Evaluation of immediate breast lipomodeling with breast-conserving surgery in patients with breast cancer

Bemen A. Besada, Ahmed S. Ahmed, Mohamed A. Motawei, Yasser S. Ahmed, Alkarmouty F. Ahmed

Department of Surgery, Medical Research Institute, University of Alexandria, Alexandria, Egypt

Correspondence to Bemen A. Besada, MSc, MRCS, Department of Surgery, Medical Research Institute, University of Alexandria, Alexandria 21500, Egypt.
Tel: +20 122 262 8800;
e-mail: bemen76@gmail.com

Received: 22 December 2022
Revised: 1 January 2023
Accepted: 2 January 2023
Published: 28 April 2023

The Egyptian Journal of Surgery 2023, 41:1824–1833

Background
The treatment of breast cancer evaluation nowadays relies on the cure rate figures and quality of life.
Aim and objectives
The aim of this study was to evaluate efficacy, complications, patient satisfaction, and esthetic outcomes of immediate lipomodeling used for correction of deformities resulting from breast-conserving surgery for patients with breast cancer and to evaluate lipomodeling and the incidence of local recurrence in its experimental level.
Patients and methods
This study was carried out on 50 female patients with malignant breast lesions admitted to the Surgical Department of Medical Research Institute and underwent breast-conserving surgery over a 1-year period.
Results
According to surgeon and patient assessment, most cases were good [20 (40%)] followed by excellent [18 (36%)] regarding surgeon assessment. Degree of satisfaction was four in 23 (46%) cases and five in 16 (32%) cases. Regarding esthetic results by the breast cancer conservation treatment core (BCCT.core) program, good results were higher, as seen in 23 (46%) patients, followed by fair results, with 18 (36%) patients.
Conclusion
Lipomodeling is a unique technique that enables autologous breast reconstruction and improves breast reconstructive surgery results by decreasing scar tissue, increasing breast softness, and creating a natural skin texture. It is possible to execute lipomodeling as a day-case procedure after breast cancer surgery, and the technique is safe. Without sacrificing oncological results, it seems to have adequate effectiveness in correcting abnormalities.

Keywords:
breast cancer, immediate lipofilling, lipomodeling

Egyptian J Surgery 41:1824–1833

1110-1121

Introduction

These days cure rate and quality of life are the two most crucial considerations when deciding on how to treat breast cancer. Observational surveys and cosmetic improvements following reconstructive surgery are used to evaluate patients' quality of life, and it is indicated that these interventions help reduce the morbidity that follows ablative procedures [1]. Discrepancy in breast symmetry is a major problem, and it may have to deal with more than simply a difference in breast volume. It may also be associated with variations in breast shape or ptosis. It is important to remember that tolerability varies from patient to patient, and that of the size [2]. The importance of restoring an acceptable image following breast cancer surgery cannot be overstated. Breast augmentation, filling of small-volume defects after breast-conserving therapy, and contour deficiencies in implant-based breast reconstructions are all examples of therapeutic applications of autologous fat grafting. However, the greater volume of adipose tissue required to reconstruct the breast mound after mastectomy makes it more difficult to achieve the same attractive results [3].

As lipomodeling has not been linked with an increased risk of oncogenesis or overall recurrence in patients with primary invasive breast cancer, it has been widely used as a safe reconstructive method throughout the past two decades [4].

Patients

This study was conducted on 50 female patients who had been hospitalized to the surgical department of the

Medical Research Institute and were undergoing breast-conservative surgery (BCS) for malignant breast lesions over a duration of one year. The participants in this study were all females.

Immediate lipomodeling is performed at the same setting as the BCS to repair any tissue defects or abnormalities that may have been caused by the procedure.

Criteria for exclusion

Conditional contraindications to BCS were as follows:

Absolute

T4, N2, or M1: two or more primary tumors in distinct quadrants of the breast (multicentric) and persistently positive margins after acceptable attempts at surgery to remove the cancer. Irradiation of the breast should never be performed on a woman who is pregnant. However, if breast cancer is discovered during the third trimester of a woman's pregnancy, it may be viable to do BCS and then treat the patient with irradiation after the baby is born. A history of having undergone breast irradiation for therapeutic purposes in the past, which means that re-treatment would subject the patient to an overly high radiation dosage. Diffuse malignant-appearing microcalcifications.

Relative

Very large or drooping breasts, collagen vascular disease as a result of radiation, and breasts that are abnormally tiny and have a large or central tumor that the patient finds cosmetically undesirable. Women who have a significant family history of breast cancer, as well as BRCA1 and BRCA2 mutation carriers, are at a greater risk of developing breast cancer, either in the same breast or the other breast.

Patients with systemic diseases causing major general medical comorbidity; current use of medications such as aspirin, cytotoxic drugs, and immune-suppressant drugs, due to the associated risk of bleeding and infection; and inadequate donor site can be treated by BCT provided that all disease is excised and margins of excision are clear. Patients with two tumors very close to each other as visible on mammograms, or multifocal disease identified only by the pathologist can also be treated.

Methods

All patients involved in this study had a thorough medical history, a comprehensive physical examination, and radiological studies. Ultrasonography and mammography of the breasts were done.

Trucut biopsy

Laboratory examination included complete blood count, profile of coagulation: prothrombin time (PT), partial prothrombin time (PTT), international normalized ratio (INR), fasting blood sugar (FBS), liver function test (LFT), and kidney function tests.

Special written informed consent

A written consent was obtained from patients after clearly describing the objectives and was signed by all patients who participated in the research. Each participant got a written copy of the informed consent, which includes the following clauses: lumpectomy with safety margins and ipsilateral sentinel lymph node biopsy, as well as determine the donor location for liposuction and lipofill the diseased breast to alleviate the deformation.

Preoperative drawings

Patients were inspected while standing erect. To assess the result, pictures were taken before and after surgery. Donor zones are regions with a sufficient amount of accessible fat (abdomen and gluteal areas).

Procedure

BCS, liposuction (fat harvesting), and lipofilling are all performed while the patient is under general anesthesia. Fat harvesting and lipofilling were done.

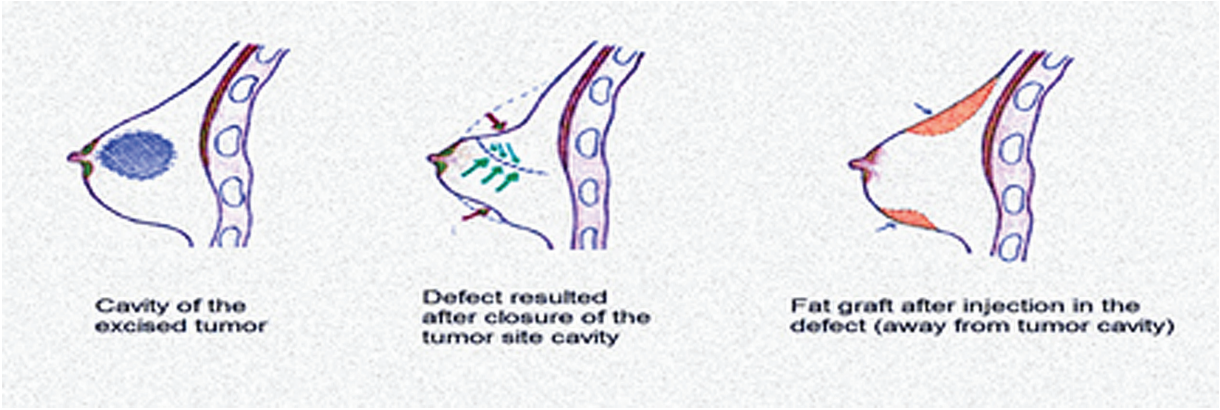
Basically, a lumpectomy is performed in accordance with specific oncological guidelines. Absorbable stitches, such as Vicryl sutures, are used to precisely and hermetically close the space produced inside the breast following tumor excision.

Adipose tissue is extracted using a 20-cm syringe, and the sample is decanted for 10–15 min. After the oily portion has been separated, the remaining liquid is drawn out and placed in syringes. Closure of the incisions used for infiltration and harvesting and performing lipoinjection was done using the numerous tunnel approach on the distorted regions generated after lumpectomy closure (Figs. 1 and 2).

Postoperative care

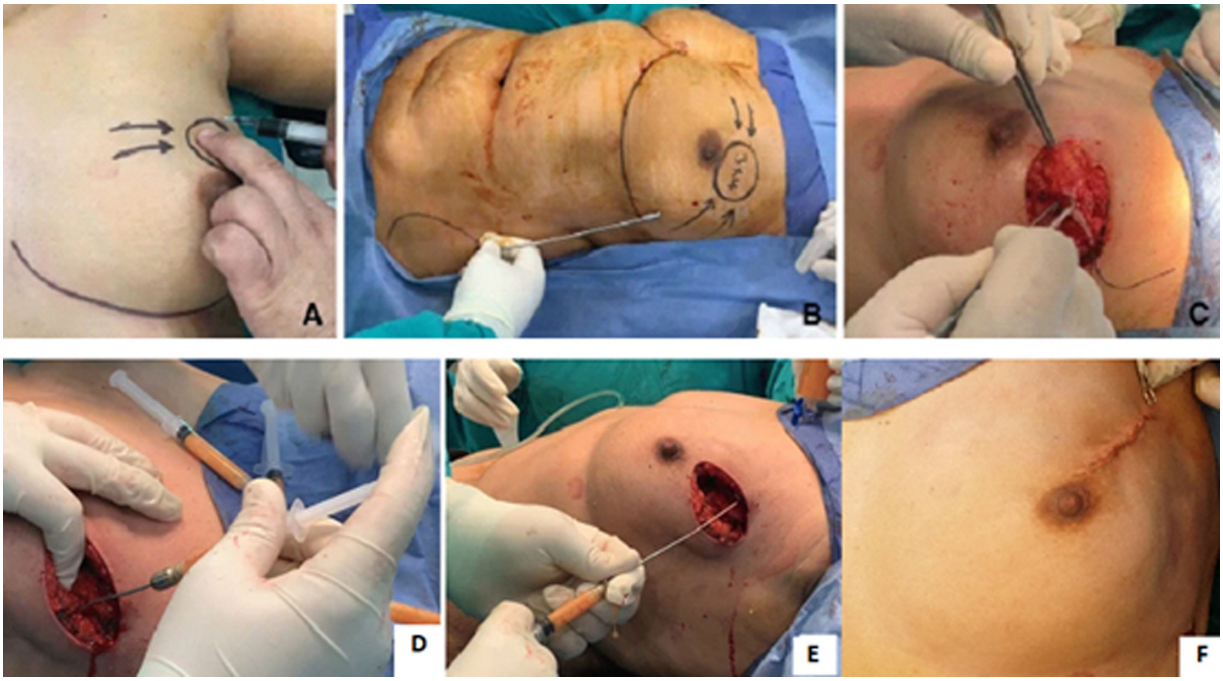
An elasticized bandage and dressings were applied, and then, 3 days later, they were switched with a high-compression sports bra for maximum immobilization

Figure 1



Steps of breast-conserving surgery and immediate lipofilling diagramed steps of the procedure.

Figure 2



Steps of breast-conserving surgery and immediate lipofilling.

of the graft, which is essential for its survival. To rule out postoperative problems including infection, necrosis, and hematoma, it is crucial to check the wound as soon as possible.

Postoperative follow-up

In this study, esthetic outcomes, patient satisfaction, and complications were evaluated after completion of the procedure, at several postoperative timings: at 1 week, 3 months, 6 months, and 12 months. Radiological assessment was done by ultrasonography/mammography at 6 and 12 months after the procedure.

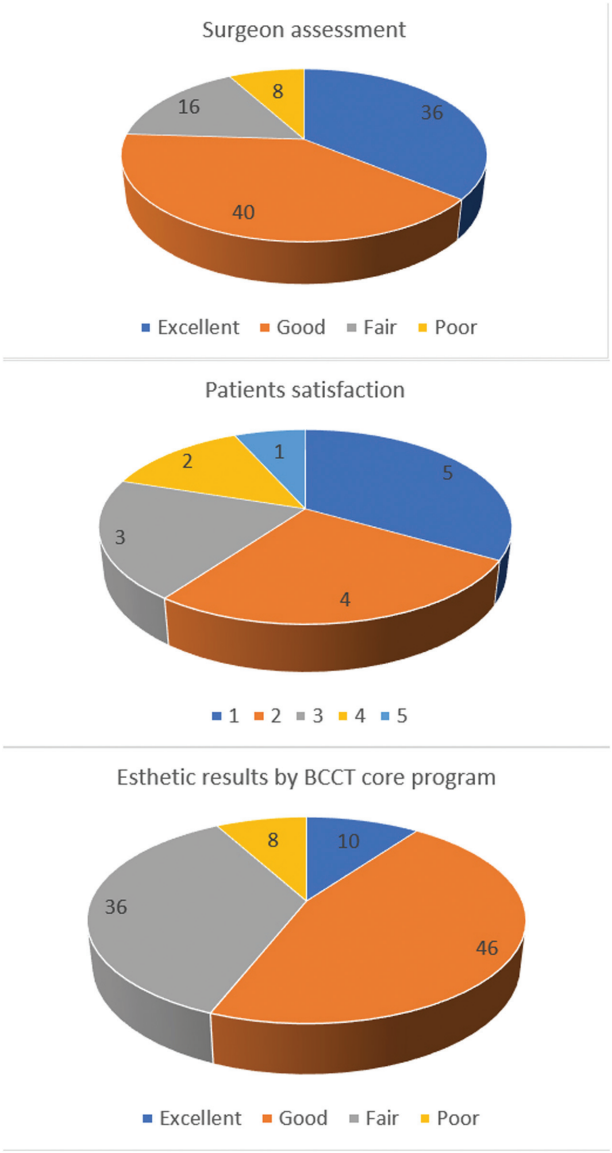
Esthetic outcomes were evaluated using the following:

(1) A computer program called BCCT.core (breast cancer conservation treatment) (Fig. 3).
(2) Panel evaluation using digital photographs of the breasts rates a range of aspects and generally uses the so-called four-point Likert or Harvard scale, with classification of overall cosmetic outcome as excellent, good, fair, or poor [5–7].

Patient satisfaction by was assessed referencing Kyungpook National University Hospital (KNUH) breast reconstruction satisfaction questionnaire (a

total of 11 items). A survey was conducted among patients 6 months after the surgery regarding overall and cosmetic satisfaction. Each item was graded on a five-point scale from highly dissatisfied (1) to highly satisfied (5) (Table 1) [8].

Figure 3



Breast cancer conservation treatment.core assessment.

Table 1 Patient satisfaction questionnaire

Question		Very				Very
Q1	Overall satisfaction with my breast construction	1	2	3	4	5
Q2	Symmetry of my breasts	1	2	3	4	5
Q3	Size of my reconstructed breasts	1	2	3	4	5
Q4	Shape of my reconstructed breasts	1	2	3	4	5
Q5	Feel to touch my reconstructed breasts	1	2	3	4	5
Q6	Pain in my reconstructed breasts	1	2	3	4	5
Q7	Scar of my reconstructed breasts	1	2	3	4	5
Q8	Donor site pain	1	2	3	4	5
Q9	Donor site scar	1	2	3	4	5
Q10	Self confidence	1	2	3	4	5
Q11	Sexual attractiveness	1	2	3	4	5

Statistical analysis of the data

Data were fed to the computer and analyzed using IBM SPSS statistics for windows, Version 23.0. Armonk, NY: IBM Corp. Qualitative data were described using number and percentage. Quantitative data were described using range (minimum and maximum), mean, SD, and median. Significance of the obtained results was judged at the 5% level.

Results

This study was carried out on 50 female patients with malignant breast lesions admitted to the Surgical Department of Medical Research Institute and underwent BCS over a 1-year period. Immediate lipomodeling was done at the same setting of the BCS to correct the resultant tissue defect and/or deformities.

Table 2 shows the distribution of the studied cases according to demographic and clinical data. Ages greater than or equal to 40 were higher, with 31 (62%) cases, and it ranged from 29 to 61 years, with a mean age of 43.8±9.73 years. Married cases were higher, with 47 (94%) cases, and negative family history cases were higher, with 46 (92%) patients. Free medical history was higher, with 25 (50%) cases, followed by diabetes mellitus, with 12 (24%)

Table 2 Distribution of the studied cases according to demographic and clinical data (*n*=50)

	N (%)
Age	
<40	19 (38)
≥40	31 (62)
Age	
Range	29–61
Mean	43.8
SD	9.73
Material status	
Single	3 (6.0)
Married	47 (94.0)
Family history	
Positive	4 (8.0)
Negative	46 (92.0)
Medical history	
Free	25 (50.0)
DM	12 (24.0)
HTN	5 (10.0)
Asthma	6 (12.0)
Cardiac	2 (4.0)

DM, diabetes mellitus; HTN, hypertension.

cases, asthma, with six (12%) cases, hypertension, with five (10%) cases, and cardiac, with two (4%) cases.

Table 3 shows the distribution of the studied cases according to operative and postoperative data. Operation time ranged from 50 to 78 min, with a mean value of 65.9±8.54 min. The site of fat harvesting was the abdomen in all cases [50 (100%)]. Weight resected ranged from 52 to 128 g, with a mean value of 93.7±21.73 g. Volume injected ranged from 65 to 159 mm, with a mean value of 105.04±27.26 mm.

Table 4 shows the distribution of the studied cases according to complication and hormonal profile. Most cases [41 (82%)] had no early postoperative complications, most cases [40(80%)] had no early postoperative complications at the donor site, most cases had no late postoperative complications, and regarding hormonal profile, luminal was higher, with 35 (70%) cases.

Figure 4 shows the distribution of the studied cases according to surgeon and patient assessment. Most cases were good 20 (40%) followed by excellent 18 (36%) according to surgeon assessment. Degree of satisfaction was 4 in 23 (46%) cases and 5 in 16

Table 3 Distribution of the studied cases according to operative and postoperative data

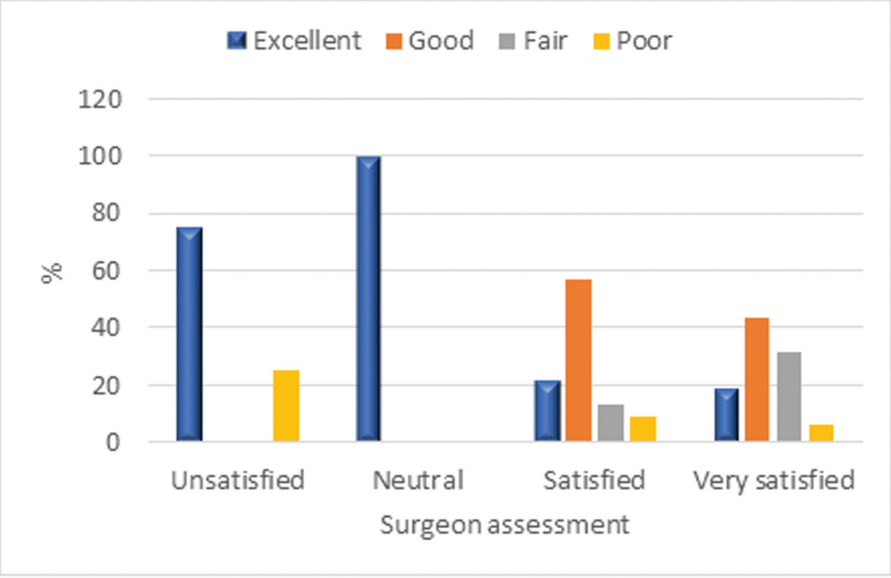
	N (%)
Operation time (min)	
Range	50–78
Mean	65.9
SD	8.54
Site of fat harvesting	
Abdomen	50 (100.0)
Weight resected (g)	
Range	52–128
Mean	93.7
SD	21.73
Volume injected (mm)	
Range	65–159
Mean	105.04
SD	27.26

Table 4 Distribution of the studied cases according to complication and hormonal profile

	N (%)
Early postoperative complications of the breast	
None	41 (82.0)
Seroma	6 (12.0)
Ecchymosis	3 (6.0)
Wound infection	0
Early postoperative complications of the donor site	
None	40 (80.0)
Hematoma	0
Ecchymosis	10 (20.0)
Late postoperative complications	
Recurrence	1 (2.0)
Oil cyst	4 (8.0)
Macrocalcifications	10 (20.0)
None	35 (70.0)
Hormonal profile (ER-PR-Her2)	
Luminal (ER+ve, PR+ve)	35 (70.0)
HER2/neu enriched	5 (10.0)
Triple negative	10 (20.0)

ER, estrogen receptor; HER2, human epidermal growth factor receptor 2; PR, progesterone receptor.

Figure 4



Distribution of the studied cases according to surgeon and patient assessments.

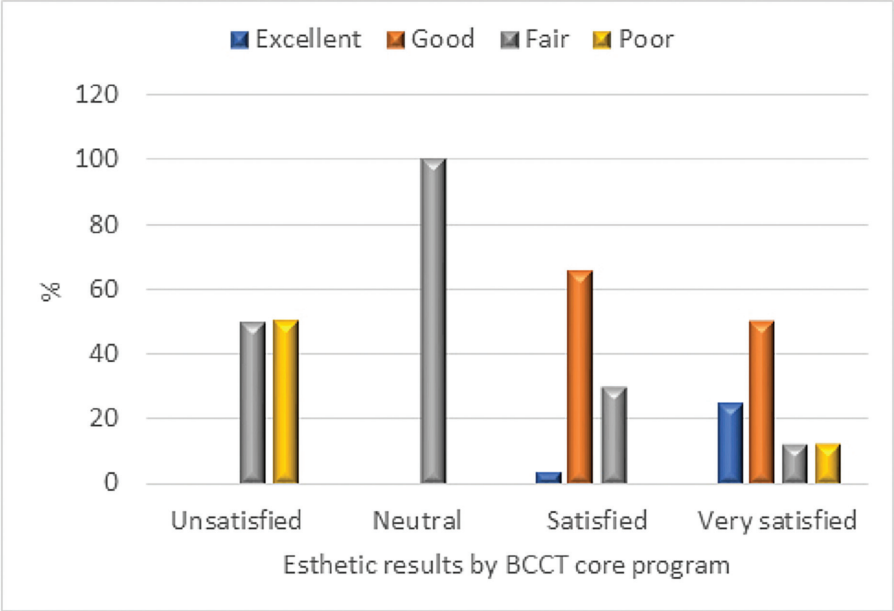
(32%) cases. Regarding esthetic results by the BCCT. core program, good results were higher, with 23 (46%) cases, followed by fair, with 18 (36%) cases.

Figure 5 shows that there was a statistically significant relation between surgeon assessment and patient satisfaction ($P<0.05$).

Figure 6 shows that there was a statistically significant relation between esthetic results by BCCT.core program and patient satisfaction ($P<0.05$).

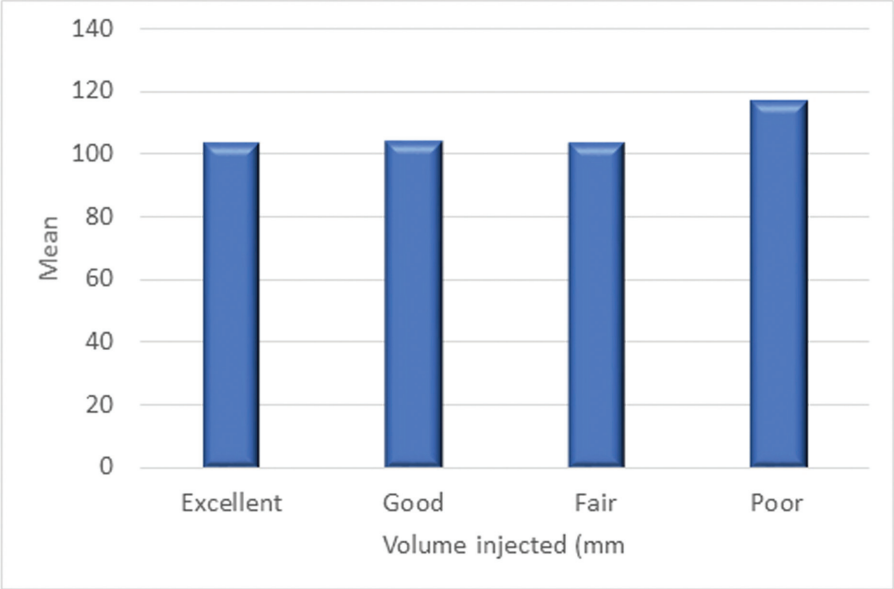
Figure 7 shows that there was no statistically significant relation between BCCT assessment and volume injected ($P>0.05$).

Figure 5



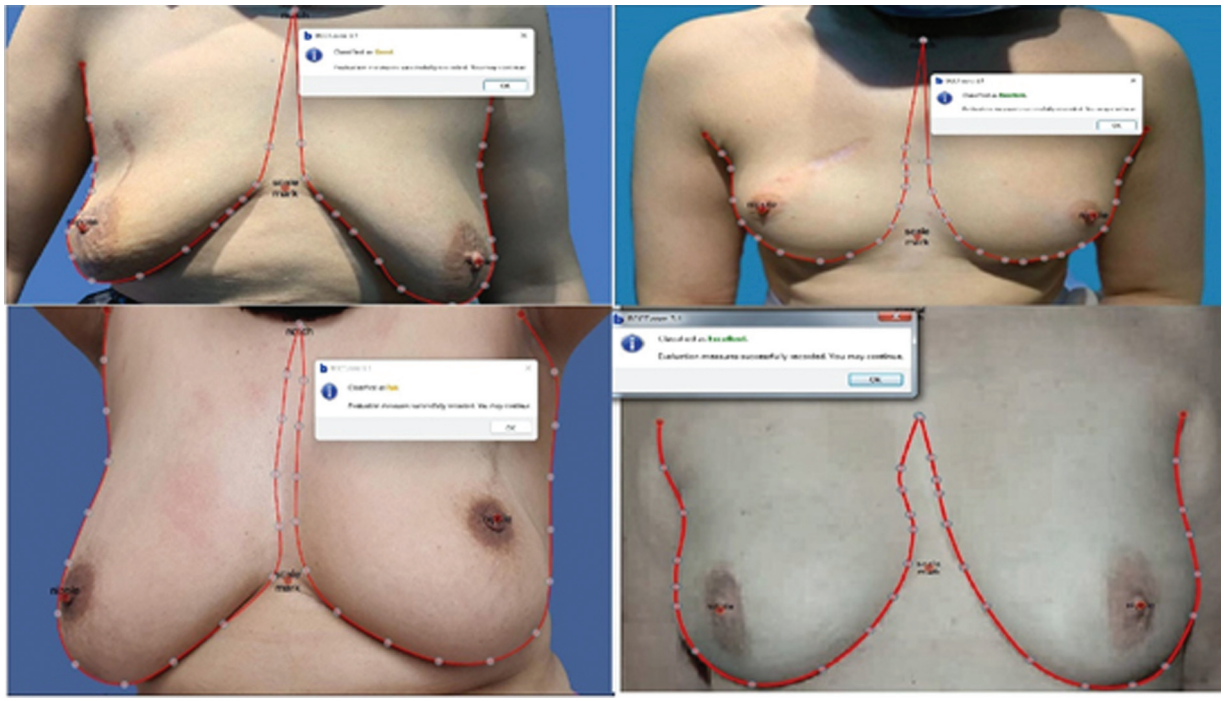
Relation between surgeon assessment and patient satisfaction.

Figure 6



Relation between esthetic results by breast cancer conservation treatment.core program and patient satisfaction.

Figure 7



Relation between breast cancer conservation treatment assessment and volume injected (mm).

Discussion

Most women with breast cancer are willing to undergoing AFT surgery to improve their breast shape and overall cosmetic benefits [9]. There is some controversy about the oncological safety of AFT for breast reconstruction after breast cancer surgery, even though thousands of patients have it done every year [10].

BCS seeks to eliminate all invasive and in situ cancer while providing a cosmetically appealing outcome. Anxiety, sadness, a negative body image, sexual dysfunction, and low self-esteem were all linked to less than desirable esthetic results after BCS, according to a study conducted in Nottingham [11].

The fact that BCS is often performed by breast surgeons while lipofilling is performed by cosmetic surgeons explains why this is the situation. A new group of oncoplastic surgeons has emerged, with expertise in both breast cancer treatment and cosmetic procedures. Studies to date have indicated that lipofilling or lipomodeling is oncologically safe [12].

Early in 2011, a procedure was established and authorized by management to use immediate lipofilling at the time of BCS, and Caldicott Guardianship was secured to protect patients' personally identifiable information [13].

Considering this, researchers were able to conduct a preliminary research to test its viability. Then, a series of patients who were expected to have poor esthetic results following BCS due to their high tumor size, relatively large tumor size compared with breast volume, or tumor location had BCS with rapid lipofilling (particularly tumors in the upper inner quadrant) [14].

Currently, BCS is often considered the gold standard treatment for early-stage breast cancers. The esthetic outcome of BCS is not uniformly acceptable for female patients. Anxiety, depression, and perceptions of one's self-image are all directly linked to the results of cosmetic procedures [15].

The breast Quality of Life (QTM) questionnaire and other patient-reported outcomes were developed with the express purpose of assessing the success of BCS and subsequent breast reconstruction. It is the perfect tool for studying how various postbreast-removal treatments affect patients [16].

The aim of this study was to evaluate the efficacy, complications, patient satisfaction, and esthetic

outcomes of immediate lipomodeling used for correction of deformities resulting from BCS for patients with breast cancer.

This study was carried out on 50 female patients with malignant breast lesions admitted to the surgical department of Medical Research Institute and underwent BCS over a 1-year period. Immediate lipomodeling is done at the same setting of the BCS to correct the resultant tissue defect and/or deformities.

The average age of our patients was found to be **43.8 ± 9.73 years**, half of them had no prior medical history, and 24.0% were diagnosed with diabetes.

Studies on breast lipomodeling often include participants aged 40–50 years; however, in a study of 52 women, Aime *et al.* [17] found that the mean age of the participants was 52 (range: 49–54) years, whereas in another research by Cogliandro, the mean age was 54 ±13 years.

The average volume injected was 105.04±27.26 mm, whereas the average weight removed was 93.7±21.73 g.

After a month after intervention, we noted a loss of volume in the order of 30% in 50%, and then the volume remains stable, which is consistent with the findings of Delay and colleagues, who stated that the volume of transferred fat is reduced by 30% and the volume of the breast remains stable after 3–4 months after intervention. The authors point out that the transplanted fat remembers where it came from, meaning that if the patient loses weight following intervention, she will no longer receive the full advantage of the procedure [18].

According to Delay and colleagues, injecting as much as 470 ml of fat did not significantly alter the outcome. When doing autologous latissmus dorsi muscle flap (LD) reconstructions, Missana and colleagues injected an average of 143 ml of fat; while performing LD and implant reconstructions, they injected 147 ml of fat; and while performing transverse rectus abdominis muscle (TRAM) flap reconstructions, they injected 142 ml of fat [19].

Depending on the type of surgery performed, the rate of fat re-absorption might vary anywhere from 30 to 50%. The quantity of injected fat needed to achieve symmetry is conditional on the patient's build and any weight loss or increase that may have occurred in the meantime [20].

Nine patients experienced complications immediately following surgery; six had seroma and three had ecchymosis. As for the late postoperative complications, 10 patients developed macrocalcifications, four patients had oil cysts, and one patient experienced a recurrence.

Studying the problems of immediate fat grafting following BCS, Li *et al.* [21] discovered that one patient in the lipofilled group developed a seroma, but that no other issues, such as cyst development, fat necrosis, infection, granuloma, or pneumothorax, were seen.

Complications such as ecchymosis (76 patients), striae (36 patients), hematomas (12 patients), and infections were documented by Illouz *et al.* [22] from their experience with over 25 years and 820 patients using lipomodeling (five patients). Neither fat necrosis nor oil cysts were more common in our research group than they were in a control group that had surgical site infections.

Among the patients we evaluated, 38 (or 76%) were rated as either excellent or good by the surgeon. In 39 of 48 cases (78%), participants provided satisfaction ratings of 5 or 4. When it came to the esthetic outcomes produced by the BCCT.core curriculum, 28 of 50 cases were evaluated as either excellent or good.

In a recent study, Khan *et al.* [13] compared the outcomes of 39 women treated with BCS alone with those of a comparable group of 35 women who also had immediate lipofilling. They came up with the conclusion that BCS in combination with immediate lipofilling yields more desirable esthetic results than BCS alone.

Breast fat grafting (lipomodeling) following extended latissimus dorsi flap breast reconstruction was studied by Sinna *et al.* [23]. An initial assessment of 200 consecutive instances indicated that among those undergoing breast reconstruction, nine (4.5%) were deemed good by the clinical team and 191 (95.5%) were deemed extremely satisfactory. No moderate or bad outcomes were documented.

According to the findings of the study, patients either reported being satisfied (20%) or extremely satisfied (80%) with the outcomes. Nobody expressed any discontent about the situation. In addition, the secondary cosmetic advantage acquired as a result of

the liposuction contributed to the patient's overall feeling of satisfaction with the treatment [24].

According to our data, there was a statistically significant correlation between surgeon evaluation and patient satisfaction ($P<0.05$) and between esthetic outcomes as measured by the BCCT.core program and patient satisfaction ($P<0.05$). Cosmetic outcomes by BCCT.core program were significantly associated with tumor location ($P>0.05$). Contrarily, it was discovered that BCCT evaluation had a statistically significant relationship with age ($P>0.05$), but no such relationship existed between BCCT evaluation and weight loss.

Statistical analysis revealed no correlation between BCCT evaluation and injected amount ($P>0.05$).

Cosmesis and patient satisfaction are important aspects of lipomodeling. Delay *et al.* [19] reported that the satisfaction rate on patients undergoing lipomodeling to be moderately good in 10% of patients, good in 40% of patients, and very good in 50% of patients.

Missana *et al.* [25] found that of 69 patients, 86.5% showed good to very good improvement and 13.5% showed moderate improvement, as determined by two distinct surgeons. A case series with 37 individuals was described by Spear and colleagues. The results were evaluated by a panel of doctors who saw significant esthetic improvement in 21.3% of patients and mild to moderate improvement in 63.8%. An unblinded comparison of lipomodeling and conventional therapy for 62 breasts in 61 women was published by Panettiere and colleagues. On a scale from 0 to 5, the lipomodeling group had a mean score of 4.2 three months following treatment, whereas the usual therapy group had a mean score of 3.1 [26].

Conclusion

Lipomodeling is a unique technique that enables autologous breast reconstruction and improves breast reconstructive surgery results by decreasing scar tissue, increasing breast softness, and creating a natural skin texture. It is possible to execute lipomodeling as a day-case procedure after breast cancer surgery, and the technique is safe. Without sacrificing oncological results, it seems to have adequate effectiveness in correcting abnormalities.

Financial support and sponsorship
Nil.

Conflicts of interest
There are no conflicts of interest.

References

1 Coleman SR. Structural fat grafting: more than permanent filler. Plast Reconstr Surg 2006; 118(3 suppl):108S–120S.

2 Carlson GW, Chu CK, Moyer HR, Duggal C, Losken A. Predictors of nipple ischemia after nipple sparing mastectomy. Breast J 2014; 20:69–73.

3 O'Halloran N, Courtney D, Kerin MJ, Lowery AJ. Adipose-derived stem cells in novel approaches to breast reconstruction: their suitability for tissue engineering and oncological safety. Breast Cancer 2017; 11:1178223417726777.

4 Myckatyn TM, Wagner IJ, Mehrara BJ, Crosby MA, Park JE, Qaqish BF, *et al.* Cancer risk after fat transfer: a multicenter case-cohort study. Plast Reconstr Surg 2017; 139:11–18.

5 Cardoso MJ, Cardoso J, Amaral N, Azevedo I, Barreau L, Bernardo M, Vrieling C. Turning subjective into objective: the BCCT.core software for evaluation of cosmetic results in breast cancer conservative treatment. Breast 2007; 16:456–461.

6 Sacchini V, Luini A, Tana S, Lozza L, Galimberti V, Merson M, Greco M. Quantitative andqualitative cosmetic evaluation after conservative treatmentfor breast cancer. Eur J Cancer 1991; 27:1395–1400.

7 Choi DH, Kim DK, Ryu DW, Lee JW, Choi KY, Chung HY, *et al.* Immediate breast reconstruction using silicone implants in previously augmented patients. Arch Aesthetic Plast Surg 2016; 22:15–19.

8 Vrieling C, Collette L, Bartelink E, Borger JH, Brenninkmeyer SJ, Horiot JC, Bartelink H. Validation of the methods of cosmetic assessment after breast-conserving therapy in the EORTC 'boost versus noboost' trial. EORTC Radiotherapy and Breast CancerCooperative Groups. European Organization for Researchand Treatment of Cancer. Int J Radiat Oncol Biol Phys 1999; 45:667–676.

9 Osswald R, Boss A, Lindenblatt N. Does lipofilling after oncologic breast surgery increase the amount of suspicious imaging and required biopsies? A systematic meta-analysis. Breast J 2020; 26:847–859.

10 Garza RIII, Ochoa O, Chrysopoulo M. Post-mastectomy breast reconstruction with autologous tissue: current methods and techniques. Plast Reconstr Surg Glob Open 2021; 9:e3433.

11 Al-Ghazal SK, Fallowfield L, Blamey RW. Comparison of psychological aspects and patient satisfaction following breast conserving surgery, simple mastectomy and breast reconstruction. Eur J Cancer 2000; 36:1938–1943.

12 Kronowitz SJ, Mandujano CC, Liu J, Kuerer HM, Smith B, Garvey P, *et al.* Lipofilling of the breast does not increase the risk of recurrence of breast cancer: a matched controlled study. Plast Reconstr Surg 2016; 137:385–393.

13 Khan LR, Raine CR, Dixon JM. Immediate lipofilling in breast conserving surgery. Eur J Surg Oncol (EJSO) 2017; 43:1402–1408.

14 Nanda A, Hu J, Hodgkinson S, Ali S, Rainsbury R, Roy PG. Oncoplastic breast-conserving surgery for women with primary breast cancer. Cochrane Database Syst Rev 2021; 10:CD013658.

15 Volders JH, Negenborn VL, Haloua MH, Krekel NM, Jóźwiak K, Meijer S, *et al.* Cosmetic outcome and quality of life are inextricably linked in breast-conserving therapy. J Surg Oncol 2017; 115:941–948.

16 Cohen WA, Mundy LR, Ballard TN, Klassen A, Cano SJ, Browne J, Pusic AL. The BREAST-Q in surgical research: a review of the literature 2009–2015. J Plast Reconstr Aesthet Surg 2016; 69:149–162.

17 Aime RLN, Martial RA, Kamary RV, Lova A, Ibrahim H, Rousseau E, *et al.* Mammary lipofiling seen to the hospital complex of Dax. Int J Reprod Contracept Obstet Gynecol 2019; 8:2475–2482.

18 Delay E, Guerid S. Fatty transfer in surgery of the breast. Surg Tech EMC Plast Surg Reconstr Aesth 2017; 12:1–12.

19 Delay E, Garson S, Tousson G, Sinna R. Fat injection to the breast: technique, results, and indications based on 880 procedures over 10 years. Aesthet Surg J 2009; 29:360–376.

20 Bonomi R, Betal D, Rapisarda IF, Kalra L, Sajid MS, Johri A. Role of lipomodelling in improving aesthetic outcomes in patients undergoing immediate and delayed reconstructive breast surgery. Eur J Surg Oncol 2013; 39:1039–1045.

21 Li H, Wang Y, Yang D, Petit JY, Ren G. Clinical study of the feasibility, complications, and cosmetic outcomes of immediate autologous fat grafting

during breast-conserving surgery for early-stage breast cancer in China. Gland Surg 2021; 10:2386.

22 Illouz YG. The fat cell 'graft': a new technique to fill depressions. Plast Reconstr Surg 1986; 78:122–123.

23 Sinna R, Delay E, Garson S, Delaporte T, Toussoun G. Breast fat grafting (lipomodelling) after extended latissimus dorsi flap breast reconstruction: a preliminary report of 200 consecutive cases. J Plast Reconstr Aesth Surg 2010; 63:1769–1777.

24 Swanson E. Levels of evidence in cosmetic surgery: analysis and recommendations using a new CLEAR classification. Plast Reconstr Surg Glob Open 2013; 1:e66.

25 Missana MC, Laurent I, Barreau L, Balleyguier C. Autologous fat transfer in reconstructive breast surgery: indications, technique and results. Eur J Surg Oncol 2007; 33:685–690.

26 Panettiere P, Marchetti L, Accorsi D. The serial free fat transfer in irradiated prosthetic breast reconstructions. Aesth Plast Surg 2009; 33:695–700.