

Research Article

Could Immediate Breast Reconstruction with Latissimus Dorsi Flap Optimize the Outcomes of Skin-Sparing Mastectomy for Breast Cancer?

A Prospective Study of The Oncologic and Patient-reported Aesthetic Outcomes.

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Abstract

Skin-sparing mastectomy (SSM) continues to be one of the best surgical options for breast cancer patients. Latissimus dorsi flap (LDF) helps to restore the absent breast mound in addition to create a natural ptosis. **Objective:** In this trial, we tried to unveil the general, oncologic as well as the patient-reported aesthetic outcomes of SSM with immediate LDF. **Methods:** This study was conducted on thirty-nine patients. The general and oncological outcomes were evaluated. The aesthetic outcomes were assessed via the analysis of the patients' answers to a special questionnaire. **Results:** All patients were stage I or II, no patients developed local recurrence (LR). The donor site seroma was the most common complication encountered (30.7%). Partial flap necrosis was noted in 12.8%. **Conclusion:** SSM with immediate LDF is an oncologically safe line of treatment for operable breast cancer, with good aesthetic outcomes and acceptable rate of complications.

Keywords: Breast cancer; immediate breast reconstruction; Latissimus Dorsi flap; Skin-sparing Mastectomy; Patient-reported outcomes.

Introduction

In the contemporary era, the breast cancer continues to be the most common malignancy affecting females. It accounts for more than 25% of all cancer cases¹. Worldwide, in 2012, more than 1.7 million new cases discovered with around 521.900 breast cancer-related deaths².

Since introduced in 1991³, Skin-sparing mastectomy (SSM) remains one of the best surgical options for breast cancer patients^{4,5}. It involves en-bloc mastectomy, with the excision of the nipple-areola complex (NAC) and biopsy scar while preserving the other breast cutaneous envelope and the inframammary fold^{4,6} paving the way for the reconstruction.

The reconstruction is a crucial step in the multi-staged approach for the management of breast cancer. Many studies^{7,8,9} have settled that the immediate breast reconstruction (IBR) surgery has well-established advantages compared to delayed breast reconstruction (DBR) in terms of

better aesthetic results, faster psychosocial recovery, as well as from the cost-effective perspective^{10,11}.

The latissimus dorsi (LD) muscle is considered as one of the most reliable donor flaps for reconstruction¹². Iginio Tansini¹³ was the first to describe the LDF in 1906. Yet, his technique did not gain popularity in breast reconstruction until the 1970s¹⁴. Schneider et al.,¹⁵ further described the detailed anatomy of the LDF.

The LDF helps to restore the absent breast mound in addition to create a natural ptosis. Even without prosthesis, LDF is a reliable reconstructive technique that gives excellent aesthetic results with the resultant well-shaped, well-sized and sustainable reconstructed breast without compromising the oncologic safety¹⁰. In this trial, we tried to unveil the oncological as well as the patient-reported outcomes by analyzing the operative and postoperative data and sifting through the results of a study-specific questionnaire.

Patients and Methods

Upon approval of the Institutional Review Board, a prospective trial had been conducted at Ain-Shams University

Hospitals, Cairo, Egypt on thirty-nine consecutive patients who suffered from breast cancer. Those patients undergone SSM and IBR with LDF during the period from February 2014 to January 2017.

Female patients aged from 25 to 65 years irrespective of ethnicity, with an established diagnosis of an operable breast cancer who are not eligible for breast-conserving surgery (BCS) were enrolled in the study. Patients with inoperable cancer, systemic metastasis, as well as those who were unfit for general anesthesia were excluded.

All the enrolled patients who met the inclusion criteria signed a written informed consent and were scheduled for SSM and IBR with LDF after completing a comprehensive preoperative assessment program. This program included but was not limited to, a detailed history, full clinical examination (especially the diseased breast, the contralateral one, and the donor site), laboratory investigations, radiological evaluation and preoperative photography. Preoperative marking was done for all the patients in the upright position. Drawings included a circum-areolar incision line for the SSM, and other surface marking for the LDF such as the midline, inframammary fold and lateral edge of the breast, the posterior axillary line, the tip of the scapula, and the iliac crest (Figure 1).



Figure 1. Preoperative marking in the upright position.

The preoperative demographic (age), anthropometric (such as weight, height, and the calculated body mass index (BMI), and clinical data (such as bra cup size of both breast, menstrual cycle, and family history) were reported. The histopathological results as well as the TNM staging were also documented.

Operative technique:

The SSM was conducted in the supine position through a circum-areolar incision, removal of the NAC along with the whole breast tissue. This was followed by elevation of the skin flaps; to the clavicle superiorly, the anterior border of the latissimus dorsi laterally, the sternal border medially and insertion of the rectus muscle inferiorly. The breast is then removed with the pectoralis major fascia from the superomedial border to the inferolateral

border. Axillary lymph node dissection was performed through a separate axillary incision.

The patient was repositioned in the lateral decubitus position; a skin incision was designed to be hidden under the bra line (figure 2). The dissection was carried out through the anterior approach. The thoracodorsal vessels and the anterior portion of the LD muscle were identified

The LD was separated from serratus anterior, paraspinous muscle, lumbosacral fascia, vertebral column, trapezius as well as from teres major muscle, then the muscle was divided near its insertion. Afterward, the LDF was elevated, rotated on the thoracodorsal neurovascular pedicle, and then was transferred through a subcutaneous tunnel to the mastectomy defect.

The patient was then placed in the supine position, and the surgeon proceeded to flap placement. The LD was then sutured medially and inferiorly to the underlying muscle and fascia. Additional sutures were placed along the anterior axillary line to prevent tension on the flap, along with some quilting sutures in the donor site in order to decrease the incidence of seroma.

The inverted-T technique was used in some cases to adjust the size of the cutaneous envelope. Closed suction drains were left at the LD donor site, mastectomy defect and axilla (figure: 3). Regular checking of the color of the skin and drain-output were carried out immediately postoperative and before discharge.



Fig. (2): The patient in a lateral decubitus position.



Fig. (3): closed suction drain at the LD donor site.

Follow-up:

All Patients were instructed to avoid ipsilateral upper limb use and to abide by regular follow-up every 3 months for one year starting 1-2 weeks after surgery. In the first follow-up visit, checking the histopathology result as well as excluding the occurrence of any LDF-related complications. Postoperative photographs of the patients were also captured (**Figure 4**).



Figure 4: Follow-up at 3-months postoperative.

In each follow-up visit, a detailed history was taken, clinical assessment was done to detect any sign of LR, complication and to assess aesthetic outcome. In the 6th month follow-up, all cases were asked to complete a special pre-formed questionnaire.

This questionnaire was our guide to assess the degree of patient's satisfaction which was staged according to the *Harris* cosmetic scale¹⁶. The *Harris* method evaluates the overall impression using a 4-staged scale. An "excellent" rating means that the treated breast was nearly identical to the untreated breast. A "good" rating means that the treated breast was slightly different from the untreated breast. A "fair" rating means that the treated breast was not seriously distorted but clearly different from the untreated breast, while a "poor" rating means that reconstructed breast was seriously distorted.

The other relevant surgical, aesthetic and oncologic data such as duration of surgery, intraoperative and postoperative complications, length of stay, histopathological results, as well as the local recurrence were documented in a special pre-formed Excel sheet for Windows (Microsoft Corporation, Redmond, Washington, USA), and verified checking for its statistical significance.

Statistical Analyses

The standard descriptive statistics were used to analyze the demographic and clinical data, as well as the surgical outcomes. Quantitative variables with a normal distribution were expressed as the mean \pm standard deviation (SD), whereas qualitative data with categorical variables were expressed as frequencies and proportions. Student's t-test was used to analyze the continuous variables while the

categorical variables and the study-specific questionnaire were analyzed via the chi-squared test and Fisher's exact test.

The statistical analyses were carried out using the Statistical Package for Social Science Version 22 software package (SPSS, Inc., Chicago, Illinois, USA), statistical significance was considered if P-value is less than 0.05.

Results

During the defined period of study, thirty-nine female patients had undergone SSM and IBR by LDF, their ages ranged from 28.6 to 61.3 years with a mean of 41.9 ± 15.2 years. Thirty-five patients (89.8%) were premenopausal and the other four patients (10.2%) were postmenopausal. As regards the comorbid diseases, seven patients (17.9%) suffer from Diabetes, whereas ten patients (25.6%) are on regular anti-hypertensive medications. Positive family history of breast cancer was evident in 35.8% of the cases. The mean operative time was 5.1 hours (range 4.39-5.9 hours), the mean blood loss was 920 cc, eighteen patients (46%) received a blood transfusion. The postoperative hospital stay ranged from 2.8-5.4 days with a mean of 3.9 days.

The histopathological types were shown in the table (1), whereas the TNM classes and their corresponding stages were illustrated in table (2). Thirty patients were scheduled for adjuvant chemotherapy which was commenced on the usual time, except for twelve patients whose wound state was the cause of delay in initiation of therapy; the mean time delay was 48.3 days. Seventeen patients (43.5%) had received neoadjuvant chemotherapy, based on the trucut biopsy result.

Table 1: Histopathological types of cancer.

Histopathological Type	Number of patients	Percentage
Invasive duct carcinoma	29/39	74.3%
Ductal Carcinoma in Situ (DCIS)	7/39	17.9%
Invasive lobular carcinoma	2/39	5%
Other types (Mucinous breast cancer)	1/39	2.5%

Table 2: TNM classes and their corresponding stages.

TNM	Stages	Percentage
T1N0	Stage I	66.3%
T1N1	Stage II	33.6%
T2N0		
T2N1		

Only two cases of the studied group showed suspicious signs of LR, an excisional biopsy was performed. The first case proved to be fat necrosis whereas the second one proved to be calcifications. Distant metastasis was observed in one case (2.5%) in the form of hepatic metastasis and a pulmonary nodule.

The aesthetic results were illustrated in table (3), with a global satisfaction rate of 89.8%. The complications after these combined procedures could be broadly classified into two major categories; the wound-related complications and the ischemic complications (table:4).

Table 3: Aesthetic Outcome according to Harris score.

Aesthetic Outcome according to Harris score	Number	Percentage
Excellent	13/39	33.3%
Good	14/39	35.8%
Fair	8/39	20.5%
Poor	4/39	10.2%

Table 4: The complications.

Complication	Number	Percentage
Wound-related complications:		
Seroma	12	30.7%
Hematoma	3	7.5%
Fat necrosis	3	7.5%
Surgical site infection	1	2.5%
Ischemic Complications:		
Partial flap necrosis	5	
Superficial skin flap necrosis	3	7.5%
Others:		
Hypertrophic scar	2	5%
Shoulder and anterior chest wall pain	9	23.07%

Discussion

Some recent epidemiological studies painted a bleak picture of the actual incidence of breast cancer; they stated that more than 1.7 million new cases discovered with around 521.900 breast cancer-related deaths in 2012^{1,2,17}

The mastectomy is an essential modality of treatment of breast cancer. Throughout the past century, different techniques of mastectomy were described, modified, and extensively studied in order to decrease the extent of excision of normal tissues without

compromising the oncologic safety of the procedure.

Recently, the rate of mastectomy operations has shown an increasing pattern; this could be attributed to the increasing rate of multifocal tumors, tumors with an extensive in situ component and those with an unfavorable breast-to-tumor size ratio¹⁸.

It is worth noting that the published data^{7,8,9,10,11,18} have settled that the IBR is better than DBR from the aesthetic, psychological, and economic points of view. Even

the studies which addressed this issue from the oncologic aspect found that IBR is not inferior to DBR;¹⁹ found in their retrospective analysis of 203 consecutive patients that there is no significant difference between the LR rate after IBR and DBR (7.7% Vs 6.4% respectively). This was further confirmed by Gieni et al.,²⁰ in their meta-analysis, they speculated that IBR is not associated with increased LR rate in comparison to mastectomy alone. Hence, all these studies support the notion that the IBR is a safe, cost-effective approach with an excellent psychological effect and a better self-esteem.

The LD is one of the largest muscles in the human body. It originates from the external surfaces of the lower 3 or 4 ribs, the iliac crest, the spinous processes of T7-T12, thoracolumbar fascia, as well as the inferior scapular angle. Its flat tendon twisted and inserted into the floor of the humeral intertubercular groove¹⁴.

The blood supply comes through the thoracodorsal vessels, some unusual anatomical variations were described²¹. The LD adducts extends and medially rotates the humerus. Surprisingly, these functions are preserved in its absence by the shoulder girdle muscles¹⁴.

In 1906, The Italian surgeon Iginio¹³ had succeeded to harvest the first pedicled myocutaneous LDF for IBR. Since that and based on some anatomical studies^{15,21}, several modifications to the original technique have been proposed in order to maximize its list of indications, as well as minimize its associated complications.

In the recent era, the LDF appeared to be an excellent alternative in patients who are not candidates for abdominally-based flaps^{14, 22}. A thorough review of the breast cancer-related literature showed scarce studies focusing on post-operative patients' satisfaction. Herein, we tried to evaluate the aesthetic patient-reported outcomes as well as the other surgical and oncologic results. The histopathological paraffin study not only confirmed the malignant nature of the lumps but also verified a negative safety margin in all patients and checked the

number of the infiltrated axillary lymph nodes. All patients enrolled in this study were in stage I or II, and the main pathological type was invasive ductal carcinoma (74.3%).

Two patients (5%) showed suspicious signs of LR; the first patient complained of a small painless nodule on the mastectomy scar during the 12th-month follow-up, it was not associated with any sign of regional or systemic recurrence, an excisional biopsy was performed and proved to be a fat necrosis. Whereas the second patient complaint of painless small lump over the axillary wound, it was proved to be just non-specific calcification after excisional biopsy. Distant metastasis was observed in one case (2.5%), in the 12th-month follow-up.

This high safety profile of the combined SSM and LDF is comparable with many previous studies^{3,4,5,7,8,9,19,23,24,25,26}. Lanitis²⁷ further confirmed this issue, in a large-scale meta-analysis of nine studies comprising 3,739 patients stating that there was no significant difference in LR between 1,104 patients with SSM and IBR, and 2,635 patients with conventional mastectomies without reconstruction.

In addition, another recent large-scale trial⁵ showed that the cumulative 10-year disease-free rate was 98%. Interestingly, it has shown that SSM has an equal oncological safety and superior cosmetic outcomes in comparison to the modified radical mastectomy. Moreover, if combined with autologous flap reconstruction, SSM decreases the need for reduction mammoplasty for the other breast¹⁸.

Another concern is related to the postoperative radiotherapy²⁸, which was considered as a barrier against the IBR. Berthet¹⁰ yielded further details in this issue; they speculated that LDF has an excellent tolerance to the adjuvant radiotherapy with no impact on the patient's aesthetic satisfaction.

Moreover, they suggested that the possibility of postoperative radiotherapy should

not prevent surgeons from proposing this technique to those who are candidates for it. Some previous studies^{10,29} suggested that achievement of breast symmetry is the main factor for patient aesthetic satisfaction. In order to achieve symmetry, the major obstacle is how to accurately measure and achieve the ideal breast volume. The bulky structures which contribute to breast volume are the pectoralis major as well as the LD muscle and its overlying fat²⁹.

The results of this trial showed a high level of patients' satisfaction; thirteen patients (33.3%) showed excellent aesthetic results, fourteen patients (35.8%) claimed good results; eight patients (20.5%) had fair results, while only four patients (10.2%) had poor results, and the total satisfaction rate was 89.8%. These results are comparable with those published by Berthet¹⁰ in which they described an 86.2% satisfaction rate.

Cocquyt³⁰ reported that the cosmetic outcome was better for patients with IBR than for those with breast-conserving surgery (BCS). Ueda³¹ reported that compared to BCS, SSM with IBR leads to a similar objective cosmetic outcome and a satisfactory body image. SSM achieved a superior cosmetic outcome compared to conventional mastectomy.

Since might be expected, the patients are liable to an accumulation of the two procedures' morbidities due to prolonged operative time. In a prospective cohort study of 326 patients, Alderman³² showed that IBR has a significantly high complication rate. In contrast, others³³ reported a low (3.9%) rate of overall complications.

The donor site seroma was the most common complication encountered in this trial; it occurred in twelve patients (30.7%) and was managed conservatively by repeated aspiration in the outpatient clinic, with complete recovery within five weeks. Other complications included (hematoma, fat necrosis, and surgical site infection) (table: 4).

The LDF has a characteristically reliable blood supply; that's why the ischemic complications were infrequent. In this study, partial flap necrosis was noted in

12.8% of the patients and was managed by debridement of the dead tissues. In addition, three patients developed superficial skin flap necrosis with mottling and temporary color changes and improved after the conservative treatment (table: 4).

Sood¹⁴ stated that the most common complication post-LDF was donor site seroma, whereas the ischemic complications were relatively uncommon. Kim⁴ claimed that the donor site-related complications occurred in 22 cases; seroma in eight cases (12.3%), evident scarring in eight cases (12.3%), and back pain in six cases (9.2%). Others²⁶ stated that the most common complications were flap necrosis (5%), infections (5%) and seroma (4%). Mehta³⁴ reported that ischemic complications could be reduced by local heat preconditioning.

The functional outcomes of LDF transfer included a significant decrease in lateral flexion of the torso and significant retraction of the scapula.³⁵ Yet, a prospective study³⁶ speculated that shoulder strength and range of motion returned to their pre-surgical baseline values within 1-year post-operative.

The limitations of this study include the relatively short-term follow-up. Further studies with long-term follow-up are needed to unveil the durability of these results.

Conclusion

Mastectomy as an essential modality of treatment entitles loss of breast mound with the resultant psychic trauma. SSM with Immediate LDF is an oncologically safe line of treatment for breast cancer, with good aesthetic outcomes and acceptable rate of complications.

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