

Fat Grafting for Maximizing the Volume of Breast Reconstruction by Latissimus Dorsi Mini-Flap

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Abstract

The oncoplastic surgery (OPS) technique, which was first attempted by Audretsch et al., expands on the concept of breast-conserving surgery.⁽¹⁾ The pedicled latissimus dorsi (LD) flap serves an important function in breast reconstruction, but its utility is limited by its inability to provide sufficient volume.⁽²⁾ Autologous augmentation of the LD flap with lipo-transfer has been used to avoid placement of an implant. We improve the technique by performing lipo-transfer during breast reconstruction⁽³⁾

The study was a prospective, comparative study includes 30 female patients with breast cancer stages, presented to Benha University Hospital during the period from March 2018 to May 2020.

All patients presented with breast lumps, right and left sided, the ages at time of presentation ranged from 36 to 57 years (average 46 years).they were divided into two groups according to type of offered replacement technique; **Group (A)**; by using mini-latissimus dorsi muscle flap only & **Group (B)**; by using mini-latissimus dorsi muscle flap in addition to immediate intraoperative fat grafting.

Recently, fat grafting has been proven to be a promising therapeutic approach for scar management after burns and physical trauma. This technique can be employed in the setting of an LD flap/tissue expander/implant reconstruction, and could also be expanded to other autologous breast reconstruction options.⁽⁴⁾

Keywords: OPS, Reconstructive Breast Surgery, Latissimus Dorsi Flap & Fat Grafting.

INTRODUCTION

The increasing incidence of breast cancer has made it one of the most prevalent cancers in women worldwide. With the recent advancements in diagnostic regimens for breast cancer and the universalized use of regular check-ups, very small, early-stage breast cancers are increasingly being detected. Thus, breast-conserving surgery is frequently performed, and attempts have been made to develop techniques to minimize postoperative breast deformity after partial mastectomy.⁽⁵⁾

Oncoplastic surgery offers a better cosmetic outcome as partial breast reconstruction, using various techniques, when performed during the same procedure. In partial breast reconstruction, therapeutic mammoplasty techniques offer creative options for large and pendulous breast. On the other hand, perforator flaps, which spare

latissimus dorsi muscle function, provide valuable method for small size breasts.⁽⁶⁾

The pedicled latissimus dorsi (LD) flap serves an important function in breast reconstruction, but its utility is limited by its inability to provide sufficient volume.⁽⁷⁾

Another approach is the extended LD flap technique, which involves more aggressive harvest of subcutaneous tissue along with the skin paddle. The short comings of this technique include a higher risk of seroma, wound breakdown, contour deformities, and lumbar hernia.⁽⁸⁾

Totally autologous breast reconstruction combining LD mini-flap and intra-pectoral fat grafting in the same procedure is a new technique allowing increased breast volume in a single surgery.⁽⁹⁾

PATIENT & METHODS

The study was a prospective, comparative study includes 30 female patients with breast cancer stages, presented to Benha University Hospital during the period from March 2018 to May 2020.

A total of 30 female patients with cancer breast were allocated to undergo different mastectomy techniques according to the site of the tumor and the excision volume in relation to the breast size with immediate reconstruction by mini Latismus-Dorsi muscle flap only versus adding intraoperative fat grafting +/- another additional fat injection sits.

All patients presented with breast lumps, right and left sided, the ages at time of presentation ranged from 36 to 57 years (average 46 years).

Inclusion criteria

1. Age below 60 years old.
2. Resection of more than 40% of the breast volume.
3. Central, lateral, lower and upper quadrants tumors.
4. Axillary dissection through separate incision away from lumpectomy incision.
5. Incomplete mobilization of breast parenchyma to allow reshaping of the breast.
6. Women considering a breast reconstruction in addition to excision.

Exclusion criteria

1. When clear margins cannot be assured without performing mastectomy.
2. Patients with T4 tumors.
3. Those patients with multicentric disease.
4. Patients with extensive malignant mammographic micro calcification.
5. Patients with inflammatory carcinoma.
6. Patients with history of previous radiation to the chest or axilla and axillary dissection.
7. Patients who have undergone a radical neck dissection with sacrifice of the spinal accessory nerve.
8. Patients with abdominal hernia of previous major exploratory abdominal operations for Group B patients' selection.
9. In patients with uncontrolled co-morbidities (diabetes- chest problems.....etc)

The participants who agreed to share in this clinical study gave informed consent after being fully informed about the technique and its circumstances.

Patients' Counseling

Patients were generally counseled that the surgery would take 4 to 5 hours for a typical latissimus dorsi flap breast reconstruction. Postoperatively, they would have 2 donor site drains and 1 to 2 breast drains, which would remain until outputs were below 30 mL/d, or generally up to 3 or 4 weeks.

On average, patients would remain in the hospital for 1-4 days. They might start upper extremity and range of motion exercises 2 weeks after surgery gradually and could anticipate regaining normal function for activities such as driving and returning to work in 3 to 6 weeks.

Patients` grouping:

In our study the 30 patients who completed a follow up for 10 months were included in this study and were divided into 2 groups.

Both groups were treated by:

- Wide local excision of the breast mass with adequate safety margins under the umbrella of intraoperative frozen section examination.
- Axilla was treated by either sentinel lymph node approach or total axillary clearance approach through a separate incision.
- Breast reconstruction was offered by mini-Latissimus Dorsi muscle flap with or without skin paddle.

Group A: This group of (15) patients was reconstructed with mini-Latissimus Dorsi muscle flap alone.

Group B: This group of (15) patients was reconstructed with mini-Latissimus Dorsi muscle flap with immediate intra-operative fat grafting.

In both groups, all (30) patients were treated by breast mass excision according;

- Preoperative preparation and drawings;

The goal of optimal operative technique is to maximize the soft tissue coverage provided by the flap, while minimizing the magnitude of donor site defect and donor site complications.

Markings are performed preoperatively with the patient in the upright position and anteriorly include the midline, inframammary fold and lateral edge of breast tissue and posteriorly include lateral margin of the latissimus along the posterior axillary line, superior margin at the tip of the scapula, and inferior margin at the iliac crest.



Fig. 1: Pre-operative drawings;

In both groups, axillary lymph nodes were treated in all (30) patients either by:

- **Sentinel lymph node biopsy; which was done for only 6 patients:**

A harmless blue dye was injected into the breast; under or around the areola, which is the darker area that surrounds the nipple. Then, an incision was done under the arm at the axillary line to find the lymph nodes that were stained from the dye and removed. A pathologist carefully examined the sentinel node(s) for signs of cancer.

- **Axillary lymph node dissection; which was done for (24) patients:**

While awaiting the results of frozen section, the site of incision for axillary access is marked below the axillary line providing a very wide access to the axilla which greatly facilitate level I and level II lymph node dissection which was carried in all patients without excessive traction for exposure or injury to the significant structures in the axilla.



Fig. 2 Dissection over and preservation of the thoraco-dorsal bundle.

In both groups (30) patients, breast defects were reconstructed by mini-Latissimus dorsi muscle flap;

In the operating room, the patient is placed in the lateral decubitus position for unilateral or prone position for bilateral flap elevation. Dissection is carried out beneath the thoracolumbar fascia, leaving the deep fat attached to the back skin flaps. The latissimus is separated from the serratus anterior at the lateral border; from the para-spinous muscle fascia, lumbosacral fascia, and vertebral column; from the trapezius fibers superomedially; and from the teres major fibers in the axilla.

After identification of the thoracodorsal vessels, the latissimus is divided near its attachment to the humerus. The myocutaneous or myofascial flap is then transferred to the mastectomy defect through a subcutaneous tunnel in the axilla. The patient is then placed in the supine position, and the surgeon proceeds with flap placement.

Finally, insertion of one or two vacuum drains, the wound is closed in two layers using vycril (polygalactine) sutures for both subcutaneous and subcuticular layers. No deep sutures were used for all wounds.



Fig. 3; Dissection of mini-LD flap



Fig. 4; Division of the thoracodorsal nerve to the LD muscle after complete localization of the muscular flap in the breast defect.

Group B (15) patients: Breast reconstruction was super added by immediate intraoperative fat grafting.

• Fat harvesting;

Fat harvest was performed simultaneously with the wide local excision and LD flap harvest, utilizing a two-team approach, in order to minimize the operation time or after finishing the flap harvest in lake of 2 team approach, but in longer time (about 30-50 minutes).

The incisions were performed with a no. 15 scalpel, and their position depends on the area to be harvested.

- The abdominal fat is harvested through periumbilical or supra-iliac incisions.
- The flanks through supra-iliac incisions, one on each side.

The “wet” technique was used by infiltration of a tumescent fluid e.g. Klein solution containing a local anaesthetic drug (10 cc lignocaine) and 0.25-1 mg epinephrine, in 500 cc Ringer’s solution or Normal Saline.

Coleman technique for fat was used with a 3-mm, blunt-edged, 2-hole cannula connected to a 10-mL syringe; fat is suctioned manually by withdrawing the plunger.

A liposuction of about 700 ml total aspirate (range: 250–2500 ml) was performed on average. Donor sites varied with a focus on the abdomen and the flanks.



Fig. 5; Manual liposuction technique; two team approach as liposuction was done simultaneous with breast mass excision



Fig. 6; lipoaspirate collection in syringes before fat processing

• Fat processing:

Once the fat is harvested, it was centrifuged at 3000 rpm for 3 min. After the centrifugation, three layers were observed:

- The first (upper) oily layer of lipids, which leaked out of disrupted adipocytes and could be poured off using absorbent material.
- The second (middle) layer consisted of purified fatty tissue. This was routinely used for fat grafting.
- The third (lower) layer contained blood, debris, tissue fluid, and local anesthetic and was ejected from the base of syringe.



Fig. 7; Centrifuged fat syringes after processing showing the 3 different layers.

To separate the hematic level, the bottom plug was opened and the blood was allowed to flow out onto a tray. The broken down fatty acids in the top level could be removed by decantation and if necessary the oil could be removed with the aid of small lined gauze.



Fig. 8; Fat syringes after filtration and getting rid of the hematic layer; which are ready for fat injection

After the filtration process, an average volume of 220 ml (range: 70–450 ml) was available for lipo-filling. This is equivalent to 20% of the initially harvested volume.

• Fat grafting:

The skin of the breast was punctured with an 18-gauge cannula that was used to release dermato-fascial adhesions and scar tissue. The same cannula was then used to inject the fat graft in the subcutaneous and sub-glandular plane of the breast.

Usually, through multiple access sites, multiple tunnels were created on insertion, but fat was injected only during withdrawal of the

cannula in a “fanning-out” pattern, to avoid excessive interstitial pressure at the recipient site and overcrowding of the transplanted adipocytes following the fat “spaghetti” principle.

The mastectomy skin flaps as well as the pectoralis major muscle were fat grafted before the inset of the LD flap

For the LD flap, fat was grafted into the subcutaneous layer of the skin paddle, the LD muscle caudal to the skin paddle, and under the muscle fascia.



Fig. 9; Fat grafting step in the subcutaneous layer of the skin paddle after its de-epithelialization



Fig. 10; Fat grafting step in the subcutaneous layer of the skin paddle

As required, additional fat grafting was performed 4 to 10 months following the initial breast reconstruction procedure. The fat grafting injections focused on correcting upper pole efficiency and increasing the projection of the reconstructed breast.

RESULTS

This study is prospective study done in Benha University including thirty female patients were followed up for ten months; all of them underwent complete breast examination and breast multi-disciplinary team assessment for offering the best therapy plan for each individual patient. All patients underwent breast conservative mastectomy of wide local excision and axillary lymph nodes assessment (either sentinel biopsy or complete dissection) then they were divided into two groups according to type of offered replacement technique;

Group (A); by using mini-latissimus dorsi muscle flap only

Group (B); by using mini-latissimus dorsi muscle flap in addition to immediate intraoperative fat grafting.

Personal data, complaint and history

The age was ranged from 36 to 57 years (with average 46 years). All patients were presented with a breast lump & none of them was presented with any other symptoms. Family history of breast cancer in the first or the second degree relatives was positive in only 6 patients (20%). 21 patients were premenopausal (70%) while 9 were postmenopausal (30%). All patients were multiparous except 3 of them were nulliparous (10%). Six patients (20%) had controlled hypertension. Other comorbidities encountered were bronchial asthma in one patient and mild mitral stenosis disease in another patient in which the conditions were controlled medically. Twenty-one patients (70%) had received preoperative chemotherapy as neoadjuvant therapy for patient down staging.

Seventeen patients (56.7%) were obese (Body Mass Index exceeding 30 kg/m²); none had evidence of general health impairment, metastatic disease or pregnancy. Eighteen patients had left breast cancer (60%) while twelve had right breast cancer (40%) and none had bilateral affection.

. Type of Cancer:

Final histopathology revealed the diagnosis of IDC in twenty-one patients (70%). nine patients (30%) had the diagnosis of ILC.

b. Tumor Molecular classification:

We found that twelve patients (40%) were classified as Luminal A, nine patients (30%) were classified as Luminal B, while six patients (20%) were classified as Basal like-Her2neo and three patients (10%) were classified as triple negative.

c. Lymphatic Involvement:

At definitive histopathological report, three patients (10%) had lymph nodes free of tumor involvement. Eighteen patients had N1 positive lymph nodes (60%) and nine patients (30%) had N2 positive lymph nodes.

d. Neoadjuvant and Adjuvant Therapy:

Twenty one patients (70%) had received preoperative neoadjuvant chemotherapy for patient down-staging according to the shared decision with our breast MDT team.

All patients (100 %) had postoperative radiotherapy. Eighteen patients (60%) had boost on the previous tumor site after intraoperative clipping.

Chemotherapy (FAC or FEC 6 cycles) was given to 27 patients (90%) who completed their cycles before the commencement of radiotherapy. Twenty one patients (70 %) received hormonal treatment; two of them discontinued hormonal therapy after one year due to bad compliance and side effects. The other nine patients (30 %) had negative hormonal receptor status and hormonal therapy was not provided.

Postoperative follow-up

Group A (Reconstruction by mini-LD muscular flap only): 15 cases

- The operative time ranged between 270-400 minutes with mean operative time of 330.5 minutes including the time taken for immediate histopathological examination of the specimens removed for frozen section examination.
- The hospital stay interval was ranged between 1- 3 days with average 2 days postoperative stay, in which wound and flap examination was done carefully.
- Immediate postoperative before discharge:
 1. Acceptable tissue edema in the recipient site.
 2. Minimal to mild fluid in the drain suction system.
 3. Three patients (20%) had flap congestion and skin ecchymosis.
 4. All patients had good taken flap with no evidence on flap ischemia or necrosis.



Fig. 11; Immediate post-operative with suction drains in the back and axilla

- During the first visit (after 1 week);
 1. Two patients (13.3%) had superficial surgical site infection at the donor site managed conservatively by systemic antibiotics and frequent dressings.
 2. One patient (6.7%) had superficial surgical site infection at the recipient site due to bad personal hygiene, managed conservatively by systemic antibiotics and frequent dressings.
 3. Four patients (26.7%) had developed seroma at the donor site in the back and aspirated radiologically guided.
 4. One patient (6.7%) had developed hematoma at the donor site in the back and managed conservatively.
 5. None of the patients had wound dehiscence neither at donor nor recipient sites.



Fig. 12; One week post-operative with suction drains in the back and axilla

- During the second visit (after 1 month);
 1. All patients who had superficial surgical site infection at the donor and recipient sites were recovered completely.
 2. All patients who had developed seroma or hematoma at the donor site in the back had been relieved completely with removal of all drains.
 3. Two patients (13.3%) had developed scar hypertrophy mainly at donor site in the back.
 4. All patients were ready even psychologically for starting the adjuvant therapy; radiotherapy, chemotherapy or hormonal therapy.



Fig. 13; 1 month post-operative after removal of the suction drains

- During the third visit (after 3 months);
 1. Six patients (40%) had mild asymmetry between the two breasts.
 2. Nine patients (60%) had mild difficulty with their daily exercise and shoulder movement.
 3. Five patients (33.3%) were presented by early radiotherapy side effects as skin redness and irritation.
- During the fourth visit (after 6 months);
 1. Four patients (26.7%) still had mild asymmetry between the two breasts.
 2. Six patients (40%) still had mild difficulty with their daily exercise and shoulder movement.
 3. Three patients (20%) were presented by late radiotherapy side effects as skin pigmentations.
 4. One patient (6.7%) had scar depression at donor site in the back.
 5. Seven patients (46.7%) were generally satisfied with the reconstruction results; others were unsatisfied about asymmetry, scar depression, reconstructed volume gradual shrinkage and difficulty in daily exercise



Fig. 14; Three months post-operative with skin redness during radiotherapy sessions

- During the fifth visit (after 10 months);
 1. Three patients (20%) still had mild asymmetry between the two breasts.
 2. Three patients (20%) still had mild difficulty with their daily exercise and shoulder movement.
 3. Two patients (13.3%) were presented by late radiotherapy side effects as reconstructed breast shrinkage.
 4. Ten patients (66.7%) were generally satisfied with the reconstruction results; others were unsatisfied about asymmetry, scar depression, reconstructed volume gradual shrinkage and difficulty in daily exercise.

- Group B (Reconstruction by mini-LD muscular flap with immediate fat grafting): 15 cases*
- The operative time ranged between 330-450 minutes with mean operative time of 405 minutes including the time taken for immediate histopathological examination of the specimens removed for frozen section examination, fat harvesting and grafting.
 - The hospital stay interval was ranged between 2- 4 days with average 3 days postoperative stay, in which wound and flap examination was done carefully.
 - Immediate postoperative before discharge:
 1. Acceptable tissue edema in the recipient site.
 2. Minimal to mild fluid in the drain suction system.
 3. Minimal fluid discharge drained directly from the liposuction incision.
 4. Two patients (13.3%) had flap congestion and skin ecchymosis.
 5. All patients had good taken flap with no evidence on flap ischemia or necrosis.



Fig. 15; Immediate post-operative after fat grafting

- During the first visit (after 1 week);
 1. Two patients (13.3%) had superficial surgical site infection at the donor site managed conservatively by systemic antibiotics and frequent dressings.
 2. One patient (6.7%) had abdominal subcutaneous ecchymosis.
 3. Three patients (20%) had developed seroma at the donor site in the back and aspirated radiologically guided.
 4. Two patients (13.3%) had developed hematoma at the donor site in the back and managed conservatively.
 5. None of the patients had wound dehiscence neither at donor nor recipient sites.



Fig. 16; 1 week post-operative with suction drains

- During the second visit (after 1 month);
 1. All patients who had superficial surgical site infection at the donor and recipient sites were recovered completely.
 2. All patients who had developed seroma or hematoma at the donor site in the back had been relieved completely with removal of all drains.
 3. The patient with abdominal ecchymosis had been recovered completely under conservative measurement.
 4. One patient (6.7%) had developed scar hypertrophy mainly at donor site in the back.
 5. All patients were ready even psychologically for starting the adjuvant therapy; radiotherapy, chemotherapy or hormonal therapy.

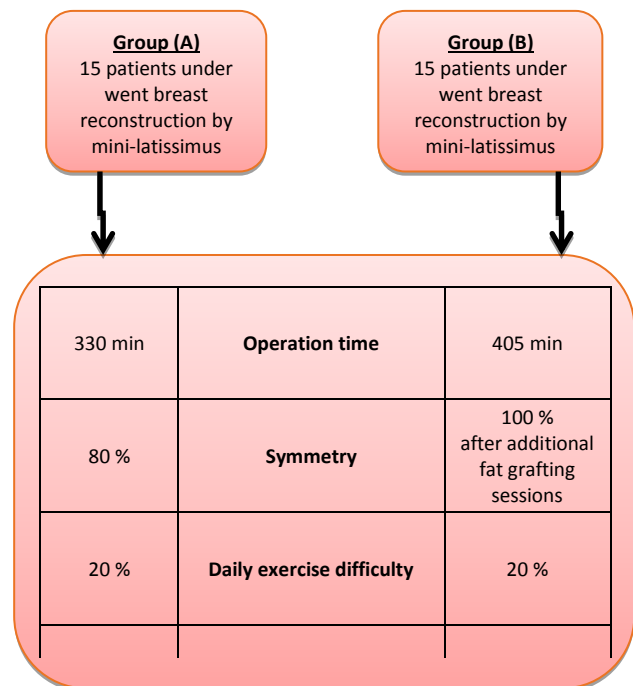


Fig. 17; One month post-operative after removal of the suction drains in the back and axilla

- During the third visit (after 3 months);
 1. Two patients (13.3%) had mild asymmetry between the two breasts; two of them were managed by additional fat grafting sits.
 2. Nine patients (60%) had mild difficulty with their daily exercise and shoulder movement.
 3. Four patients (26.7%) were presented by early radiotherapy side effects as skin redness and irritation.
- During the fourth visit (after 6 months);
 1. One patient (6.7%) still had mild asymmetry between the two breasts and managed by additional fat grafting sits.
 2. Seven patients (46.7%) still had mild difficulty with their daily exercise and shoulder movement.
 3. Three patients (20%) were presented by late radiotherapy side effects as skin pigmentations.
 4. Two patients (13.3%) had scar depression at donor site in the back and were managed by another fat grafting sits.
 5. Eleven patients (73.3%) were generally satisfied with the reconstruction results;

others were unsatisfied about asymmetry, scar depression, reconstructed volume gradual shrinkage and difficulty in daily exercise.

- During the fifth visit (after 10 months);
 1. Almost all patients had a symmetrical breasts after all additional fat grafting sits..
 2. Two patients (13.3%) still had mild difficulty with their daily exercise and shoulder movement.
 3. Two patients (13.3%) were presented by late radiotherapy side effects as reconstructed breast shrinkage and managed by additional fat grafting sits.
 4. Fourteen patients (93.3%) were generally satisfied with the reconstruction results, un-satisfaction about asymmetry, scar depression and reconstructed volume gradual shrinkage were managed by additional fat grafting sits.



• **Statistical analysis**

The collected data were summarized in terms of mean ± Standard Deviation (SD) and range for quantitative data and frequency and percentage for qualitative data.

DISCUSSION

A shift in the paradigm for breast cancer management began in the late 1970s, when pioneers demonstrated that the overall survival rates achieved with mastectomy could be equaled with breast conserving tumor excision and radiotherapy.⁽¹⁰⁾

Breast-conservation therapy with lumpectomy is a valuable component of breast cancer treatment, with an equivalent survival outcome to that of mastectomy.^(11,12) In addition to physical preservation, women who undergo breast conservation have a better view of their body image, are more comfortable with nudity and breast caressing, and might have less adverse physical sequelae from asymmetry, chest wall adhesions and numbness associated with mastectomy.^(13,14)

In addition to being equivalent to mastectomy in terms of oncological safety, BCT offers advantages over mastectomy in terms of quality of life and esthetic outcomes. Quality of life after breast surgery is affected by preservation of the breast, avoiding donor site morbidity, cosmetic results, treatment duration, and convenience. All of these factors must be considered in the assessment of a patient who appears to be an appropriate candidate for BCT.⁽¹⁵⁾

Oncoplastic breast surgery (OPS) is relatively new; firstly, oncoplastic techniques are warranted to allow wide excision and clear margins without compromising cosmeses. Secondly, such surgery is ideally performed at the same time as oncological excision.⁽¹⁶⁾

Since Tansini⁽¹⁷⁾ introduced the technique in 1896, utilizing the LD flap has presented a versatile option for breast reconstruction. However, with the increasing popularity of utilizing abdominal-based perforator flaps, the LD flap has become the secondary choice for autologous breast reconstruction. The LD flap alone cannot always provide sufficient volume for the reconstructed breast.⁽¹⁸⁾

Two classic methods have been applied for LD flap volume enhancement: implant insertion and extended LD flap harvest. Implant insertion is associated with potential complications, such as infection, unnatural breast contour, capsular contraction, implant migration, and implant extrusion.⁽¹⁹⁾

Extended LD flap harvesting can provide additional volume without inserting an

implant, but aggressive tissue harvesting may lead to increased risks of seroma, wound dehiscence, and contour deformity. In addition, this technique is restricted to patients with sufficient tissue at the flap donor site, which is usually associated with a higher BMI.⁽²⁰⁾

From March 2018 to May 2020; we started the evaluation and comparison of having immediate fat grafting procedure with breast reconstruction by mini-Latissimus dorsi muscle flap versus the muscular flap only for getting much more reconstruction volume without more morbidity to reach higher satisfaction. Before surgery, we followed the shared decision methodology by having a complete explanation of the nature of the technique, its benefits, risks and possible complications were introduced to all the patients.

Fat grafting offers a less invasive method of volume enhancement. Since 2009 reversal of the American Society of Plastic Surgeons' moratorium on fat grafting, research in this area has increased dramatically.⁽¹³⁵⁾ Several studies have shown that fat grafting can significantly improve breast contour and provide additional volume in both autologous and implant-based reconstructions and is also associated with relatively few complications, such as infection and fat necrosis.⁽²¹⁾

In 2010, Sinna et al.⁽²²⁾ described the largest case series of second-stage fat grafting in LD flap autologous breast reconstruction, which included 200 patients and 244 injection sessions. In that study, the mean volume of fat grafted per breast was 176 mL (range, 30-405 mL), and complications included minor local infection (0.8%) and fat necrosis (2.0%).⁽¹³⁸⁾ The author did not clearly state in which layer the fat was injected, because all the fat grafting revisional procedures included in the study were performed via "blind" injection. The body of literature on simultaneous fat grafting and autologous tissue breast reconstruction is very limited, with only a single recent report of immediate fat grafting-augmented LD flap breast reconstruction.⁽²³⁾

In this article, fat was injected into the adipose layer and muscle fascia of the flap skin paddle for volume enhancement of the lower pole, with a mean injected fat volume of 220 mL (range, 70-450 mL).

To our knowledge, this study aims to describe the immediate, multisite, and

multilayer fat grafting technique for breast reconstruction. Simultaneous fat grafting into the LD flap was performed in all the cases in this series, and no fat grafting-related complications, fat embolism, or compromised LD flap vascularity as a result of this technique were observed in this cohort. The average and maximal fat grafting volume in this case series was 220 mL and 450 mL, respectively,

Fat grafting can safely be performed into the subcutaneous layer of the LD skin paddle, under muscle fascia, and within the muscular fibers caudal to the skin paddle during immediate breast reconstructions, at the same time as an LD flap transfer. Performing the fat-grafted, volume-enhanced LD flap procedure with fat grafting recipient sites can serve as a useful alternative to utilizing abdomen-based flaps in autologous breast reconstruction, especially to salvage a failed implant or to perform an LD flap breast reconstruction.⁽²⁴⁾

This is an easy technique for performing autologous breast reconstruction in patients with a wide variety of BMIs (range, 20.9-42.3) that also offers low morbidity and fast recovery. Although no volumetric breast measurements were performed in this series, it can be deduced from the mastectomy weight measured for each patient (mean weight, 210 g; range, 120-380 g) that a large, variable breast volume can be achieved with the technique.

This paper highlights the extended options for fat grafting recipient. The pectoralis major and serratus muscles were not fat grafted in immediate breast reconstructions following cancer removal, because of the concern that the injection may disseminate any residual tumor tissues, leading to local metastases.

The concept and theory of injection metastasis remains controversial, and there is very little clinical evidence to support a lack of cancer risk as a result of a breast reconstruction. In vitro studies have mainly alluded to an increased risk of breast reconstruction promoting cancer or metastases, although these results have not been confirmed in vivo. We have not observed this association in our practice, although long-term oncologic follow-up is required for both autologous and implant-based breast reconstructions.⁽²⁴⁾

The impact of performing simultaneous fat grafting with an LD flap transfer in a patient that has undergone radiation therapy, along with determining safe fat grafting volumes and fat survival in this context, is an area that requires further research. The volume of fat grafted during a simultaneous fat grafting session and the number of sessions of subsequent fat grafting required were both multifactorial and individualized, impacted by the patient's habitus, the size of the patient's LD muscle and LD skin paddle, the contralateral breast volume, possible fat grafting recipient sites, and the patient's expectations for their reconstruction.⁽²⁴⁾

Patients with a large LD muscle and LD skin paddle usually have more fat grafting recipient tissues available. Harvesting the largest potential skin paddle and the entire LD muscle is critical for achieving the largest desired breast volume. The design of the skin paddle can be made by assessing the donor site skin groove and performing a pinch test, which can help to plan the largest skin paddle and maintain a well-concealed donor site scar.⁽²³⁾

Recently, fat grafting has been proven to be a promising therapeutic approach for scar management after burns and physical trauma. Therefore, there is evidence to suggest that early fat grafting may help reduce scar tissue formation. This technique can be employed in the setting of an LD flap/tissue expander/implant reconstruction, and could also be expanded to other autologous breast reconstruction options, including the transverse upper gracilis flap, the profunda artery perforator flap, and the deep inferior epigastric perforator/musclesparing free transverse rectus abdominus myocutaneous flap breast reconstruction.⁽⁴⁾

This preliminary report describes our early experiences with utilizing the fat-grafted, volume enhanced LD flap transfer and fat grafting recipient sites in purely autologous breast reconstruction. The interpretation of our results is limited by this study's small number of patients and short follow-up period for patients. Multiple sessions of fat grafting are still needed in some cases to achieve the patient's desired results, depending on her final desired volume for the reconstructed breast.

CONCLUSION

The LD flap transfer with simultaneous fat grafting in immediate breast reconstruction is a simple and safe technique for autologous breast reconstruction.

Our experience has shown that fat grafting can be performed safely and easily along with the autologous LD flap transfer using a multisite, multilayer approach.

This strategy can potentially be employed in tertiary breast reconstruction as well and can be successfully carried out in patients who have previously undergone radiation therapy, without an increased risk of complications, including fat necrosis.

The technique offers an alternative approach to autologous breast reconstruction that can provide larger breast volumes without the need for aggressive LD flap harvesting, which is associated with increased donor site morbidity.

Utilizing fat-grafted, volume enhanced LD flap transfer and fat grafting recipient sites is a promising approach for complete autologous breast reconstruction in patients with limited donor site availability.

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