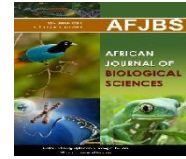


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# Utilization of autologous fat grafting in correction of post mastectomy reconstructive defects

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### Abstract

**Background:** Autologous fat grafting has shown good cosmetic results in the correction of volume and contour defects after post-mastectomy reconstruction for breast cancer.

**Aim and objectives:** To show our initial experience with autologous fat grafting, regarding its safety, efficacy, and possible complications after post-mastectomy reconstruction.

**Patients and methods:** This prospective study included 21 breast cancer individuals who underwent autologous fat grafting for defect correction after post-mastectomy breast reconstruction from January 2019 until October 2023.

**Results:** During follow-up, 3 patients (14.3%) developed palpable breast nodules, and 2 of them (9.5%) had a biopsy, both showing fat necrosis on pathology. Two patients did not attend their follow-up visits. According to breast Q satisfaction, 7 patients had a score of  $N > 80$ , 6 (70–80), 3 (60–70), one patient (50–60), and 4 had a score of  $N$  less than 50. All patients had a result of “good” (100%) by the software, which is a satisfactory result after post-mastectomy reconstruction.

**Conclusion:** Autologous fat grafting is a beneficial and relatively secure choice for enhancing the appearance of breasts after mastectomy surgery. The treatment is technically simple and is linked to a significantly low likelihood of problems.

**Key words:** autologous fat grafting, lipofilling post-mastectomy, patients' outcomes, breast cancer

## Introduction

Autologous fat transplantation to the breast started around 1895 and has been utilized more frequently by plastic surgeons for a variety of purposes over the past 25 years (1).

Concerns related to the safety of fat grafting in the setting of breast cancer recurrence and oncological surveillance limited its application until a 2007 paper by Coleman and Saboeiro demonstrated its long-term safety in 17 patients (2, 3).

Two recent systematic reviews and meta-analyses of the literature have demonstrated the oncological safety of fat grafting in the breast following breast cancer treatment without any observed increase in locoregional recurrence rates (4, 5).

The results of lipofilling have also been seen as unpredictable due to the partial resorption of the grafted fat. Prior researchers have documented a clinical volume reduction ranging from forty percent to sixty percent, typically occurring during the initial four to six-month period (6, 7).

Recent studies have indicated that these issues may be less important than originally thought. Multiple articles have documented positive results & high levels of patient satisfaction after correcting contour abnormalities in rebuilt breasts (3, 8–9).

The objective of the present research was to show our initial experience with autologous fat grafting, regarding its' safety, efficacy, and possible complications after post-mastectomy reconstruction.

## Patients and methods

This prospective study included 21 breast cancer individuals who underwent autologous fat grafting for defect correction after post-mastectomy breast reconstruction from January 2019 until October 2023.

**Eligibility Criteria:** Female patients post-breast reconstructive procedure after mastectomy, either implant or autologous flap-based; 3–4 months after completion of definitive surgical treatment if there is no adjuvant chemotherapy or radiotherapy; 6 months after finishing radiation therapy; female patients scheduled for post-mastectomy delayed reconstructive procedure; 3–4 months after completion of definitive surgical treatment if there is no adjuvant chemotherapy or radiotherapy; and 6 months after finishing radiation therapy.

**Exclusion criteria:** Patients who underwent BCT and patients diagnosed with inflammatory breast cancer and fat grafting techniques were conducted after either implant-based or autologous tissue reconstruction.

## Ethical consideration

This study poses no harm to patients; all data will be anonymous to protect the privacy and confidentiality of patients' information, and all patients will be consented to for their approval of the procedures. The investigation was presented to the Institutional Review Board (IRB) in order to obtain approval. Policy about the publication: All participants' identities will be included in any article resulting from this work, and the order of their names will reflect their level of participation in data analysis & manuscript writing. Additional external writers may be included if they contribute to the material and meet the criteria for authorship according to international standards.

## Methods

### Procedure

Preoperatively, markings were done over the breast in areas where fat injection is required and over the donor areas in the abdomen. A single antibiotic dose is given on induction of anesthesia. Under general anesthesia, the selected donor areas were infiltrated with a tumescent solution containing saline and epinephrine (1000:1) in order to reduce bleeding and postoperative bruising, and 15 minutes were allowed to pass in order to achieve vasoconstriction. A blunt-tipped 3 mm harvesting Coleman cannula, connected to a suction jar,

was inserted into the subcutaneous space through a stab incision made with a scalpel no. 15 blade. Under moderate suction, the adipose tissues were mechanically disrupted and aspirated using the wet technique (1:1) ratio of tumescent and aspirated fat. Aspiration was done by passing the cannula through the tissues in an even, sweeping motion in order to avoid postoperative contour irregularities. Fat was transferred from the suction jar to 50-ml syringes and left for 15 minutes to decant. After the separation of contents, the liquid was disposed of, and the remaining fat was injected into the subcutaneous tissues of the breast & into the reconstructed breast in cases of LD flap using a 2 mm cannula. The subsequent visit is after 6 months post-operative, where, after breast examination, the patient answers the breast questionnaire and a follow-up breast ultrasound is done. Patients were followed up every 6 months to assess for any complications or radiological abnormalities.

### Patients' assessment

**Questionnaire:** Patients' experience was assessed with the BREAST-Q version 1.0™ for reconstruction, a validated questionnaire downloaded from the Mapi Research Trust and translated into Arabic [21]. In this research, we utilized the BREAST-Q reconstruction module to specifically examine the aspects of psychological well-being, satisfaction with breasts, and appearance of the abdomen when unclothed. The sum score for each item in the questionnaire is adjusted with an equivalent Rasch transformed score (0–100). The BREAST-Q™ is a validated questionnaire specifically designed to assess patient-reported outcomes (PROM) related to breast illness. The development of this technology was a collaborative effort between the Memorial Sloan Kettering Cancer Institute and the University of British Columbia.

**Surgeon's assessment score:** The study evaluated patients' aesthetic outcomes using a three-surgeon assessment score, including preoperative and postoperative photos. The scores were based on reconstructed breast volume and contour deformity after corrective lipofilling. The mean score was calculated for each surgeon scoring 21 patients. **BCCT core software:** BCCT core software, developed by INESC Porto Breast Research Group, objectively assesses postoperative breast cancer cosmetic results [22] in cases where contralateral symmetrization was performed. The software, which assigns each case to one of four Harris scale classes, provides an anteroposterior view of the postoperative photo.

### Statistical analysis

Data were coded & entered utilizing the statistical package for the Social Sciences (SPSS) version 28 (IBM Corp., Armonk, NY, USA). Data was summarized using mean, standard deviation, median, minimum, & maximum in quantitative data and frequency (count) & relative frequency (percentage) for categorical data.

## RESULTS

**Table (1): Follow up imaging results**

		Count	%
FU US Changes	Palpable suspicious Dermal nodule for bx	1	4.8%
	Palpable mass, (fat necrosis) BIRADS 3 for FU	1	4.8%
	oil cysts	2	9.5%
	Fat necrosis, 2 cm lesion was biopsied	1	4.8%

	<b>Fat necrosis</b>	1	4.8%
	<b>lost FU</b>	2	9.5%
	<b>NAD</b>	13	61.9%

During Follow up, 3 patients (14.3 %) developed palpable breast nodules, 2 of them (9.5 %) had a biopsy, both showing fat necrosis on pathology. Two patients did not attend their follow up visits. (Table 1)

**Table (2): Breast Q satisfaction with breast score**

<b>Satisfaction with breast score</b>	<b>Number of patients</b>
<b>N&gt;80</b>	7 (33.3 %)
<b>N (70-80)</b>	6 (28.6%)
<b>N (60-70)</b>	3 (14.3%)
<b>N (50-60)</b>	1 (4.8 %)
<b>N less than 50</b>	4 (19%)

According to breast Q satisfaction, 7 patients had a score of (N>80), 6(70-80), 3(60-70), one patient (50-60) and 4 had N less than 50. (Table 2)

**Table (3): Satisfaction with the appearance of the abdomen after liposuction.**

		<b>Count</b>	<b>%</b>
<b>Abdomen when unclothed</b>	<b>Very dissatisfied</b>	1	4.8%
	<b>Somewhat dissatisfied</b>	3	14.3%
	<b>Somewhat satisfied</b>	8	38.1%
	<b>Very satisfied</b>	9	42.9%

Regarding to satisfaction, one day was very dissatisfied, 3 somewhat dissatisfied, 8 somewhat satisfied and 9 very satisfied. (Table 3)

**Table (4): the 3 surgeon's assessment for the 21 patients after completion of lipofilling**

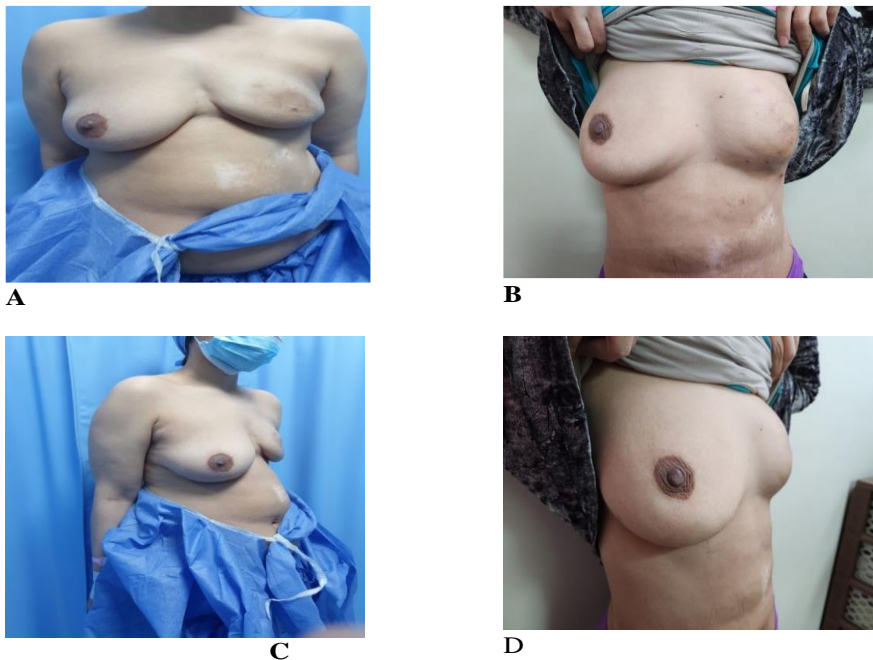
	<b>Mean</b>	<b>Standard Deviation</b>	<b>Median</b>	<b>Minimum</b>	<b>Maximum</b>
<b>Surgeon 1 assessment score</b>	3.90	1.14	4.00	2.00	6.00
<b>Surgeon 2 assessment score</b>	4.67	1.06	5.00	3.00	6.00
<b>Surgeon 3 assessment score</b>	4.43	1.08	4.00	2.00	6.00

The mean of Surgeon 1, 2 and 3 assessment score were 3.90, 4.67, 4.43 respectively. (Table 4)

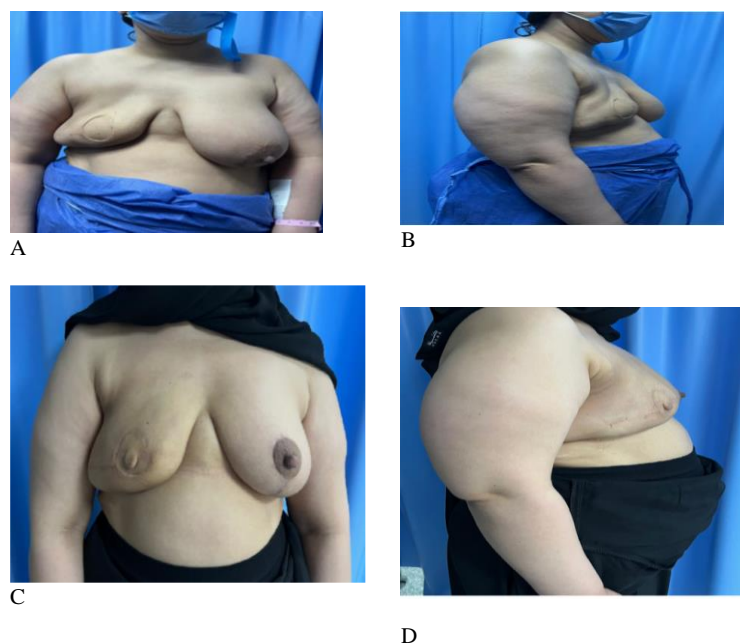
**Table (5): BCCT core software results**

		Count	%
BCCT Core 3.1 (in patients with contralateral symmetrizing procedure)	Good	5	100%

All patients had a result of “Good” (100%) by the software, which is a satisfactory result after post mastectomy reconstruction. (Table 5)

**Case presentation**

**Figure (1):** Patient (C) had a Lt breast SSM for an invasive breast cancer with an immediate LD flap reconstruction 18 months prior to lipofilling, received adjuvant chemotherapy and radiotherapy, A and C (Preoperative photo), B & D (Postoperative after two sessions of Lt breast fat grafting)



**Figure (2):** Patient (A) diagnosed with invasive breast cancer had a Rt breast skin sparing mastectomy with an immediate Latissimus Dorsi flap reconstruction, One year prior to lipofilling. She received

adjuvant chemotherapy and radiotherapy. A & B preoperative photo C & D 6 months postoperative (after Rt breast lipofilling and nipple reconstruction, left breast reduction mammoplasty wise pattern incision)

## DISCUSSION

The results show that fat grafting for correction of contour deformities in reconstructed breasts post-mastectomy is safe and improves aesthetic outcomes. Several authors have described good cosmetic outcomes after lipofilling, which agrees with our experience (10–12).

Postoperatively, one patient who had lipofilling for her reconstructed breast post-mastectomy LD flap reconstruction developed an infection of the grafted fat, which discharged pus from the fat injection sites in the breast.

She had another fat grafting session after 6 months to improve the contour deformities and skin irregularities in the reconstructed breast.

No other complications were reported; for some patients, there was mild ecchymosis of the abdomen that resolved over time, leaving no marks.

These findings are consistent with earlier research, such as the study by **Spear et al.**, which identified four issues in 47 treated breasts over an average follow-up period of 49 weeks. These complications included one case of cellulitis and three minor liponecrotic cysts (11).

**Missana et al.** documented five instances of lipo necrotic cysts, with no occurrence of early complications, following a total of 74 surgeries. The follow-up period lasted for 11.7 months (13).

In our study, radiological follow-up showed 4 patients with fat necrosis (19%), 2 patients with oil cysts (9.5%), and 13 patients with normal imaging (61.9%). 2 patients did not show up for follow-up imaging (9.5%).

Three patients (14.3%) developed palpable breast nodules; two of them (9.5%) had a biopsy, both showing fat necrosis on pathology.

This is comparable to retrospective research by **Dile, Pauline, et al.** on palpable nodules after lipofilling in breast cancer cases, where 176 patients underwent lipofilling after mastectomy and reconstruction, and of those, 37 (21%) developed palpable nodules (14).

In our study, we observed that the BREAST-Q scores were above 70 for satisfaction with the breast in 13 patients (62%).

These were patients who had a localized contour defect in the reconstructed breast, correctable by one or two sessions of lipofilling, and underwent nipple reconstruction in patients with skin sparing mastectomy.

Contralateral breast reduction in the indicated patients helped achieve symmetry with the reconstructed breast, giving a good cosmetic result.

In a cross-sectional study done at Helsinki University Hospital, assessing the BREAST-Q results in patients undergoing different methods of breast reconstruction post-breast cancer operation, The median score for satisfaction with breast was 61 (range 0–100, IQR 49–71) in all reconstruction types (15).

In our study, the median was 75 (range 33–92). This is not for the purpose of a direct comparison, but to show that our experience with lipofilling after breast reconstruction gave satisfactory results for our patients.

This was similar to a retrospective study by **Inkeri et al.** assessing the patients assessment of the outcome of lipofilling post-surgery for breast cancer (12).

The injected fat is believed to have regenerative abilities due to the presence of stem cells generated from adipose tissue. These stem cells facilitate the growth of new blood vessels in ischemic tissues, promoting their revitalization (16).

The mean surgeons assessment scores mentioned in Table VII are: surgeon 1 (3.90), surgeon 2 (4.67), and surgeon 3 (4.43) (range 2–6).

This shows that the majority of cases had an improvement in contour deformity after lipofilling; however, some patients did not achieve the expected degree of correction.

Postoperative resorption of injected adipose tissue is a widely recognized issue following lipofilling. Some authors advocate for overcorrection, while others favor many sessions of lipofilling (17).

Delay et al., who have a wealth of experience in fat transplantation to the breast, think that the body absorbs between thirty and forty percent of the injected fat. Therefore, they recommend overcorrection wherever feasible (9).

It is likely that in some of our previous situations, larger quantities or many sessions, or both, would have yielded more noticeable outcomes.

Patients with a reconstructed breast showing a discrepancy from the contralateral breast regarding size and ptosis, which was observed in some patients who had an LD flap reconstruction and received postoperative radiotherapy, did not achieve the best cosmetic results with lipofilling alone.

Some patients preferred not to have a contralateral breast reduction, instead opting to correct the discrepancy with lipofilling sessions.

This improves the contour defects and increases the size and projection of the breast, which showed after the second lipofilling session, but will not restore the symmetry between both breasts.

Seventeen patients (81%) were satisfied with the appearance of the abdomen, while four patients (19%) were dissatisfied.

Liposuction from the abdomen requires experience to achieve a good cosmetic result and avoid any contour discrepancy between the abdominal quadrants.

The use of different aspiration cannulas, suction from varying planes, and the breast surgeons' experience with liposuction help achieve a good result.

BCCT core software was used to objectively assess the postoperative results in cases where a contralateral symmetrization procedure was done, as some patients in our study did not wish to perform a contralateral symmetrizing procedure.

In these patients, the software assessment would not give a good result when aesthetically comparing both breasts.

In the five patients where the software was used, all had a result of "good" (100%) by the software, which is a satisfactory result after post-mastectomy reconstruction.

### **Limitations**

The main limitation in our research is the number of lipofilling procedures: 21 patients underwent lipofilling procedures, 13 (69.1%) cases had one session, and 8 patients had two lipofilling sessions (38.1%).

### **Conclusion**

Autologous fat grafting is a beneficial and relatively secure choice for enhancing the results of breast reconstruction after mastectomy. The treatment is technically simple and is linked to an extremely low likelihood of problems.

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