follow-up visits. Longer operative time affected patient's sensory recovery but improved surgeon ratings. Larger studies are needed to validate results and reduce complications..

KEYWORDS: Breast Surgery, Oncoplastic, LDMF, Partial lateral mastectomy

How to Cite: Hossam Abdelrahman Abdelrahman Yassin Elkaialy, Ashraf Abdelmoghny Mostafa, Ahmed Gamal Elden Othman, Dina Mohamed Hanafy , Mohamed Hamdy Zaid (2024) Evaluation of Pedicled Descending Branch Latissimus Dorsi Mini Flap as an Immediate Reconstructive Technique Post Conservative Breast Surgery Regarding Cosmetic and Oncological Outcomes.., Vascular and Endovascular Review, Vol.7, No.2, 229-244

INTRODUCTION

Breast cancer is the most common malignancy in women worldwide with a rate of 2.26 million new cases and more than 684 thousand deaths in 2022 [1].

In Egypt, breast cancer is the most common malignancy in women. The incidence of recently diagnosed cases reached more than 22 thousand cases in 2020 [2].

Breast cancer has multiple subtypes based on genetics. The classification of these subtypes has evolved over the years. From the immunohistochemical perspective, breast cancer is described according to the expression of the following hormone receptors: estrogen (ER), progesterone (PR) and human epidermal growth factor (HER2). Therefore, the following four subtypes of breast cancer are widely recognized: luminal A, luminal B, HER2-positive, and triple-negative. The current clinical model for classification of breast cancer may be benefit from the addition of several molecular markers such as miRNAs (let-7, miR-155, miR-150, miR-153) and mutations (p53, BRCA 1 and 2 genes) (3).

Oncoplastic surgery is a type of breast preservation that utilizes displacement of tissue or replacement of volume methods to enhance aesthetic outcomes after partial mastectomy **[4].**

Breast-conserving surgery processes are classified as level one and level two procedure forms. Surgeons consider level one processes when removing below twenty percent of breast tissue in small to moderate-sized breasts. These processes include aesthetically applied incisions either at the inframammary crease, peri areolar margin, or axilla **[4].**

Level 2 procedures involve the elimination of twenty percent to fifty percent of breast tissue in moderate- to large-sized breasts with moderate to severe ptosis. These involve progress of the pedicle with a vertical or a wise skin incision pattern **[4].**

Immediate plastic remodeling is shown for cases with an unfavorable tumor-to-breast ratio or an unfavorable cancer site (medial, central, or inferior quadrants) and for cases that need re-excision for included margins**[5].**

The latissimus dorsi (LD) flap is an important reconstruction option because of it's adaptability and stability as an autologous flap **[6].**

In the 1980s, latissimus dorsi myocutaneous flaps became the favored autogenous reconstruction technique for reconstruction of the breast following mastectomies, and it began to be utilized also after partial mastectomies following the 1990s **[7].**

The disadvantage of the latissimus dorsi flap is associated with the formation of a further donor location with scarring and possible morbidity **[8].**

The disadvantages of autologous latissimus dorsi flaps are seroma and enlarged scars that happen at the donor location, resulting from elevated tension on the healing dermis as well as poor healing of wounds that happen at the donor location due to excessive soft tissue collection **[9]**.

The principle of the latissimus dorsi mini-flap is to utilize part of the latissimus dorsi muscle as a replacement of volume for large breast defects up to twenty to thirty percent of the breast volume. The latissimus dorsi mini-flap is collected depending on the thoracodorsal bundle **[10].**

The aim of this study was to assess the latissimus dorsi muscle flap as a replacement of volume for large breast defects following wide local removal in various quadrants of the breast and it's advantages concerning the aesthetic results, procedure-related complications, case satisfaction, and oncologic outcome as postoperative flap exposure to radiotherapy.

PATIENTS AND METHODS

This was a prospective cohort study conducted at Ain Shams University Hospitals, during April 2023 until March 2024. Twenty-five female patients with pathologically proven breast cancer of a maximum size of five cm tumor mass and minimum two cm were recruited for this study to undergo breast-conservative surgery.

Inclusion criteria:

-Women aged from their 20 to 60 years who underwent wide local excision of lateral breast masses (multifocal, T2 mass or a

mass in small breast) as part of breast-conserving surgery.

- Defects following resection involving twenty percent to thirty percent of the volume of the breast (approximately one quadrant).

- Eligible cases involved wide local removal in any quadrant of small- to moderate-sized breasts.

- Patients included had either negative axilla and were candidates for sentinel lymph node excision or positive axilla and were suitable for upfront surgery or neoadjuvant chemotherapy with clip placement and were suitable for targeted axillary dissection.

Exclusion criteria:

- Patients over 60 years or those unfit for prolonged surgeries

- Pregnant women or those planning to breastfeed within the next two years

- Females with pendulous breasts.

- Patients with prior skin incisions on the same breast

- Breast masses involving less than 20% or more than 30% of breast volume, multicentric disease

- Patients unable to tolerate postoperative radiotherapy.

Method

History and examination

History was taken for each patient. Comorbidity, surgical, family history of similar condition, contraceptive and hormonal therapy were reported.

This was followed by a thorough physical examination, starting with a general assessment to exclude systemic illnesses, including measurement of vital signs and checking for signs such as pallor, cyanosis, jaundice, or lymphadenopathy. The local breast examination involved detailed inspection and palpation. Visual inspection was conducted in multiple positions to assess breast symmetry, skin changes, nipple abnormalities, and any dimpling or fixation. Palpation was performed in a systematic manner, noting any masses, their size, shape, mobility, and tenderness, along with assessment of nipple discharge. The axillary and supraclavicular areas were also palpated for lymph node involvement.

Radiology and labs

Included a full panel of preoperative labs: CBC, ESR, CRP, liver and renal function examinations, and a coagulation profile (PT, PTT, INR).

Radiological evaluation included

Sonomamography on both breasts and axillary lymph nodes or MRI if high-risk patient or dense breast.

Axillary lymph nodes were clipped by metallic clip before neoadjuvant chemotherapy

Core biopsy of the breast lesion and axillary lymph node was performed followed by immunohistochemistry to determine tumor histology, grade, and biological indicators, including estrogen receptor, progesterone receptor, Her2/neu, and Ki-67.

Silver in-situ hybridization in case Her-2neu immunohistochemistry was equivocal.

Neoadjuvant chemotherapy

Molecular classification of breast cancer includes four subtypes, luminal A, luminal B, triple negative, and Her2neu positive breast cancer.

- ***Luminal A*** patients have good response to cyclophosphamide, methotrexate, and 5-fluorouracil for six cycles.

-***Luminal B*** patients receive 5-fluorouracil, epirubicin, and cyclophosphamide for six to eight cycles.

-***Triple negative*** patients are provided with anthracyclinebased chemotherapy such as AC (doxorubicin/ cyclophosphamide) followed by docetaxel or paclitaxel.

-***Her2neu positive*** patients were managed by trastuzumab, doxorubicin, and cyclophosphamide (AC) followed by taxane-based chemotherapy such as paclitaxel or docetaxel.

Chemotherapy protocol was decided by oncologist who put in consideration aspects related to the patient's general condition when choosing their suitable regimen. Patients who had node positive or who had tumor size of five cm received the noeadjuvant chemotherapy.

High-resolution sonomamography or MRI were done on both breasts and axilla assessing the response to neoadjuvant chemotherapy.

Surgical intervention

The incision was planned according to the exact site of the mass and its proximity to the nipple and areola complex which was spared weather circumareolar or S-shaped incision. Marking of the incision site was done before induction of anesthesia as shown in **Fig. (1, A).** Wide local excision was performed according to oncological principles, ensuring adequate margins confirmed intraoperatively by frozen section analysis. Axillary staging has been performed via sentinel lymph node biopsy or axillary dissection as shown in **Fig. (1, B),** based on clinical and imaging findings.

After confirming negative margins, the patient was repositioned in lateral position with the arm extended, and a mini latissimus dorsi (LD) flap was harvested for reconstruction **Fig. (1, C).** As this technique is called scar less LD, flap harvesting of the muscle was done from the same skin incision. Mobilization of the LD muscle was done by tracking the posterior axillary fold to the lumbosacral fascia. Next step was retracting the muscle posteriorly to expose the space between the LD muscle and serratus anterior where the thoracodorsal bundle was located. The length of the flap is measured by adding few more centimeters to the length of a line drawn from the apex of the axilla to the lower end of the defect to be able to fold it to fill the defect sufficiently. Further mobilization of the pedicle was obtained by ligation of the branches arising from the bundle along with possible division of the circumflex scapular branch too. Moreover, perforators from the intercostal arteries are divided to gain more length of the pedicle. The flap was mobilized and transferred anteriorly without tendon division, then molded to fit the resection cavity and fixed in place with absorbable sutures **Fig. (1, D).**

The perforator of the flap is identified and secured as shown in **Fig.(1,E)** to make sure it was not twisted during the process of trans positioning the flap through the created tunnel to be fixed by absorbable sutures within the defect avoiding tension. Drains were inserted, and layered wound closure was completed before final dressings were applied **Fig. (1, F).**

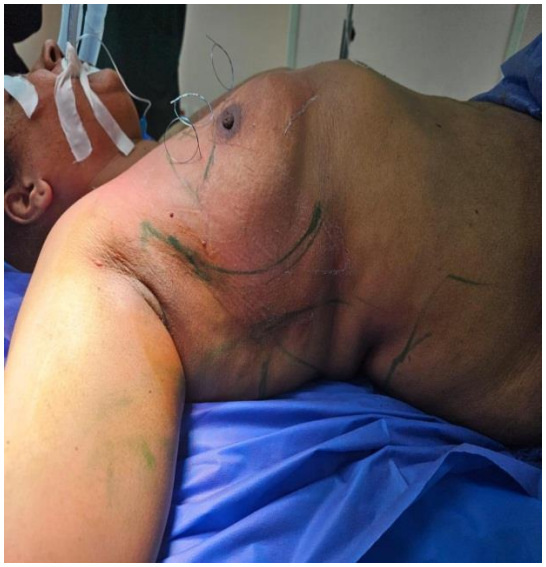
Postoperative follow-up

Follow-up was conducted weekly for two months, then monthly up to three months after radiotherapy. At each visit, anterior and lateral photos were taken, and patients were assessed for complications such as seroma, infection, or flap necrosis.

Sensory preservation was evaluated using patient-completed questionnaires, and pain levels were recorded using the Visual Analogue Scale (VAS). Patient satisfaction with the procedure was also assessed through a structured survey evaluating scar appearance, breast contour and symmetry, back symmetry, and overall satisfaction, using a 5-point scale. A panel of three surgeons conducted the surgeon evaluation by reviewing postoperative photographs using a standardized scoring system. The quality of life was assessed by using the EORTC QLQ C30 and BR23 questionnaires.

DASH score was the method used to assess shoulder stiffness.

Patients were asked to answer simplified questionnaire to evaluate their level of satisfaction with the cosmetic result 3 months after the completion of the radiotherapy. The following was the questionnaire we used. Please, could you rate your satisfaction regarding the final shape of your breast after the operation? 1 means complete dissatisfaction and 10 means complete satisfaction. Sensory preservation was assessed after the completion of the radiotherapy by giving the patient a simple questionnaire and the participant were asked to give a score in a scale from (110). The following was the questionnaire we used. Please, could you rate the preservation of the sensation in your breast skin after the operation from 1 to 10? 1 means complete loss of sensation and 10 mean the sensation before the operation. Final cosmetic outcome were assessed by three independent surgeons and the mean will be calculated. The following was the questionnaire we used. Please, could you rate the shape of the following reconstructed breast from 1 to 10? 1 means the worst cosmetic outcome and 10 means the best possible cosmetic outcome.



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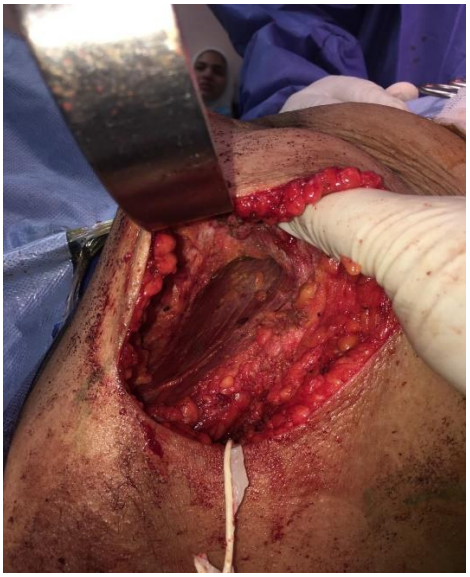

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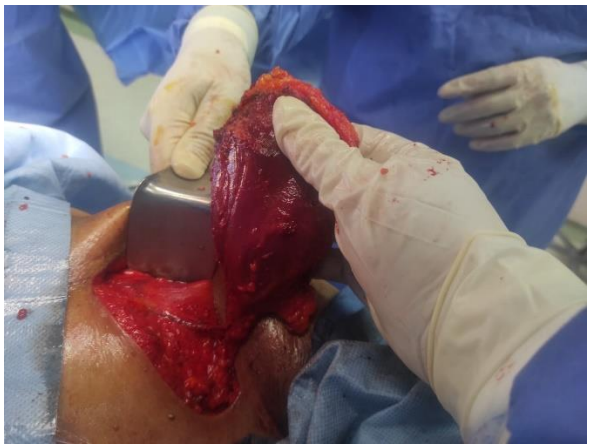

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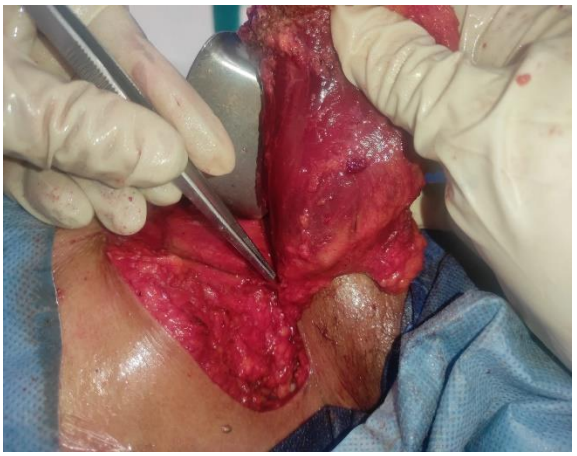

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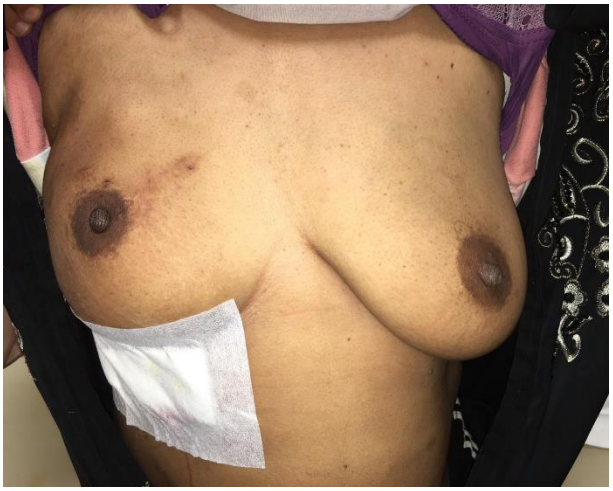

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Figure (1) :(A): Preoperative marking**. (B):** After the excision of the mass and lymph nodes. **(C):** The latissimus dorsi mini-flap. **(D):** The perforator after lymph node dissection. **(E):** Identification of the flap pedicle. **(F):** Immediate postoperative result.

Ethical Consideration

According to approved standards of the ethical committee of the scientific research faculty of medicine at Ain Shams University. The collected information has been utilized for the purposes of the study only.

Statistical Analysis

Statistical analysis has been carried out using Microsoft Excel (version 7) and SPSS for Windows (SPSS Inc., Chicago, IL, USA). Descriptive statistics involved mean, standard deviation, and range for parametric information; median and interquartile range for non-parametric information; and frequency and percentage for categorical parameters.

Spearman correlation coefficient (r) was used to delineate the correlations between the results. The significant correlations will be mentioned first. There was a significant negative correlation between postoperative pain in (in weeks) and VAS scores with a p-value of 0.014 and r of -0.617. In other words, the as post-operative pain increases less overall satisfaction was obtained from the patients. Thus, post-operative pain management is an important factor that affects patient satisfaction.

RESULTS

This prospective cohort study involved 25 female patients with an average age of 44.32± 5.97 diagnosed with early breast cancer of average mass diameter 4.5±0.86cm and axillary lymph node involvement with an average diameter of 1.59±0.39cm. Five of the patients who received neoadjuvant chemotherapy had good response with an average tumor size post neoadjuvant chemotherapy of 3.88± 1.00

The study demonstrates that mean age of the studied group was 44.32 years (± 5.97 SD). Regarding parity, the majority of participants had between two and three children, with 40% had P2 and 36% P3. Only a small proportion had one child (12%) or four children (12%). None of the participants had a past history of breast cancer. Family history of breast cancer was reported in 12% of the group. Most participants were premenopausal (88%), while 12% were postmenopausal. Contraceptive use was reported by 28% of the participants, with 72% did not use contraception. Table 1 shows the clinical findings among the patients participating in the study.

Fifteen out of the twenty-five patients had single lesion in upper outer quadrant. Multifocal tumors in the UOQ were identified in (12%). The central and lower outer quadrants were each affected in (8%). Clinically and radiologically positive ipsilateral axillary lymph nodes were found in (72%). Radiologic-only detection of lymph node occurred in (12%). No fixed ipsilateral lymph nodes were observed in any patient (0%). Contralateral axillary lymph nodes were negative in all patients (100%). The upper lateral quadrant was involved in the majority (68%). The lower lateral quadrant was affected in (32%). Table 2 shows the results of the data collected describing tumor character among participants. Most patients had cup C breast size (48%), followed by Cup B in (40%), Cup D in (12%). Grade 2 ptosis was the most common (48%). Grade 1 was present in (40%), and Grade 3 in (12%).

Table (1): Distribution of patient characteristics and medical history in the studied group.

		Studied group N=25
Age mean± SD		44.32± 5.97
Parity	P1	3 (12%)
	P2	10 (40%)
	P3	9 (36%)
	P4	3 (12%)
Past history of breast cancer	Yes	0 (0%)
	No	25 (100%)
Family history of breast cancer	Yes	3 (12%)
	No	22 (88%)

Menopause	Yes	3 (12%)
	No	22 (88%)
Diabetic	No	22 (88%)
	Yes	3 (12%)
Hypertensive	No	18 (72%)
	Yes	7 (28%)
Cardiac	No	25 (100%)
	Yes	0 (0%)
Contraception	Yes	7 (28%)
	No	18 (72%)

SD: Stander deviation.

Table (2): Distribution of Examination characteristics in the studied group.

		Studied group N=25
Site of the tumor	Single lesion upper outer quadrant	15 (60%)
	Multifocal in UOQ	3 (12%)
	Upper inner Q	3 (12%)
	Central Q	2 (8%)
	Lower outer Q	2 (8%)
Positive ipsilateral LN clinically and radiologically	Yes	16 (64%)
	No	9 (36%)
Radiologic only detected LN	Yes	3 (12%)
	No	22 (88%)
Affected LN clinically or radiologically	Yes	22 (88%)
	No	3 (12%)
Fixed ipsilateral LN	Yes	0 (0%)
	No	25 (100%)
Contralateral LN	Negative	25 (100%)
	Positive	0 (0%)
Affected quadrant	Lower lateral	8 (32%)

	Upper lateral	17 (68%)
Size of breast	Cup B	10 (40%)
	Cup C	12 (48%)
	Cup D	3 (12%)
Breast ptosis	G 1	10 (40%)
	G 2	12 (48%)
	G 3	3 (12%)

Moreover, 64% of the participants have axillary lymph node involvement (N1), while 36% with N0 (no lymph node involvement). The most common clinical stage was T2 N1 M0 (52%), followed by T2 N0 M0 (32%) and T3 N0 M0 (12%). Mean tumor size before neoadjuvant chemotherapy was 4.5 cm, with a relatively low standard deviation (0.56). Notably the tumor size decreased to an average of 3.88 cm, with a greater variability (SD = 1.00). 20% of patients had a good response to neoadjuvant chemotherapy, while 80% had a poor response. This was displayed in **Table 3** among with distribution of the pathological types of the tumors. The Miller-Payne grading system showed that 75% of patients were classified as Grade II (moderate response), 18.75% as Grade I (minimal response), and 6.25% as Grade III (marked response). The most common histologic subtype was invasive ductal carcinoma (IDC) in 68%, followed by invasive lobular carcinoma (ILC) in 32%, and mean narrowest margin was 21.32 mm, with a standard deviation of 6.78 mm.

Table (3): Distribution of Pathology data in the studied group.

		Studied group N=25
Axillary stage	N0	9 (36%)
	N1	16 (64%)
	N2	0 (0%)
	N3	0 (0%)
Clinical stage	T3 N1 M0	16 (64%)
	T2 N0 M0	5 (20%)
	T3 N0 M0	4 (16%)
Size before mean± SD		4.5± 0.56
Size after mean± SD		3.88± 1.00
Response to Neoadjuvant chemotherapy	Good response	5 (20%)
	Poor response	11 (80%)
	No response	0 (0%)
Miller payne grade	Grade I	3 (18.75%)
	Grade II	12 (75%)

	Grade III	1 (6.25%)
Pathology	IDC	17 (68%)
	ILC	8 (32%)
Narrowest margin mean± SD		21.32± 6.78

Post-operatively the median of hospital stays was 2 days and ranged from 2.00 to 5.00, the median of operative time was 177 minutes and ranged from 160 to 195 minutes, and the median duration of seroma was 3 weeks ranging from 2.00 to 4.00. 100% of studied patients suffered from seroma, 12% of studied patients suffered from shoulder stiffness after 150 degrees. One (8%) of studied patients suffered from minor bleeding, and also eight percent of examined cases had minor bleeding and postoperative infection. This is shown in **Table 4.** Moreover, during the follow up visits the median sensory preservation score was 8.00, with a range from 7.00 to 9.00; the median VAS score was 8.00, with a range from 8.00 to 9.00; and the median three-surgeon assessment score was 9.00, with a range from 8.00 to 9.00. These findings were recorded and displayed in **Table 5**. It shows also correlations between the operative time and both sensory preservation and VAS scores, indication nonsignificant p values. However, there was significant one in terms of three surgeon assessment score. In other words, the more time spent to perform best flap size that fits the defect, while handling the tissues well, the better cosmetic outcome. Moreover, this was clearly reflected on patients' satisfaction as in **Table 7**.

Table (4): Distribution of operative data in the studied group

	Studied group **N=25**
Hospital stays Median(range)	2 (2-5)
Operative time Median(range)	177 (160-195)
Duration of seroma (weeks) Median(range)	3(2-4)
Complications	
Seroma	5(20%)
Shoulder stiffness after 150	3(12%)
Minor bleeding	1(4%)
Postoperative infection	5(20%)

Table (5): Distribution of postoperative data in the studied group

	Studied group **N=25**

Sensory preservation score Median (Range)	8 (7.00 – 9.00)
VAS score Median (Range)	8 (8.00 – 9.00)
Three surgeon assessment score Median (Range)	9 (8.00 – 9.00)

	Operative time	
	r	**P**
Sensory preservation score	-.404*	0.045
Three surgeon assessment score	0.862	**< 0.001**
VAS score	0.006	0.97

P-value below 0.05 statistically significant

Table (6): Relation between patients' satisfaction and operative time

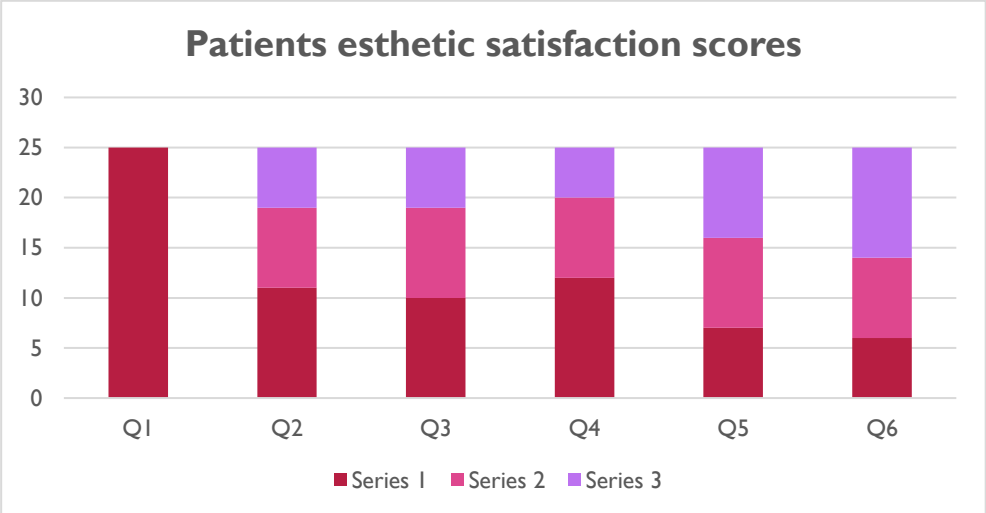
	Operative time	
	P	**r**
Patient satisfaction score	**0.003**	**-o.512**

P-value below 0.05 statistically significant

| Esthetic satisfaction evaluation

At 1 year postoperatively, all six items evaluating "appearance and position of the scar", "contour of the back", "symmetry of the back", "contour of the operated breast", "symmetry of bilateral breasts", and "overall outcome" were rated between "satisfied" and "extremely satisfied" by all patients . The data collected from the distributed questionnaire is displayed in the bar graph **Figure 7**.

Figure (7): Bar graph displaying patients' esthetic response to the reconstructed breast



Percentage of esthetic satisfaction reported by the patient in two groups. Q1, appearance and position of the scar; Q2, contour of the back; Q3, symmetry of the back; Q4, contour of the operated breast; Q5, symmetry of bilateral breasts; Q6 overall outcome. 3, satisfied (blue); 4, very satisfied (orange) ; 5 extremely satisfied (grey).

Subsequently, operation related complications, including shoulder stiffness minor bleeding and wound infection, were monitored postoperatively among patient and a statistically negative correlation to operative time was recognised as in **Table 8.**

Table (8): Relation between minor complications and operative time

		Operative time in minutes			
		Mean ± SD	**Range**	**Test value**	**P value**
Shoulder stiffness after 150	Yes	176.4± 10.8	(160-195)	t = 0.03	0.98
	No	176.5± 10.0	(160-195)		
Minor bleeding	Yes	178.5± 3.5	(176-181)	t = 0.32	0.77
	No	176.3± 10.4	(160-159)		
Postoperative infection	Yes	171.0± 1.4	(170-172)	t = 0.006	0.43
	No	176.9± 10.3	(160-195)		

P-value below 0.05 statistically significant.

All candidate postoperatively had their operated arm range of motions recorded and compared to those of non-operated arm. The ROM showed significant decreases in flexion ($P < .001$; $P < .05$), extension ($P < .001$; $P < .001$), abduction ($P < .001$; $P < .001$), and lateral rotation ($P < .001$; $P < .001$), compared to the nonoperative side. This is displayed in **Table 9.**

Table (9): Comparison between arm ROM of the operated and non-operated sides

Motion	**Mean range**	**P value**
Flexion		
Operated side	160.75 ±10	<0.01
Non-operated side	170.5 ± 8.7	
Extension		
Operated side	50.2 ± 9.1	<0.01
Non-operated side	70.3 ± 6.24	
Abduction		
Operated side	160.34 ± 8.1	<0.01
Non-operated side	170.56 ± 7.4	

Lateral Rotation		
Operated side	60.43 ± 10.51	<0.01
Non-operated side	83.66 ± 9.8	
Medial Rotation		
Operated side	86.56 ± 9.4	0.065
Non-operated side	82.31 ± 11.71	
Adduction		
Operated side	10.22 ± 2.23	0.374
Non-operated side	11.01 ± 2.12	

P-value below 0.05 statistically significant.

DASH score

Qualified questionnaires with 27 or more items filled were obtained from all 25 patients. Low DASH score indicates good physical condition and mild disability or symptoms, which was low with a postoperative mean score 10.57 ± 5.09.

DISCUSSION

Our study in alignment with **Abdelmofeed et al. [11]**, who stated that UOQ involvement in 66.7% and lower lateral quadrant in 33.3%, reported that 60% of tumors were single lesions in the upper outer quadrant (UOQ), with 12% being multifocal in the same region. The central and lower outer quadrants were each affected in 8%, and the lower lateral quadrant in 32%. Moreover, Most patients had cup C breasts (48%), followed by cup B (40%) and cup D (12%). Grade 2 ptosis was most common (48%), followed by Grade 1 (40%) and Grade 3 (12%) which is similar distribution to that of Abdelmofeed et al. [11], who stated that cup C (46%), cup B (40%) and D(12%).

Our study was in line with **Osman et al.,**[12] who indicated that the clinically and radiologically positive ipsilateral axillary lymph nodes were found in (73.3%). Radiologic-only detection of lymph node occurred in (13.3%). No fixed ipsilateral lymph nodes were observed in any patient (0%). Contralateral axillary lymph nodes were negative in all patients (100%). Accordingly, our study revealed that clinically and radiologically positive axillary lymph nodes were found in (72%). Radiologically only detected lymph nodes were in (12%). No fixed or contralateral lymph nodes were included among candidates.

Similar to our results **Zhou et al.,**[13] who reported that the average diameter of tumor was 28.75±7.31mm, the most common tumor site is the Upper-lateral 20(63%), followed by Upper-medial and Lower-lateral 4(13%), 28(87%) had T2 stage and 4(13%) had T1. In addition, in consistent with **Osman et al.,**[12] who observed that the mean tumor size was 5.07 ± 1.86 cm. The most common pathological type present among the recruited patients was the invasive ductal carcinoma, which was present in 10 (66.7%) patients.

Given the esthetic and oncologic outcomes of LDMF technique, this procedure is now considered a safe and satisfying method of replacing large volume defects in small to medium- sized breast patients. Our technique of using the axillary approach pedicled descending branch LD mini-flap came out with evident advantages as a solution in this situation. Therefore, LDMF further expands the role of breast conserving surgery in early breast cancer weather received a neoadjuvant or as an upfront surgical intervention. In our study, the tumor size in patients having their defects repaired by LD mini-flap was significantly large 4.5± 0.56 cm. At the same time, it was clearly noticed that the breast size in 88% of the patients who underwent LD mini-flap reconstruction was relatively small (A-C cup). In accordance with **Zhou et al.,**[13] who assessed the functional and esthetic outcomes of pedicled descending branch latissimus dorsi (LD) mini-flap compared with conventional breast-conserving surgery (BCS), they observed that 81% of patients had breast size (A-C cup), and 19% had (≧D cup). Notably, all patients showed satisfaction towards esthetic outcomes regarding both the donor-site and the reconstructed breast compared to the other non-operated side. The challenge that faces this technique was its ability to

replace volume defects in tumor with central or inner quadrants primary sites. This is attributed to the limited pedicle length; therefore, the LD mini flap is ideally suited for lateral breast defects.

Previous studies mentioned by **Lee KT & Mun GH,** [14] suggested that following LD muscle transfer some degree of shoulder stiffness were recorded; however, the LDMF and TDAP flaps showed low functional morbidity. In alignment with that, our study showed that LD-mini flap presented mild affection of the operated site shoulder function.

This mild effect on shoulder function can be attributed to ALND and post-operative radiation received by all patients as described by **Lihuan Zhou MD et al.** [15]. He compared the DASH scores of both groups LD and implant. It showed minimal shoulder stiffness; however, when compared to the other non-operated shoulder there was affection in both ROM and strength. Proving the role insignificant impact of muscle harvesting on post- operative shoulder stiffness. In our study, 12% of studied patients suffered from shoulder stiffness after 150 degrees.

Regarding the operative time recorded in our study was with a median of 177 minutes, and the median duration of seroma was 3 weeks. 20% of studied patients suffered from seroma that was managed accordingly. This minimal rate of seroma goes with **Lihuan Zhou MD et al.**[15] who stated that pedicled descending branch branch LD mini-flap has a reliable and concise blood supply with an easier and safer flap harvest procedure. Moreover, given a mean operation time of 50.47 ± 15.21 minutes for harvesting the flap with no total or partial flap losses and no separate back incision to access the muscle, the low rate of wound seroma and infection (20%) is considered a high advantage for LD mini-flap operation.

As for bleeding one patient (4%) of examined cases had minor bleeding on the follow up that was explained as side effect to anticoagulant medication received by those patients to manage comorbidities.

Our results were aligned with **Abdelmofeed et al.** [11], who documented that the mean postoperative hospital stay was 2.5 days and there were no donor location complications like bleeding during operation, hematoma following operation, or infection.

In terms of wound complication, further support to our study regarding LDMF as a wound friendly procedure was displayed by **Anuar & Awang**,[16] who observed that in (LDMF) group; 2 patients suffered from seroma, 3 suffered from hematoma and 10 suffered from wound dehiscence. However, in (LICAP) group 2 patients suffered from seroma, 11 suffered from hematoma and 3 suffered from wound dehiscence, with no statically difference.

Our results of assessing patients' satisfaction using the EORTC QLQ C30 and BR23 questionnaires was directly related to shoulder pain post-operatively. This put lights on the fact that when shoulder pain was managed effectively patients satisfaction improved.

In the current study the median VAS score was 8.00 with a range from 8.00 to 9.00, and the median three-surgeon assessment score was 9.00 with a range from 8.00 to 9.00.

In the current study, a statistically insignificant variance has been observed between quadrants of the tumor groups regarding VAS score. A statistically insignificant variance has been observed between minor complications regarding VAS score. This could indicate that the surgery is generally well-tolerated by patients and that minor postoperative issues do not substantially hinder recovery or satisfaction. A statistically insignificant variance has been observed between minor complications concerning the sensory preservation score. Meaning these complications do not seem to affect pain or discomfort levels significantly.

The median sensory preservation score was 8.00 with a range from 7.00 to 9.00, finding showed a statistically significant negative association has been observed among sensory preservation score and surgical period. A significant positive association has been observed among surgical period and surgeon evaluation score.

Gendy et al. [17] determined that latissimus dorsi muscle flap reconstruction has been related to a lesser extent of sensory loss compared to skin-sparing mastectomy with conservation of nipple-areola complex sensation in most cases.

There was a significant negative association among surgeon evaluation score and resection volume. There was no significant association among sensory conservation score and volume of resection (mm). There was statistically no significant correlation between patient satisfaction (VAS) and resection margin.

Raja et al. [18] observed that the usage of the latissimus dorsi muscle flap for reconstruction of the breast decreases the defect caused by breast tissue loss; furthermore, it doesn't seem to atrophy significantly with time.

Concerning the study conducted by **Raflis Ruzairee.** [19] concluded that in a stage II/III breast tumor, a breast-conserving surgery with immediate partial breast reconstruction utilizing a latissimus dorsi muscle flap may be safely conducted with satisfactory aesthetic results in females with a large tumor-to-breast-size ratio.

In addition, **Anuar & Awang**, [16] who observed that in (LDMF) group; 56.6% of patients were deeply satisfied and 43.3% were satisfied. In (LICAP) group; 61.5% of patients were deeply satisfied and 38.5% were satisfied, with no statically difference.

Nowadays lateral intercostal perforator artery flap, LICAP, is taking upper hand as a preferred technique over Latissimus dorsi min-flap among breast surgeons. This can be attributed to certain points including a less time-consuming procedure among with sparing of the LD muscle thus avoiding any morbidity postoperative. However, from our own practice not all patients are candidates for LICAP because if the surgeon is not able to find a suitable blood vessel from which to transplant tissue, LICAP flap surgery will not be able to take place. It is also important to note that radiotherapy might cause some shrinkage of the breast following a lumpectomy and LICAP flap reconstruction, which could impact the final symmetry of the breast.

Clinical Implications

The findings of this study demonstrate that the use of the pedicled descending branch latissimus dorsi mini flap (LDMF) is a safe and effective volume replacement technique following breast-conserving surgery (BCS), particularly for patients with lateral breast defects and small-to-medium breast sizes. This technique allows surgeons to preserve breast aesthetics without compromising oncologic safety, even in patients undergoing neoadjuvant chemotherapy. The preservation of body image, patient satisfaction, and favorable cosmetic outcomes observed support the clinical adoption of LDMF as a viable alternative to more invasive reconstructive procedures. Furthermore, minimal impairment in shoulder function and manageable postoperative complications suggest that the LDMF approach can be implemented without significant morbidity, expanding the range of reconstructive options for early-stage breast cancer patients.

Strengths of the Study

One of the key strengths of this study is its prospective design, which enabled structured data collection, consistent follow-up, and real-time complication monitoring. The study incorporated both objective and subjective assessment tools, including validated quality-of-life questionnaires (EORTC QLQ-C30 and BR23), the DASH score for functional morbidity, and evaluations by an independent panel of surgeons for cosmetic outcomes. This multimodal evaluation approach provides a well-rounded understanding of the technique's functional, aesthetic, and patient-reported outcomes. The use of a single surgical team across all cases also minimized variability in technique, improving internal consistency. Additionally, the inclusion of both neoadjuvant and upfront surgical cases allows a broader understanding of LDMF applicability across clinical scenarios.

Limitations

Despite its strengths, the study has several limitations. First and foremost is the relatively small sample size (25 patients), which may limit the generalizability of the results and the statistical power for subgroup analysis. The study was conducted in a single institution with a homogenous patient population, which might not reflect broader demographic variations. Furthermore, the short follow-up period limits insight into long-term outcomes such as recurrence rates, delayed flap complications, and the durability of cosmetic results after radiotherapy. Finally, while shoulder function was assessed postoperatively, there was no preoperative baseline comparison, making it difficult to quantify the true functional impact of the surgery.

CONCLUSION

The study showed a positive response to neoadjuvant chemotherapy in most cases. Sensory preservation decreased with longer operative times, while patient satisfaction was not significantly affected by resection margins or minor complications. Surgeon assessment scores improved with longer surgeries, indicating higher satisfaction with more extensive procedures. Despite promising results, the small sample size limits generalizability. Future research should explore long-term outcomes and strategies to reduce complications like seroma and shoulder stiffness.

List of Abbreviations

ALND – Axillary Lymph Node Dissection

BCS – Breast-Conserving Surgery

DASH – Disabilities of the Arm, Shoulder, and Hand Questionnaire

EORTC QLQ-C30 – European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire Core 30

EORTC QLQ-BR23 – EORTC Breast Cancer-Specific Module

IDC – Invasive Ductal Carcinoma

ILC – Invasive Lobular Carcinoma

LD – Latissimus Dorsi

LDMF – Latissimus Dorsi Muscle Flap

LICAP – Lateral Intercostal Artery Perforator Flap

MDT – Multidisciplinary Team

MRI – Magnetic Resonance Imaging

ROM – Range of Motion

SLN – Sentinel Lymph Node

SPSS – Statistical Package for the Social Sciences

VAS – Visual Analogue Scale

WBRT – Whole Breast Radiotherapy

Ethical Considerations

This study was conducted in accordance with the ethical standards of the Research Ethics Committee of the Faculty of Medicine, Ain Shams University. Ethical approval was obtained prior to the initiation of the study. All patients provided verbal informed consent after a clear explanation of the research objectives, procedures, and potential risks. Participation was entirely voluntary, and patients were informed of their right to withdraw at any stage without any impact on their clinical care. Confidentiality of data was strictly maintained throughout the research process.

Acknowledgment

The authors express their sincere gratitude to the Department of General Surgery and the Breast Unit at Ain Shams University Hospitals for their guidance and support throughout the study. We extend special thanks to the surgical team, nursing staff, and administrative personnel for their cooperation. Our deep appreciation also goes to the patients and their families for their trust and participation, without whom this study would not have been possible.

Conflicts of Interest

The authors declare that there are no conflicts of interest related to this study.

Confidentiality of Data

All collected data were anonymized and stored securely. No personally identifying information was published or shared. Data management complied with institutional confidentiality policies and ethical standards.

Financing Support

This research did not receive any specific financial support, grants, or funding from public, commercial, or nonprofit agencies. The study was entirely self-funded by the authors

REFERENCES

[1] Cancer today [Internet]. Available at: http://gco.iarc.fr/today/home. Accessed December 12, 2022.

[2] Ibrahim AS, Khaled HM, Mikhail NN, Baraka H, Kamel H. Cancer incidence in Egypt: results of the national population-based cancer registry program. J Cancer Epidemiol 2014; 2014:437971

[3] Orrantia-Borunda E, Anchondo-Nuñez P, Acuña-Aguilar LE, et al. Subtypes of Breast Cancer. In: Mayrovitz HN, editor. Breast Cancer [Internet]. Brisbane (AU): Exon Publications; 2022 Aug 6. Chapter 3. Available from: https://www.ncbi.nlm.nih.gov/books/NBK583808/ doi: 10.36255/exon-publications-breast-cancer-subtypes

[4] Patel K Bj, Nardello S, Cohen S, Rielland J, Chatterjee A. An Oncoplastic Surgeey Primer : Common Indication, Techniques, And Complications In Level 1 And 2 Volume Displacement Oncolpastic Surgery. Ann Surg Oncol. 2019;26:3063-3070.

[5] Cochrane Ra, Valasiadou P, Wilson, Al-Ghazal Sk And Macmillan Rd: Cosmesis And Satisfaction After Breast-Conserving Surgery Correlates With The Percentage Of Breast Volume Excised. Br J Surg. 90:1505–

1509. 2003.

[6] Sood R, Easow Jm, Konopka G, Et Al. Latissimus Dorsi Flap In Breast Reconstruction: Recent Innovations In The Workhorse Flap. Cancer Control: Journal Of The Moffitt Cancer Center 25 (2018): 1073274817744638

[7] Dixon Jm, Venizelos B, Chan P. Latissimus Dorsi Mini-Flap: A Technique For Extending Breast Conservation. Breast 11 (2002): 58-65.

[8] Nelson Ja, Lee It, Disa Jj. The Functional Impact Of Breast Reconstruction: An Overview And Update. Plastic And Reconstructive Surgery. Global Open 6 (2018): E1640.

[9] Fernando Hernanz, Sara Regaño, Carlos Redondo-Figuero, Et Al. Oncoplastic Breast-Conserving Surgery: Analysis Of Quadrantectomy And Immediate Reconstruction With Latissimus Dorsi Flap. World J Surg 31 (2007): 1934-1940.

[10] Rainsbury Rm. Breast-Sparing Reconstruction With Latissimus Dorsi Miniflaps. European Journal Of Surgical Oncology (Ejso) 28 (2002): 891-895.

[11] Abdelmofeed Am, Fadey Ma, Seif O, Abdelhalim Mh, Younes Mt. Usefulness Of Nerve-Sparing Pedicled Segmental Latissimus Dorsi Muscle Flap Combined With Lateral Thoracic Skin Flap For Partial Volume Reconstruction In Laterally Located Breast Cancer. European Journal Of Plastic Surgery. 2023 Aug;46(4):541-50.

[12] Osman AG, Abd-Elnasser A, Abd-Elfattah MH, Abd-erRazik MA. Latissimus dorsi mini-flap after partial mastectomy: Ain Shams University Hospitals' experience. The Egyptian Journal of Surgery. 2022 Oct 10;41(1).

[13] Zhou L, Wang Y, Cai R, Huang J, Li X, Xie Z, Wang J, Sun Y, Chang Ei, Tang J. Pedicled Descending Branch Latissimus Dorsi Mini-Flap In Repairing Partial Mastectomy Defect: Shoulder Functional And Esthetic Outcomes. Journal Of Surgical Oncology. 2019 Sep;120(3):518-26.

[14] Lee KT, Mun GH. A systematic review of functional donor-site morbidity after latissimus dorsi muscle transfer. Plast Reconstr Surg. 2014;134(2):303-314.

[15] Zhou L, Wang Y, Cai R, et al. Pedicled descending branch latissimus dorsi mini-flap in repairing partial mastectomy defect: Shoulder functional and esthetic outcomes. J Surg Oncol. 2019;120:518-526.

[16] Anuar NA, Awang RR. Latissimus Dorsi Mini Flap and Lateral Intercostal Artery Flap Following a Breast Conserving Surgery: A Comparison Based on the Oncological Clearance and Cosmetic Outcomes. European Journal of Surgical Oncology. 2024 Feb 1;50(2).

[17] Gendy Rk, Able Ja, Rainsbury Rm. Impact Of Skin-Sparing Mastectomy With Immediate Reconstruction And Breast-Sparing Reconstruction With Miniflaps On The Outcomes Of Oncoplastic Breast Surgery. Journal Of British Surgery. 2003 Apr;90(4):433-9.

[18] Raja Ma, Straker Vf, Rainsbury Rm. Extending The Role Of Breast-Conserving Surgery By Immediate Volume Replacement. British Journal Of Surgery. 1997 Jan;84(1):101-5.

[19] Raflis Ruzairee A. Breast Conserving Surgery With Immediate Partial Breast Reconstruction Using A Latissimus Dorsi Mini Flap: Oncological Clearance And Cosmetic Outcomes. International Surgery Journal. 2022 Mar;9(3):534

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