

# Value of immediate dermal fat graft in breast reconstruction during conservative surgery for breast cancer

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## Background

Being the symbol of femininity and motherhood, the breast is very precious to every female and its absence due to mastectomy due to cancer has a very negative impact on physical and psychological life for females. Breast-conserving and breast-reconstructive surgeries are the solution for these problems, while free autologous fat grafting is one of these options, and this study is designed to evaluate its efficiency.

## Patients and methods

During the period from June 2016 to November 2020, a prospective study was performed over 45 patients who have undergone immediate dermal fat grafting aiming for breast reconstruction during conservative surgery for breast cancer. The follow-up period ranged from 4 to 40 months.

## Results

The excised specimen volume size (tumor + safety margin) was 120 cm<sup>3</sup> ranging from 95 to 145 cm<sup>3</sup> and its weight was 55 g, ranging from 35 to 110 g. Although the graft volume was 140 cm<sup>3</sup> with a range of 120–170 cm<sup>3</sup> and its weight was 65 g ranging from 45 to 130 g. Last, the maximum surgical margin was 33 mm with a range of 27–42 mm. The results showed that for objective cosmetic satisfaction, the authors got excellent results in 15.55% of patients, while 62.23% were good, and 22.22% got a fair result with no poor ones. The subjective patient satisfaction was excellent in 48.88% of patients, 40% were good, and 11.12% got a fair result with no poor ones. The total actual number of patients who faced complications was 17.8%, which were all resolved and managed quickly with conservative methods.

## Conclusions

Immediate dermal fat grafting in breast reconstruction during conservative surgery for breast cancer is a reliable, simple, safe, efficient, and rapid method for breast reconstruction with a very big advantage from being an autologous tissue with a relatively low rate of complications.

## Keywords:

breast cancer, breast reconstruction, free dermal fat graft

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## Introduction

Since the beginning of the recorded time, the breast has been considered as a symbol of motherhood, femininity, and sexuality. The breast is always shown as a central focus of a woman's anatomy [1,2].

The Ancient Egyptians were the first who described the tumors of the breast starting nearly 3500 BCE, as documented in Origins of Medical Papyri by two very special papyri: The Edwin Smith Surgical Papyrus and The Ebers Papyrus [3].

Breast cancer affects both sexes and is considered the most frequent type of cancer in women worldwide. Its incidence rises dramatically with age. It reportedly accounted for 29% of all new cancer cases and 14% of all cancer-related deaths among women worldwide up to 2012, with 1.7 million new cases and 522 000 deaths in 2012 [4]. One of every eight women in the

United States will develop breast cancer in their lifetime, and from the total female cancer cases in Egypt, breast cancer represented 35.1% [5,6]. Breast cancer is the second leading cause of cancer death among women. The surgical treatment still is the best option for those patients [7]. Yalom's [8] work illustrates how and why the breast is an important symbol of femininity throughout history and still is continuing to be so important to women in today's modern societies, giving a very fluent and inclusive description as both (life-giving) and (life-destroying). This gives the essence for why breast surgeons must be trained with a keen sense of blending science and art.

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The breast loss after mastectomy has great psychological and sexual effects. The external breast prosthesis is a good option for masking the breast loss from the outer world, but it is not the best option for females as it is not incorporated into a woman's body image, so it does not always help her address the sense of deformity, contrary to the breast-conserving surgery (BCS), which leaves a woman's body image intact [9].

Breast-reconstruction procedures have evolved so much with the development of implants and the rising of autologous reconstruction. Implant-based reconstruction has improved with the invention of form-stable silicone implants, acellular dermal matrix, and fat grafting [10].

The problem that may face the surgeons is that BCS may not always reach a satisfactory cosmetic outcome, especially in patients with large tumors, smaller breasts, or tumors located at the junction of the upper quadrants of breast and at the inner quadrants. Among the advances in BCS, immediate autologous fat grafting is a promising technique for partial breast reconstruction after BCS. It has the advantage of enabling the reconstruction of defects in areas difficult to repair, particularly in the upper inner quadrants. It also may decrease the need for major glandular or myocutaneous flaps mobilization, and it is associated with high patient and physician satisfaction [11].

The purpose of this paper is to present the preliminary results of immediate dermal fat graft in breast reconstruction during conservative surgery for breast cancer.

### Patients and methods

During the period from June 2016 to November 2020, a prospective study was performed over 45 patients who have undergone immediate dermal fat grafting in partial breast reconstruction during conservative surgery for breast cancer. The study took place in Menoufia University Hospitals in Shebien Al Kom, Egypt. It was approved by the hospital ethical committees and the described work has been carried out in accordance with the Code of Ethics of the World Medical Association. An informed consent was obtained from all included patients, and they had been informed that the cosmetic results may be affected if they received adjuvant radiotherapy.

### Preoperative work

Detailed history taking, complete clinical examination, laboratory and radiological investigations (including

pre- and postoperative ultrasound and mammogram), cytological examination by fine-needle aspiration cytology or true cut-needle biopsy, and complete preoperative metastatic workup were performed for every patient. We excluded from our study any female who has advanced breast cancer, T3, T4, or N2, multicentric tumor, or bilateral cases such as lobular carcinoma, pregnancy, and metastatic cases, and cases with tumor with its safety margin-excised specimen size or volume are expected to be less than 20% or larger than 40% of the original breast size, and contraindication of radiotherapy (skin disease, systemic lupus, or previous radiation).

### Surgical technique

Before anesthesia, the patients stand up and an accurate marking of the breast and the free dermal fat graft (FDFG) defects was done. A lumpectomy with safety margin 2–4 cm, including the underling pectoral fascia, was done and confirmed by the frozen section to insure its negativity intraoperatively (Figs 1 and 2A). Axillary dissection was done and then meticulous hemostasis of both pectoral and axillary beds (Fig. 2B). After that, the defect inside the breast was measured with accurate measurement of size and weight of the excised specimen to reinsure the size of FDFG that was harvested from the lower abdomen.

The FDFG was harvested using a low elliptical incision that makes the resulting linear scar to be hidden under the bikini line. After *in situ* de-epithelialization and

Figure 1



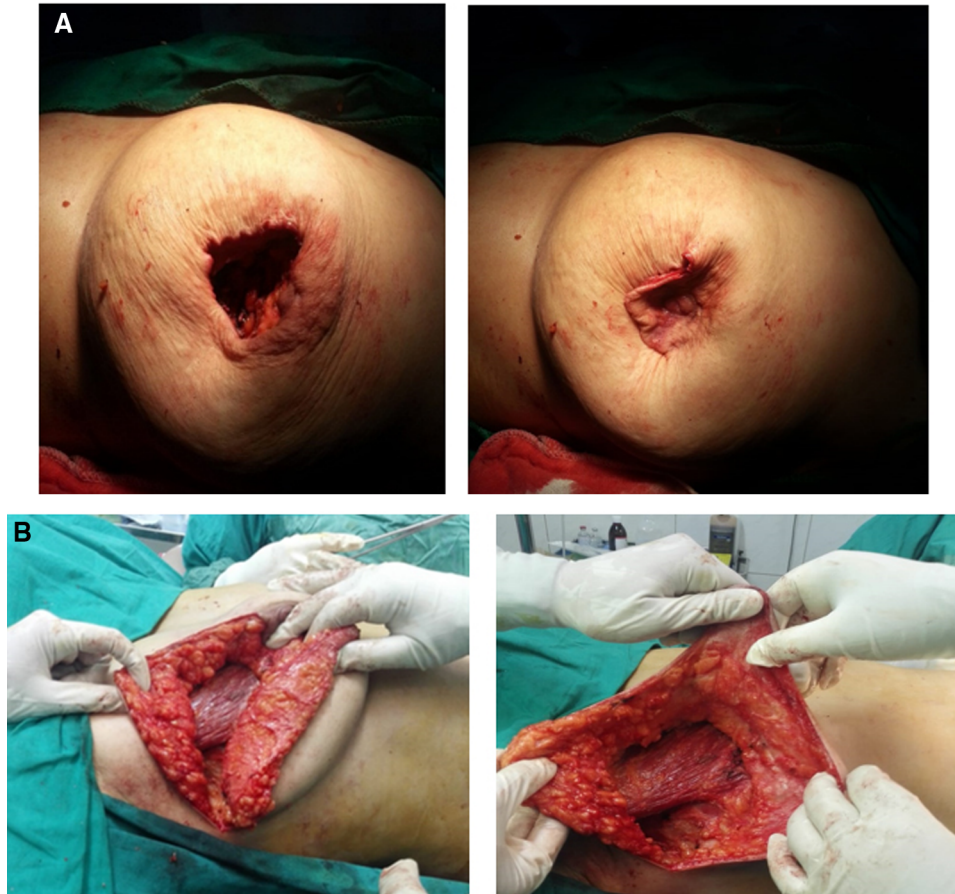
Excision of breast mass.

sharp dissection, FDFG was harvested as a fusiform or ellipse-shaped specimen (Fig. 3).

Then trimming and tailoring were done of the FDFG based on breast-excised specimen-measured values and was 20% more in size, simulating its shape (Fig. 4).

Here we should document that during reshaping of the FDFG, we had to take great care to make it thinner while replacing tumors at the upper parts of the breast and thicker while replacing tumors at the lower parts and beneath the nipple and areola to have a more natural cosmetic result. FDFG was inserted in an

**Figure 2**



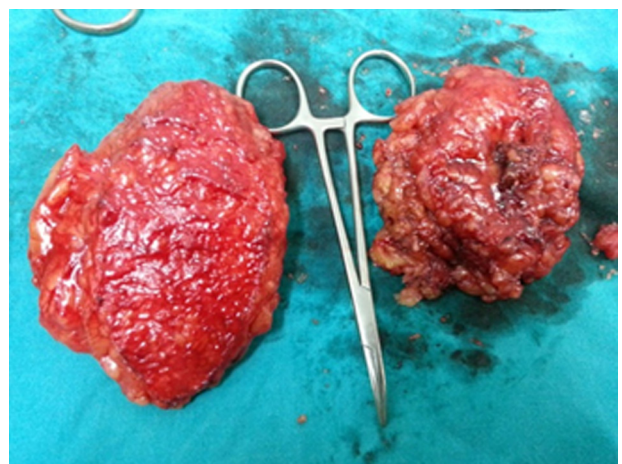
(A) Breast defects after excision of specimen. (B) Breast defects after excision of specimen showing the axillary dissection (different cases).

**Figure 3**



Donor site after excision of dermal fat graft.

**Figure 4**



The excised specimen and graft before trimming.

ideal direction that fits the dermis and irregular defects, with the dermis facing the surface of the pectoralis major muscle, so the revascularization between these two surfaces could take place (Fig. 5). A good fixation took place of the graft along its periphery with interrupted Vicryl 4/0 sutures, then after good fixation of the whole graft, the skin was closed in two layers with suction drain inserted at the excision bed and axilla (Fig. 6).

Finally, a firm but not tight dressing and elastic bandage are applied and the patient followed up in the immediate postoperative period to detect complications such as hemorrhage and rejection. The patients received antibiotics, antiedematous, and analgesic treatment, and discharged when the drain stopped mostly at 2 days postoperative, and replaced the bandage by compression sport bra to attain immobilization of the graft.

The donor site was closed in two layers by Vicryl 3/0 sutures in subcutaneous fatty tissue and by Prolene 5/0 for dermis after putting a suction drain.

The patients were discharged on a regular discharge basis after 2 days, then the patient followed up in a

planned outpatient clinic visit after 2 weeks, after 1 month, and then after 3 months with doing a postoperative sonomammogram at this time for evaluation of graft vascularity and ensuring its viability. Finally, the same process was carried out every year later by sonomammogram.

The follow-up period ranged from 4 to 40 months, patients were followed up clinically and radiologically where the implanted FDFG was easily seen using mammography and ultrasonography (Figs 7 and 8). The living implanted FDFG was seen as a solid mass with lower internal echo than the normal gland and subcutaneous adipose tissue with no degenerations or cyst formation.

## Results

During the study period, 45 female patients with breast cancer had been treated by conservative lump excision with immediate FDFG from which 31.1% were premenopausal and 68.9% were postmenopausal. The mean age was 54 years with a range of 37–65 years. Patient comorbidities were diabetes mellitus (DM) 35.55%, hypertension (HTN) 40%, and chronic liver disease 15.5%. The operative

**Figure 5**



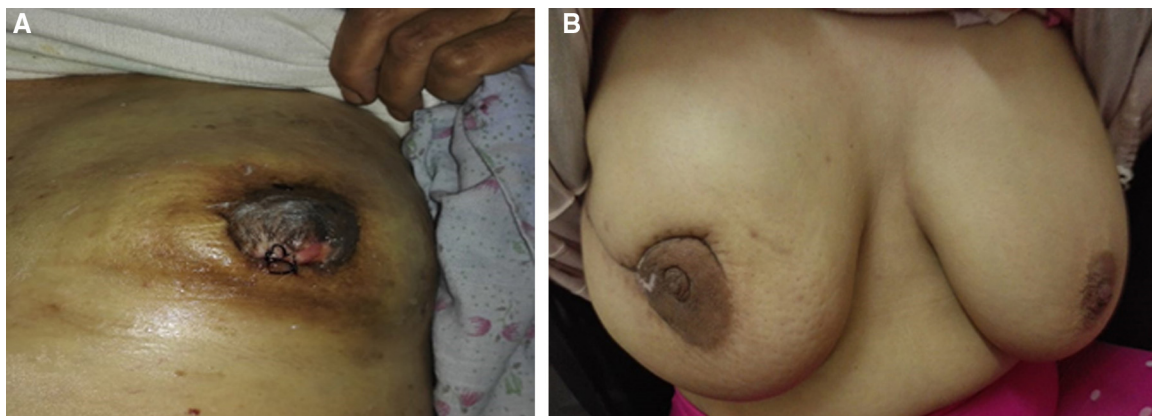
The graft after trimming in the breast pocket (different cases).

Figure 6



Breast after wound closure (different cases).

Figure 7

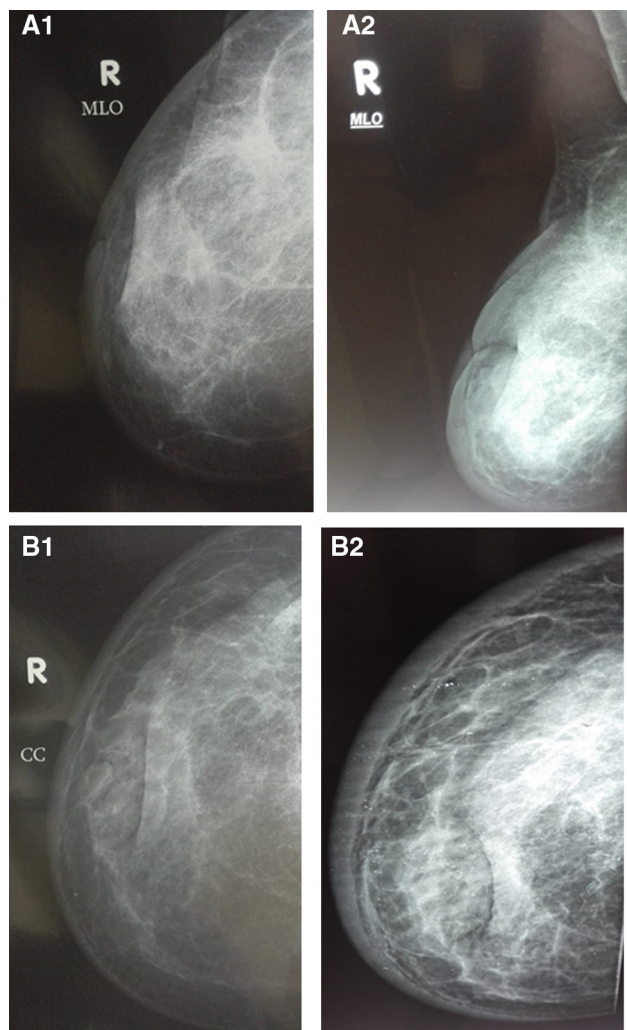


(A) A case during early follow-up. (B) Another case at 6-month postoperative follow-up.

side was the right side in 46.5%, where it was the left side in 53.5% of patients. The excised specimen volume size (tumor+safety margin) was 120 cm<sup>3</sup> ranging from 95 to 145 cm<sup>3</sup> and its weight was 55 g, ranging from 35 to 110 g, while the graft volume was 140 cm<sup>3</sup> with a range of 120–170 cm<sup>3</sup>

and its weight was 65 g ranging from 45 to 130 g. Last, the maximum surgical margin was 33 mm with a range of 27–42 mm (Table 1). The mean length of the BCS operation was 105 min with a range of 95–120 min, while the mean length of the FDFG operation was 52 min with a range of 40–65 min, and

Figure 8



(A1) A preoperative mammogram MLO view. (A2) A postoperative mammogram MLO view. (B1) A preoperative mammogram CC view. (B2) A postoperative mammogram CC view.

the mean estimation blood loss for both operations was 220 cc with a range of 150–300 cc (Table 2).

Postoperative complications were divided as complications for the breast wound and complications for the donor-site wound. The breast wound complications were infection in 8.9% of patients, seroma 11.1%, and partial flap necrosis 2.2%, giving a total complication rate of 22.2%, while the total actual number of patients who faced complications was 17.8%, and this was due to occurrence of more than one complication in some patients. No hematoma or total flap loss has been occurred with any of our patients. Whereas the donor-site complications were seroma in 6.6% of patients, and infection 4.4%, giving the total sum of complications 11%, the total actual number of patients who faced complications was 8.9%. This is due to occurrence of more than one complication in

some patients. No hematoma or need for donor-site grafting has been occurred with any of our patients (Table 3).

We here should document that the vast majority of complications occurred either in breast wound or donor-site wound in patients with comorbidities, especially DM and chronic liver disease. Also, we should document that all complications responded fairly to the conservative measures in their treatment with no need for secondary operative measures, and like all other patients, passed a smooth recovery period.

We adopted the Objective and Subjective Assessment (Sawai's cosmetic assessment, Japanese Breast Cancer Society) as our method for postoperative cosmetic assessment where it contains eight items: breast size; breast shape; wound scar; softness of the breast; shape and size of nipple–areola; color of nipple–areola; level of the nipple (difference in the distance from the suprasternal notch in bilateral nipples); the lowest point of the breast (difference of bilateral breasts). The cosmetic outcome was considered to be excellent when the total score was 12 points, good when it was 9–11, fair when it was 5–8, and poor when it was 0–4 (Table 4) [12]. According to Objective and Subjective Assessment (Sawai's cosmetic assessment, Japanese Breast Cancer Society), our results showed that we got excellent results in 15.55% of patients, while 62.23% were good, and 22.22% got a fair result with no poor result. The subjective satisfaction according to the patients for the results they had was excellent in 48.88% of patients, while 40% were good, and 11.12% got a fair result with no poor result (Table 5).

## Discussion

Nearly most of researches documented that breast conservation or restitution decreases the negative effect of breast cancer on the woman's sexual life, and a good cosmetic result has a marked effect on subsequent psychological outcomes [13,14]. Since the 80s of the last century, the breast-conserving surgeries became rapidly the first-line procedures for early-stage breast cancer with ensuring local control and accepted cosmetic results [15]. But with increasing usage of these procedures, a big problem rises to the surface when the breast is small or large volumes should be excised, which resulted in nonsatisfactory cosmetic outcomes, and this led to evolution of reconstruction era [16]. Fat tissue engineering provides a unique chance for surgeons to rebuild the mound of the breast with a very simple surgical approach. The fat

**Table 1 Patients and tumor characteristics of the studied group**

Study (N=45)		
Age in years		
Mean age=54		Range=37–65
Menopausal status		N (%)
Pre		14 (31.11)
Post		31 (68.89)
Comorbidity		
DM		16 (35.55)
HTN		18 (40)
Chronic liver disease		7 (15.55)
Tumor side		N (%)
Right		21 (46.55)
Left		24 (53.35)
Tumor site		N (%)
UOQ		25 (55.55)
LOQ		9 (20.0)
UIQ		2 (4.45)
LIQ		3 (6.66)
Central		6 (13.34)
Excised specimen volume size (tumor + safety margin)	120 cm <sup>3</sup>	95–145 cm <sup>3</sup>
Excised specimen weight (tumor + safety margin)	55 g	35–110 g
Maximum surgical margin	33 mm	27–42 mm
Graft volume	140 cm <sup>3</sup>	120–170 cm <sup>3</sup>
Graft weight	65 g	45–130 g

DM, diabetes mellitus; HTN, hypertension.

**Table 2 Operative characteristics**

Length of the operation (BCS)	Mean=105 min	Range=95–120 min
Length of the operation (FDFG)	Mean=52 min	Range=40–65 min
Estimation blood loss	Mean=220 cc	Range=150–300 cc

BCS, breast-conserving surgery; FDFG, free dermal fat graft.

**Table 3 Postoperative complications**

Postoperative complications	N (%)
For the breast wound	
Infection	4 (8.9)
Seroma	5 (11.1)
Partial flap necrosis	1 (2.2)
Hematoma	0 (0.0%)
Complete necrosis of the flap	0 (0.0)
Total actual number of patients who faced complications	8 (17.8)
To the donor	
Need for graft	0 (0.0)
Infection	2 (4.4)
Seroma	3 (6.6)
Hematoma	0 (0.0)
Total actual number of patients who faced complications	4 (8.8)

grafting for breast-reconstruction surgery can decrease volume, shape, and symmetry defects, and it would help to avoid possible late effects of radiation on the skin and breast tissue [17,18]. Since the beginning of

using the fat grafting and throughout its usage, it was found that some shrinkage in its size occurs [19–21]. Mackay *et al.* [22] explained this in his experiment on animal models by partial replacement of host fibrous tissue to the graft adipose tissue with clinical preservation of the graft pliability and texture for years after implantations. Nosan *et al.* [23] suggested that there are many factors responsible for the variations in volume loss of the implanted graft, like traumatic handling of the graft, inadequate immobilization, hematoma, wound infection and poor vascularity of the tissue implanted, or extensive graft thickness. They also documented that the resorption may range from 10 to 40% from the original size. Shima *et al.* [24] described that shrinkage of the grafts was 21.6 and 25.2% after 3 years of follow-up. For this reason, in our study, we had harvested the graft with nearly 20% overcorrection of the size of the original excised specimen where the excised specimens were 55 g, with a range of 35–110 g, and the FDFGs were 65 g, with a range of 45–130 g. This is also compatible with Kijima *et al.* [21], who had

**Table 4 Objective and subjective assessment (Japanese Breast Cancer Society)**

Assessment item	Point of view
Size of breast	
2	No visual difference
1	A slight difference
0	A significant difference
Shape of breast	
2	No visual difference
1	A slight difference
0	A significant difference
Scar	
2	Unapparent
1	Apparent
0	Significantly apparent
Softness of breast	
2	Equivalent and soft
1	Slightly firm or partially firm
0	Quite firm
Size and shape of nipple–areola	
1	No difference
0	Some difference
Color of nipple–areola	
1	No difference
0	Some difference
Level of the nipple (difference in the distance from the suprasternal notch in bilateral nipples)	
1	Unapparent difference
0	Apparent difference
Level of the lowest point of the breast	
1	A difference of less than 2 cm
0	A difference of larger than 2 cm
Total score (assessment)	
12	Excellent
9–11	Good
5–8	Fair
0–4	Poor

Japanese Breast Cancer Society. Cosmetic assessment after breast-conserving surgery. The 12th annual meeting of the Japanese Breast Cancer Society. 2004; pp. 107–9 (12).

harvested their flaps with 30% overcorrection from the original excised specimen size, where the average excised specimen was 56 g with a range of 28–108 g and replaced by FDFG average 78 g with a range of 35–148 g. Also, our results are compatible with Kijima *et al.* [25].

Regarding patients' age, excised volume and weight, safety margin, and graft volume and weight, the results of Biazus *et al.* [11], who used autologous fat transfer following BCS, were compatible with our results regarding the age and volume of graft. Although de Biasio *et al.* [26] documented in their study that they did not need to oversize the graft size, expecting no or minimal shrinkage of it, this may be also the cause of the relative lower size of their excised specimens and grafts compared with our results,

**Table 5 Objective and subjective assessment (Sawai assessment, Japanese Breast Cancer Society)**

	N (%)
Postoperative patient satisfaction (Sawai assessment, Japanese Breast Cancer Society)	
Excellent	7 (15.55)
Good	28 (62.23)
Fair	10 (22.22)
Poor	0 (0.00)
Subjective postoperative patient satisfaction	
Excellent	22 (48.88)
Good	18 (40)
Fair	5 (11.12)
Poor	0 (0.00)

beside the presence of a positive margin in one of their cases (2.7%).

Compared with Kijima *et al.* [21,25,27], we had a lower operative time regarding the original operative time and flap operation time with a higher volume of blood loss. Although in de Biasio *et al.* [26], the results show compatibility with our results regarding the complication rate with 16.2% (6/37) compared with our total actual number of patients who faced complications, 17.8% (8/45), with relative compatibility in number and types of complications, they showed lower operative time, lower preoperative rate of comorbidities, and lower mean number of patients' ages.

In our study, the patient subjective satisfaction according to the cosmetic results was excellent in 48.88% of patients, 40% were good, and 11.12% got a fair result with no poor result recorded, while de Biasio *et al.* [26] documented that they had 75% of patients with excellent patient satisfaction and 25% good or fair satisfaction, with no poor results on an 18-month follow-up.

According to Objective and Subjective Assessment (Sawai's cosmetic assessment, Japanese Breast Cancer Society), our results showed that we got excellent results in 15.55% of patients, 62.23% were good, and 22.22% got a fair result with no poor result. This is matching with the results of de Biasio *et al.* [26], where they documented to have excellent results in 5.4% of patients, 64.9% were good, and 29.7% got a fair result with no poor result, whereas Kijima *et al.* [27,28] showed 88.9% good results and 11.1% fair results with no any excellent or poor result.

Our results showed that the immediate reconstruction by free dermal fat grafting during breast-conservative surgery for breast cancer is consistent with that obtained by other researchers [17,21,24–28].



## Conclusion

Immediate dermal fat grafting in breast reconstruction during conservative surgery for breast cancer is a reliable, simple, safe, efficient, and rapid method for breast reconstruction with a very big advantage from being an autologous tissue with a relatively low rate of complications.

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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