The role of lipofilling after oncoplastic breast surgeries: Evaluation of outcomes and patient satisfaction

Original Article

Mohamed Ahmed Rizk, Gamal Abdelhamid Eid, Ahmed Mohamed Abdullah, Mina Rashad Helmy and Moamen Shalkamy Abdelgawaad

Department of Surgery, Faculty of Medicine, Assiut University, Assiut, Egypt.

ABSTRACT

Background: Breast-conserving surgery has been established as the standard surgical treatment for most patients with early breast cancer, providing overall survival and recurrence rate equivalent. This work aimed to evaluate the outcomes of lipofilling (fat grafting) after breast-conserving surgery for patients with unilateral breast cancer.

Patients and Methods: This prospective study was carried out on 25 patients aged more than 18 years old, females only, with breast cancer that is a candidate for breast-conserving surgery. All patients were subjected to history taking, clinical examination (general examination and local breast examination), radiological assessment (breast ultrasound, mammography, MRI, and metastatic workup), biopsy (core biopsy), and laboratory investigations.

Results: The duration of hospitalization was 2 days in all cases. Early complications included wound infection (12%) and hematoma (4%). Late complications included clinically significant seroma (12%) and fat necrosis (8%). Neither of these patients required readmission. Additionally, no patients developed or showed any signs of recurrence during the scheduled 6-month follow-up visits. About surgeons' satisfaction, most surgeons reported very good results regarding the five aspects of the used score. The same was also reported when the same questionnaire was answered by the patients. Patient satisfaction showed satisfactory results about the surgery.

Conclusion: Lipofilling after breast-conserving surgery for breast cancer is a safe and efficacious procedure. The safety is manifested in the acceptable morbidity rate, while the efficacy is manifested by the excellent cosmetic outcomes after the procedure.

Key Words: Lipofilling, oncoplastic breast surgeries, outcomes, patient satisfaction.

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Corresponding Author: Mina R. Besada, MSc, Department of Surgery, Faculty of Medicine, Assiut University, Assiut, Egypt. **Tel.:** 01016633429, **E-mail:** minarashad36@gmail.com

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INTRODUCTION

Breast cancer is the most common malignancy in women worldwide and a global public health issue[1]. This disease is the most common type of female cancer in Egypt[2].

Progressive improvements in screening and treatment of breast cancer have been made in recent years[3]. Breast-conserving surgery has been established as the standard surgical treatment for most patients with early breast cancer, providing overall survival and recurrence rate equivalent to that of modified radical mastectomy but with substantially less impact on patient quality of life[1].

However, breast-conserving surgery for breast cancer led to breast defects and asymmetry compared to the other breast, thus compromising the esthetic outcome. This has necessitated the development of various oncoplastic techniques allowing for the excision of tumors with adequate safety margins and better cosmetic results[4].

Autologous fat grafting (AFG) is a minimally invasive breast reconstruction technique developed by Coleman[5,6] in which small amounts of the patient's fatty tissue are grafted into the breast defect to restore volume. Also, this is known as the "lipofilling," technique[7].

Although AFG has become an established part of breast reconstruction techniques in many centers, its oncologic safety is still a matter of debate. Several in-vitro and preclinical studies in animal models have suggested that stem cells in grafted fat may cause residual tumor cells in the resection defect to reproduce, thus predisposing to locoregional recurrence[8–10].

Conversely, many studies conducted in humans in subsequent years have demonstrated successful oncologic outcomes with AFG[11,12].

Additionally, despite its minimally invasive nature, as with any tissue transfer, complications have been described with AFG, such as palpable masses, fat necrosis, oil cysts, infection, changes in breast imaging, and donor site morbidity[13].

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The Egyptian literature is poor, with studies handling the safety and efficacy of lipofilling in patients undergoing breast-conserving surgery for breast cancer. That was a good motive for us to conduct the present study.

This work aimed to evaluate the outcomes of lipofilling (fat grafting) after breast-conserving surgery for patients with unilateral breast cancer. Although lipofilling can be done after breast tumor excision, whether it is a benign or malignant lesion, we concern here in this study about lipofilling after breast-conserving surgery in malignant tumors.

PATIENTS AND METHODS:

This prospective study was carried out on 25 patients aged more than or equal to 18 years old, females only, with breast cancer that are a candidate for breast-conserving surgery in whom the defect occurred after wide excision of the mass with a safety margin was large and was expected to result in bad cosmetic result. Such a limited number of patients included in this study is actually related to two factors: first is the limited number of cases that are candidates for such sophisticated operations after the marked advancement in oncoplastic operations with many techniques available now. The other factor is partially due to the cultural challenges in Upper Egypt, with most of the females refusing any esthetic operations even if they were aimed for reconstruction only. An informed written consent was obtained from the patients who agreed to do the breast cancer surgery and lipofilling.

The study was done after approval from the Ethical Committee and Institutional Review Board (IRB) of the General Surgery Department at Assiut University Hospitals from February 2023 till February 2024.

Exclusion criteria were age less than 18 years, bilateral or multicentric lesion, patient with locally advanced or metastatic breast cancer, patient refused operation, and previous breast surgeries.

All patients were subjected to history taking (personal history: name, age, sex, occupation, marital status, residence, and special habits), current complaint including breast lump, pain, or nipple discharge, analysis of each complaint regarding its onset, course, duration, associations, what increased and what decreased, review of other body systems, current medical comorbidities with their durations and commenced medications, previous surgical therapy, family history regarding breast cancer), clinical examination (general examination and local breast examination), radiological assessment (breast ultrasound, mammography, MRI, and metastatic workup), biopsy (core biopsy), and laboratory investigations [complete blood count, renal function tests (serum creatinine and blood urea nitrogen), liver function tests (serum albumin, bilirubin, hepatic transaminases, and international normalized ratio), random blood sugar, and virological workup including HCVAb, HBsAg, and HIVAb].

The surgical procedure

Preoperative markings were usually done with the patient in the upright position (Fig. 1). All procedures were performed under general anesthesia when the patient was in a supine position with his operated arm abducted for axillary exposure. A broad-spectrum antibiotic (cefotaxime 1 g) was administered at the time of skin incision. Initially, an excision of the tumor was done based on the oncoplastic surgery principles recommended for each patient (Figs 2–3). As noticed in these figures, the mass breast ratio was quite large, and the resulting defect after wide local excision with safety margin was large and would result in marked disfigurement with lateral displacement of the nipple–areola complex if it was closed primarily. Intraoperative frozen section to evaluate safety margins. Axillary evaluation or sentinel lymph node was done according to the indication of every case.

Donor site procedure

The tumescent solution (1 ml of epinephrine 1 : 500 000 diluted in 500 ml of 0.001% lactate ringer solution) was prepared to be injected into the donor site before starting the procedure. Epinephrine was added for better hemostasis as it induces vasoconstriction. A 50 ml syringe was connected to a blunt cannula with a 4-mm tiny bore for injection. For every cubic centimeter of the intended fat harvest volume, 1 ml of the solution was injected. Before beginning to extract fat, the surgeon waited for a minimum of 15 min. A 50 ml syringe fitted with a 2.5 mm manual aspiration cannula was used to remove the fat graft from abdominal subcutaneous tissue as in (Figs 4-6). The oily and liquid portions were separated using an operating towel rather than centrifugation (Fig. 7).

Fat transfer

The graft was then transferred to 1 ml syringes that were attached to a blunt needle of 1.4 mm. A blunt needle measuring 1.4 mm was used to inject the fat transplant into the subcutaneous and glandular breast tissue surrounding the surgical site. In order to obtain an appropriate breast contour, we typically overcorrected, projecting resorption of roughly 30–50% of the transferred volume. The amount of the injected fat was calculated and recorded. Digital massage was done after to disperse the fat graft to avoid fat lake formation. After the grafting, the adjacent tissue was closed with reabsorbing suture in an attempt to restore the breast shape (Figs 8, 9).

Postoperative care

All patients were transferred to the recovery room and then to the internal department, where closed monitoring

was done. Early mobilization was encouraged, and analgesia was maintained by oral paracetamol (1 g/8 h) and diclofenac sodium (50 mg/12 h). If the patient reported intolerable pain, i.v. opioids were commenced. All patients were discharged on the second day postoperative. They were instructed to change the simple dressing every 72 h.

The compressive dressing in the harvest site was kept in place for 5 days.

Adjuvant treatment

All patients received complementary radiotherapy to the breast in divided doses. Adjuvant chemotherapy and hormone therapy were prescribed according to the histological and immunohistochemical characteristics of the tumor.

Follow-up

Follow-up visits were arranged 1, 2, and 4 weeks after the procedure. Subsequent visits were arranged at 3 and 6 months. (Figures 10,11) showed regaining the contour of the breast without any disfigurement, depression, or change in original size. During clinical assessment of the patients, a radiological assessment by ultrasound or mammography was performed when indicated. Early, late complications and recurrence were recorded.

Esthetic outcomes as regards (breast size, shape, symmetry, scars appearance, skin color, and overall cosmesis) were evaluated by photographs 6 months after the surgery by using a Maass *et al*.[14] scale based on a 1–5 score. The patients were also asked to answer the same score to assess their satisfaction with the surgical procedure subjectively. The team's surgeons and other colleagues from the same institute were asked about their satisfaction.

The primary outcome was early (infection, flap necrosis, or hematoma) and late wound complications (fat necrosis or seroma formation). The secondary outcomes were esthetic outcomes and patient satisfaction regarding the procedure outcome.

Statistical analysis

Statistical analysis was done by SPSS, v28 (IBM, Armonk, New York, USA). Shapiro–Wilks test and histograms were used to evaluate the normality of the distribution of data. Quantitative parametric data were presented as mean and SD and were analyzed by unpaired Student t test. Quantitative nonparametric data were presented as the median and interquartile range and were analyzed by the Mann–Whitney test. Qualitative variables were presented as frequency and percentage and analyzed using the χ^2 test or Fisher's exact test when appropriate. Logistic regression was also used to estimate the relationship between a dependent variable and one (univariate) or more independent variables (multivariate). A two-tailed *P value* less than 0.05 was considered statistically significant.

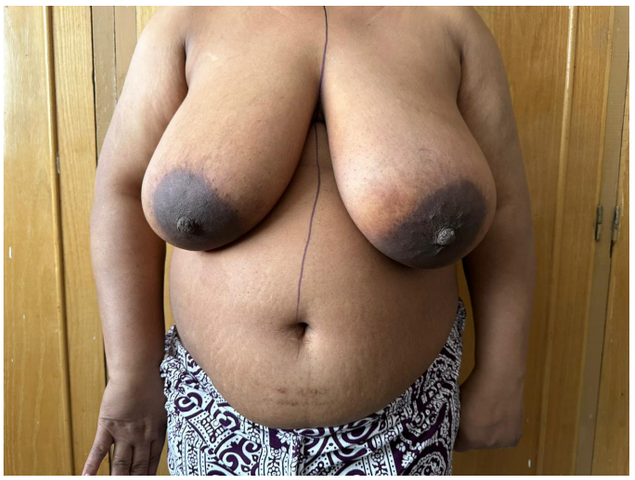

Fig. 1: Preoperative marking of breast mass in the upright position.

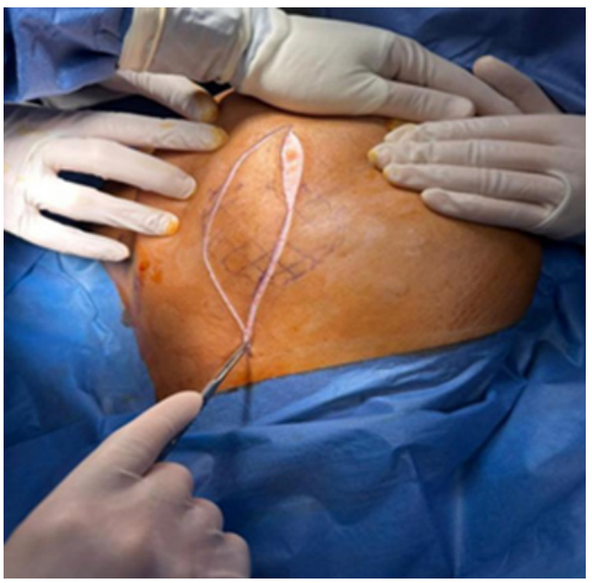

Fig. 2: Skin incision.

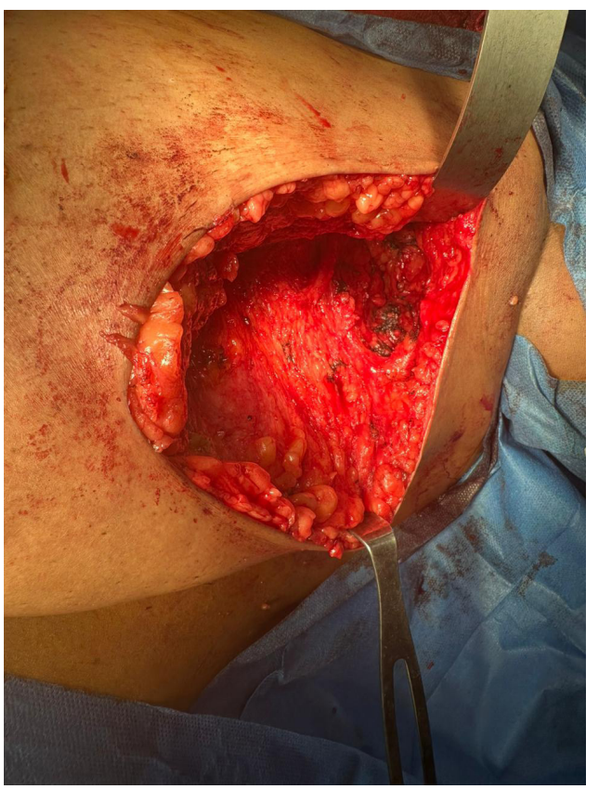

Fig. 3: Excision of the breast mass (breast-conserving surgery).

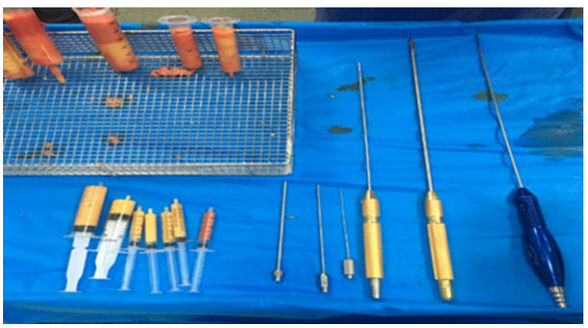

Fig. 4: Preparation of instruments and tumescent solution.

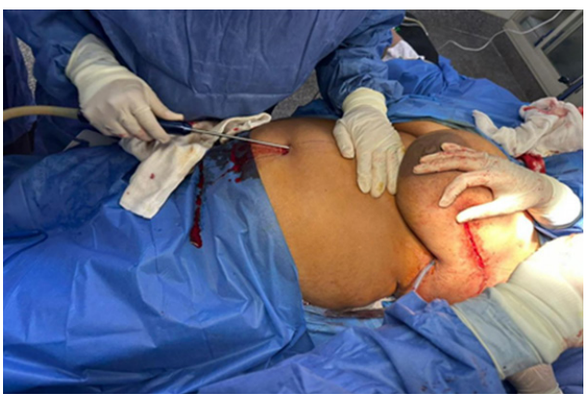

Fig. 5: Donor site procedure.

Fig. 6: Donor site procedure.

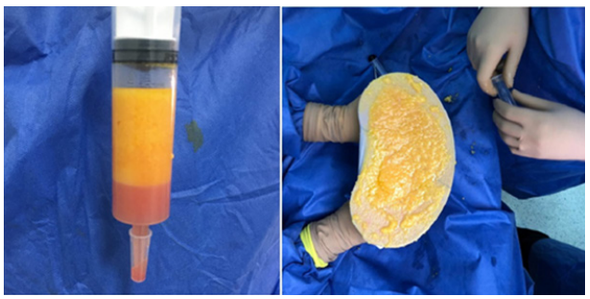

Fig. 7: Harvsted fat and separation of oily and liquid portions.

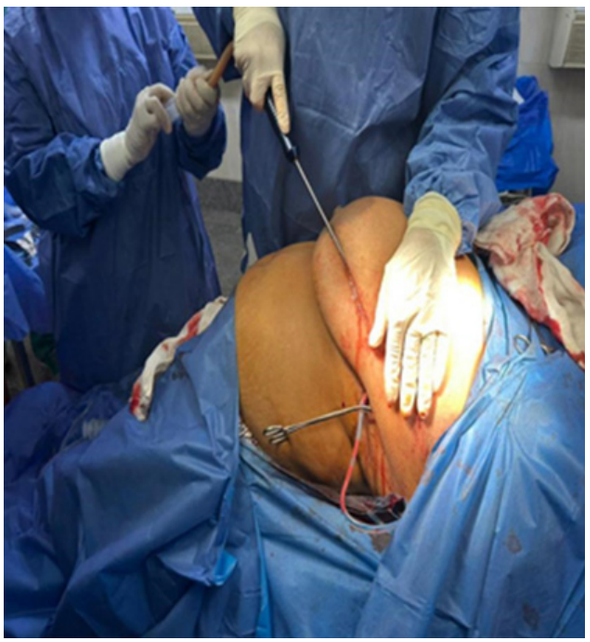

Fig. 8: Injection of harvested fat.

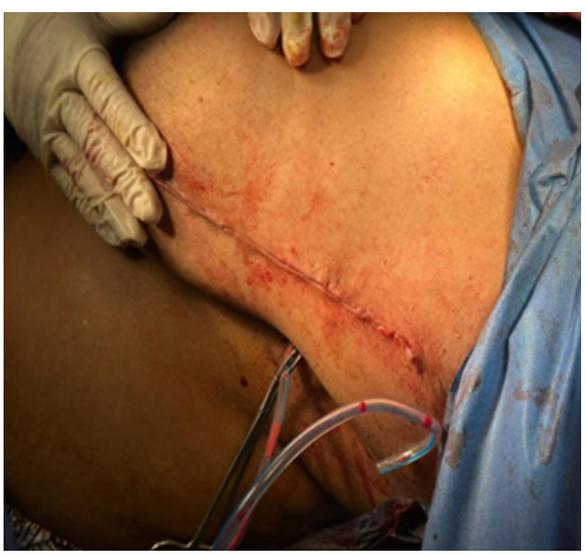

Fig. 9: Closure of wound.

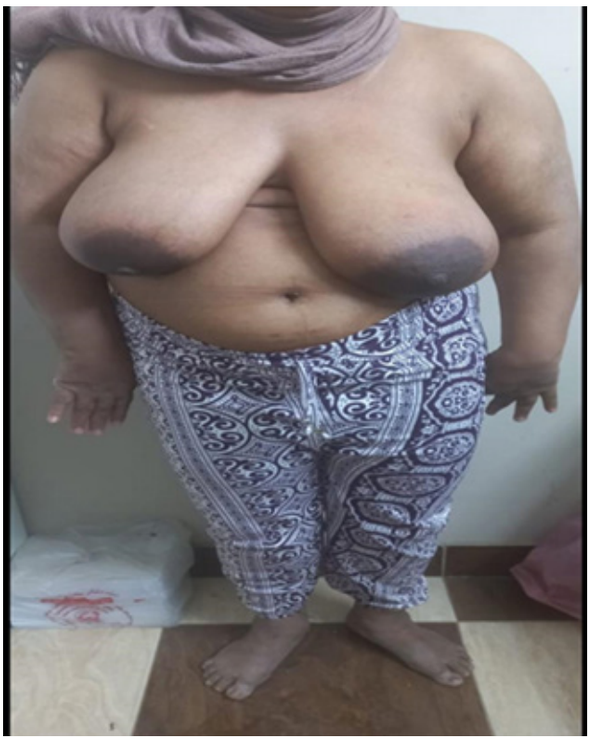

Fig. 10: Follow up after 6 months.

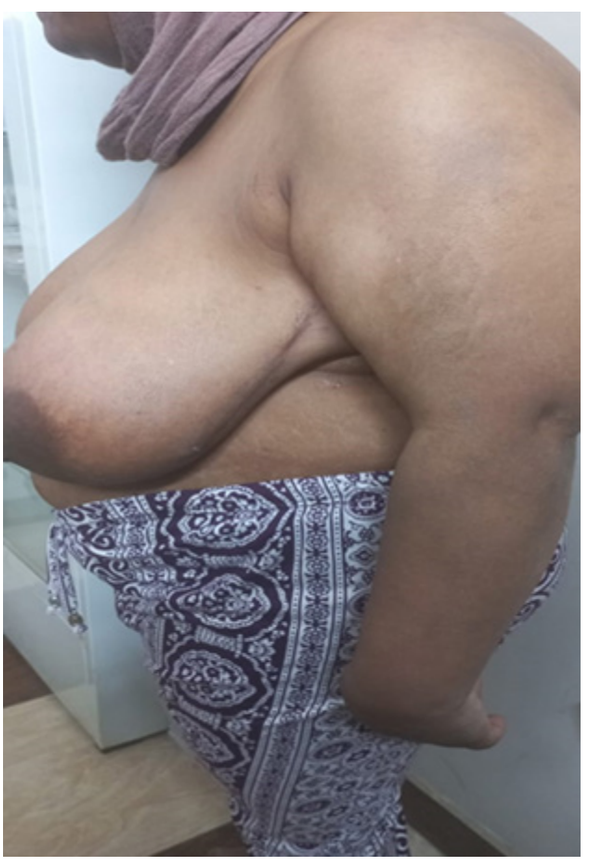

Fig. 11: Follow-up after 6 months.

RESULTS:

Table 1 shows the age of the included 25 cases ranged between 30 and 60 years (median=46). Their BMI had a median value of 33.6 kg/m^2 (range, 24.1–46.4 kg/m^2). Hypertension was the most prevalent medical comorbidity (28%), followed by diabetes mellitus (16%). Two patients reported a positive family history of breast cancer (8%). The right breast was affected in 60% of patients, while the remaining cases had a left-sided lesion. The size of these lumps ranged between 1.5 and 4 cm (median=2.5). No patients were commenced on neoadjuvant therapy prior to the surgical procedure. The procedures performed were as follows: lateral mastopexy (tennis racket mammoplasty) (32%), wide local excision (32%), batwing (20%), and round block technique (16%). The time needed for neoplasm excision ranged between 30 and 50 min (median=40), and the volume of the resected specimen had an average value of 140 ml (range, 100–300). The time needed for the liposuction procedure ranged between 30 and 90 min (median=50) while lipofilling time ranged between 25 and 60 min (median=40 min). Harvested fat volume had a median value of 200 ml (range 140–280).

On pathological assessment of the resected specimen, all cases were invasive ductal carcinoma (100%). All specimens had free surgical cut margins. TNM classification was as follow: stage I (12%), IIA (60%), and IIB (28%). According to lymph nodes, it should be N0 or N1; according to TNM staging (65%) were N1, and (35%) were N0. The duration of hospitalization was 2 days in all cases. Early complications included wound infection (12%) and hematoma (4%). Late complications included clinically significant seroma (12%) and fat necrosis (8%). Neither of these patients required readmission and were treated medically without any consequences and any noticeable effect on the final esthetic outcome or the patient's satisfaction. Regarding the complications, early complications were hematoma and wound infection; both are minor complications and were treated by repeated dressing or local gel for hematoma. Also, the late complications, either the seroma or fat necrosis, were minor complications, which were treated conservatively by aspiration in the case of seroma and antibiotics with antiedematous in the case of fat necrosis. None of the previous complications resulted in disfigurement or affected the final esthetic result. So, we got this high level of satisfaction from the patients as these minor complications were easily managed and did not affect the final esthetic outcome. Additionally, no patients developed or showed any signs of recurrence during the scheduled 6-month follow-up visits (Table 1).

About surgeons' satisfaction, by team assessment, they reported very good results regarding the five aspects of the used score. The same was also reported when the same questionnaire was answered by the patients. Patient satisfaction showed satisfactory results about the surgery (Table 2).

There was a significant agreement between surgeon and patient satisfaction scores, and that was manifested throughout the six aspects of the used score ($P<0.05$). The good cosmetic outcomes obtained after lipofilling could be explained by volume restoration, fine-tuning contour, scar camouflage, and improved breast symmetry, despite little complications happened as fat necrosis or infection, with no change in their satisfaction with the procedure (Table 3).

Old age and diabetes mellitus were significant risk factors for postoperative morbidity after lipofilling with breast-conserving surgery (Table 4).

Table 1: Patient characteristics, tumor-related criteria, operative data, pathological criteria, hospital stay, and complications

	Patients (*N*=25)
Demographic data	
Age (years)	46 (30–60)
BMI (kg/m^2)	33.6 (24.1–46.4)
Medical comorbidities	
DM	4 (16)
HTN	7 (28)
Positive family history of breast cancer	2 (8)
Tumor-related criteria	
Side	
Right	15 (60)
Left	10 (40)
Size (cm)	2.5 (1.5–4)
Neoadjuvant therapy	0
Operative data	
Surgical resection technique	
Lateral mastopexy (tennis racket mammoplasty)	8 (32)
Wide local excision	8 (32)
Batwing	5 (20)
Round block technique	4 (16)
Time needed for resection (min)	40 (30–50)
Volume resected (ml)	140 (100–300)
Liposuction time (min)	50 (30–90)
Lipofilling time (min)	40 (25–60)
Harvsted fat volume (ml)	200 (140–280)
Pathological criteria	
Tumor type	
Invasive ductal carcinoma	25 (100)
Lobular carcinoma	0
TNM class	
I	3 (12)
IIA	15 (60)

IIB	7 (28)
N0	8 (35)
N1	17 (65)
Resection margins	
Free	25 (100)
Infiltrated	0
Hospital stay and complications	
Hospital stay (day)	1 (1–2)
Early complications	
Wound infection	2 (8)
Hematoma	1 (4)
Skin flap necrosis	0
Late complications	
Fat necrosis	2 (8)
Clinically significant seroma	3 (12)
Readmission	0
Recurrence	0

Data are presented as median or frequency (%).
DM, diabetes mellitus; HTN, hypertension; TNM, tumor-node-metastasis.

Table 2: Surgeon and patient satisfaction with the cosmetic results

Esthetic outcome	Score out of (5)	Study group (*N*=25)
Surgeon satisfaction		
Size	4	2 (8)
	5	23 (92)
Shape	4	8 (32)
	5	17 (68)
Symmetry	3	1 (4)
	4	7 (28)
	5	17 (68)
Skin color	3	4 (16)
	4	16 (64)
	5	5 (20)
Scar appearance	3	6 (24)
	4	14 (56)
	5	5 (20)
Overall cosmesis	3	1 (4)
	4	6 (24)
	5	18 (72)
Patient satisfaction		
Size	4	4 (16)
	5	21 (84)
Shape	4	11 (44)
	5	14 (56)
Symmetry	3	3 (12)
	4	8 (32)
	5	14 (56)
Skin color	3	2 (8)
	4	17 (68)
	5	6 (24)
Scar appearance	3	8 (32)
	4	13 (52)
	5	4 (16)
Overall cosmesis	3	2 (8)
	4	8 (32)
	5	15 (60)

Data are presented as frequency (%).

Table 3: Agreement between surgeon and patient satisfaction

Variables	Observer 1 (*N*=25)	Observer 2 test of (*N*=25)	*P* value
Size			
4	2 (8)	4 (16)	0.002*
5	23 (92)	21 (84)	
Shape			
4	8 (32)	11 (44)	0.032*
5	17 (68)	14 (56)	
Symmetry			
3	1 (4)	3 (12)	0.001*
4	7 (28)	8 (32)	
5	17 (68)	14 (56)	
Skin color			
3	4 (16)	2 (8)	0.001*
4	16 (64)	17 (68)	
5	5 (20)	6 (24)	
Skin appearance			
3	6 (24)	8 (32)	0.001*
4	14 (56)	13 (52)	
5	5 (20)	4 (16)	
Overall cosmosis			
3	1 (4)	2 (8)	0.001*
4	6 (24)	8 (32)	
5	18 (72)	15 (60)	

Data are presented as frequency (%).
*Significant as *P value* less than 0.05.

Table 4: Regression analysis for postoperative morbidity

		Multivariate analysis		
Variables	Univariate analysis	OR	95% CI for OR	*P* value
Age	0.031*	1.462	0.823–1.945	0.212
BMI	0.278	-	-	-
Controlled DM	0.015*	1.607	0.753–1.877	0.196
Controlled HTN	0.736	–	–	–
Positive family history	0.846	–	–	–
Side of lesions	0.582	–	–	–
Size of lesions	0.115	–	–	–
Surgical resection	0.720	–	–	–
Time of resection	0.125	–	–	–
Liposuction time	0.238	–	–	–
Lipofilling time	0.203	–	–	–
Harvested fat volume	0.052	–	–	–
Tumor type	0.501	–	–	–
TNM	0.163	–	–	–

CI, coefficient interval; DM, diabetes mellites; HTN, hypertension; OR, odds ratio; TNM, tumor-node-metastasis.

DISCUSSION

Breast-conserving surgery, which only removes the tumor or the quadrant where the tumor is located, is gaining acceptance, representing nowadays around 75% of procedures in breast oncological surgeries, because of esthetic results, quality of life, and patient satisfaction[15].

As the esthetic result has become an important part of breast cancer surgeries, new surgical techniques of breast reconstruction have been developed[16]. Breast reconstruction after breast-conserving surgery for cancer is an option that allows women to restore the shape, symmetry, and appearance of the breast[17].

There are several options for breast reconstruction after breast-conserving surgery. The choice of technique depends on factors such as the size and location of the tumor, the amount of breast tissue removed, the patient's body shape, and their preferences[18].

AFG (lipofilling) is widely used in plastic surgery to restore contour, increase volume, and give a symmetrical shape in breast reconstructive surgery[19]. Despite the advantages of lipofilling, it has some drawbacks, such as the risk of fat necrosis[20].

Moreover, while using lipofilling in breast reconstruction, including after breast-conserving surgery, long-term data on its safety, durability, and impact on cancer outcomes are still limited[1,21].

The current study was conducted at Assiut University Hospital, aiming to study the safety and efficacy of lipofilling after breast-conserving surgery for breast cancer. The study enrolled 25 ladies diagnosed with breast cancer whose age range between 30 and 60 years (median=46).

Khater *et al*.[22] reported that the mean age of their breast cancer participants was 47.5±11.0 years (range, 26–80 years). Additionally, Alieldin *et al*.[23] reported that the median age at diagnosis was 49.1 years (range, 23–90 years).

In the current study, the BMI of the included cases had a median value of 33.6 kg/m^2 (range, 24.1–46.4). The mean of the previously reported BMI lies within the BMI zone of obesity, and that could reflect the high prevalence of obesity in Egypt that was mentioned in the "One Million Health" survey[14].

In the current study, the size of breast masses ranged between 1.5 and 4 cm (median=2.5). Stumpf *et al*.[24] reported that the diameters of the resected masses had a mean value of 2.43±1.05 cm. Khan *et al*.[25] reported a median tumor size of 2.1 cm (range, 0.7–6 cm).

We ensured safety margin clearance from malignant tissue in all patients by intraoperative frozen section before starting fat implantation[21].

We preferred to perform immediate lipofilling rather than the delayed one. The advantages of immediate reconstruction have proved to be much higher than the possible disadvantages: increased microsurgical flap survival rate, decreased rates of morbidity, and reduced surgical time[15].

In our study, we preferred to gather fat from the abdominal wall rather than any other sites.

In our research, we intend to overcorrect the deficits by injecting harvested fat with more volume than the excised breast tissue. That was manifested by the increased values of graft volumes versus resected volumes. Biazus *et al*.[16] reported that the median volume of fat graft used was 128.2 ml (45–320 ml), being 2.7 times larger than the median resected volume (46.6 ml).

After fat grafting, a percentage of the grafted fat may not survive and be absorbed by the body. Studies have shown that the percentage of fat that survives can vary, but generally, it ranges from 30 to 70%[26]. By overcorrecting, the surgeon accounts for this absorption and ensures that an adequate volume of fat remains in the breast to achieve the desired outcomes[27].

In the current study, the duration of hospitalization was an average of two days. Biasio *et al*.[28] reported a mean hospitalization period of 3.27±0.61 days for the same procedures in the same cases. However, the reader should accept some differences between studies regarding the hospitalization period that could depend on center protocol, patient criteria, and the incidence of postoperative complications.

Our findings revealed that invasive ductal carcinoma was the only cancer type (100%). Biazus and colleagues reported that invasive ductal carcinoma was the most common pathology (99.2%), whereas the remaining patients (0.8%) had invasive lobular carcinoma. Biasio *et al*.[28] also reported that invasive ductal carcinoma was detected in 97.6% of their participants, making it the most common type of breast cancer.

Our study revealed the incidence of wound infection in 8% of cases. This is a clean surgical procedure. Few studies have reported an incidence of less than 5.0%, and most publications report an incidence of between 10. 2 and 30%[29], while the incidence of fat necrosis in 8% of cases[30].

In the current study, postoperative hematoma occurred in only one (4%) patient. Our incidence of hematoma lies within the reported range of incidence of the same complication, which ranges between 2 and 10%[31,32].

No patients developed skin flap necrosis in the current study. Nonetheless, reported rates of skin flap necrosis in the literature range from 2 to 22% in prospective studies, including breast cancer resection cases with reconstruction[33].

In the current study, clinically significant seroma was encountered in 12% of cases. Our incidence lies within the reported range for the same adverse event in the literature, which ranges between 3 and 85%[34].

Stumpf *et al*.[24] reported that performing immediate lipofilling in association with breast-conserving surgery did not have a significant impact on recurrence (3.7 vs. 4.2% in the breast-conserving therapy alone group – $P>0.05$).

Studies analyzing the oncological outcome of AFG have declared this procedure to be safe even with a longer mean follow-up than ours[35,36]. It must be stressed that in all aspects considered in the current literature, so far, nothing has demonstrated the worsening of oncological outcomes as a result of using these techniques[37–39].

Additionally, prospective, clinical case–control studies have shown no increased clinical risk of breast cancer in patients treated who underwent fat grafting[11,39].

Our findings showed that postoperative cosmetic outcomes were excellent from the surgeon and patient perspectives.

Ahmed *et al*.[20] confirmed the previous findings, as 52 (96.30%) patients reported postoperative satisfaction after immediate lipofilling. Moreover, Biazus *et al*.[35] reported that the esthetic scores were considered very good in the majority of cases.

Largo *et al*.[9], in a systematic review, reported that seven out of 12 studies aimed at gaining volume after fat grafting had excellent results. In addition, Moltó García *et al*.[15] reported that breast symmetry reached was significant for both the surgeon and the patient. The satisfaction survey was highly rated, since more than 90% of patients have given the highest score.

Furthermore, Biasio *et al*.[28] reported that in their study group, 75% (27/36) of women declared an excellent esthetic result at an 18-month follow-up, the other 25.0% (9/36) declared a good esthetic result, and none declared a poor result.

Other studies agreed with our findings regarding the relationship between old age and morbidity after breast surgery[40,41].

Limitations:

A relatively small sample size. Additionally, it lacks intermediate and long-term follow-up. More studies should be conducted to cover the previously mentioned drawbacks.

CONCLUSION

Lipofilling after breast-conserving surgery for breast cancer is a safe and efficacious procedure. The safety is manifested in the acceptable morbidity rate, while the efficacy is manifested by the excellent cosmetic outcomes after the procedure.

CONFLICT OF INTEREST

There are no conflicts of interest.

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