Aesthetic outcome of laparoscopically harvested omental flap versus glandular flap in breast conservative surgery

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SUMMARY

Background and aim: *The oncoplastic breast surgery (OBS) involves reconstruction of the resection defect either by volume displacement or by volume replacement. Glandular flap is easy, quick and acceptable method to fill breast defects after breast conserving surgery (BCS). The value of the omentum in extra-peritoneal reconstruction was not appreciated until the mid-20th century. The aim of this study was to assess the aesthetic outcome after immediate breast reconstruction either with glandular flap or laparoscopic harvested omental flap in early breast cancer after BCS.* ***Methods:*** *The present study conducted on 44 patients with early breast cancer in Surgical Oncology Unit, General Surgery Department, Tanta University Hospital during the period from October 2017 to May 2018. All patients underwent breast conservative surgery followed by immediate breast reconstruction either by glandular flap in 20 patients (group I) or Omentoplasty in 24 patients (group II). The operative time, post-operative complications, the length of hospital stay and aesthetic outcome were compared between both groups.* ***Results:*** *The operative time in group I ranged from 90-120 minutes with a mean time of 113 minutes while the operative time in group II ranged from 110-160 minutes with a mean of 133 minutes. The hospital stay in group I ranged from 4–5 days with a mean of 4 days while in group II it ranged from 4-6 days with a mean of 5 days. In group I, two patients (10%) developed wound seroma, two patient (10%) developed fat necrosis while in group II, 8 patients (33.3%) developed fat necrosis and two patients (8.3%) developed epigastric incisional hernia with no wound seroma reported. As regard the aesthetic outcome using patient self-evaluation, in group I, 70% of the patients were satisfied with the overall aesthetic results and 30% dissatisfied while in group II, 91.7% of the patients were satisfied and 8.3% were dissatisfied. As regard the aesthetic outcome using objective assessment with Breast Cancer Conservation Treatment Cosmetic results software (BCCT.core), in group I, excellent results obtained in 20% of cases, good results in 40% of cases, fair results in 20% of cases and poor results in 20% of cases while in group II, excellent results obtained in 41.7% of cases, good results obtained in 33.3% of cases, fair results in16.7% of cases and poor results in 8.3% of cases. No local recurrence or distant metastasis reported.* ***Conclusion:*** *The glandular flap has shorter operative time and less extensive surgery than omental flap. The omental flap has the potential to recreate a soft, naturally ptotic breast shape that is ideal for matching with the contralateral breast.*

KEYWORDS

Conservative Breast Surgery, Glandular Flap, Omenal Flap, cosmoses.

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1. INTRODUCTION

The definition of success in the treatment of early-stage breast cancers has evolved beyond the simplistic outcomes of low recurrence rates. The term functional breasts' means that there is adequate symmetry in the volume and shape of breast and the breast footprint, including the infra-mammary fold position [1].

The main goal of breast conserving surgery would be the resection of the tumor with adequate surgical margins while achieving a satisfactory cosmetic outcome and preserving glandular function. Unfortunately this is not always the case and subsequent deformities are not uncommon. Generally, fair to poor cosmetic outcomes following breast conservative surgery and whole breast radiotherapy are observed in as many as one-third of treated cases resulting in decreased quality of life for these patients [2, 3].

Oncoplastic breast surgery (OBS), a sophisticated, organ-preserving breast surgery has developed in the eighties of the last century to eliminate the disadvantages of the significant excision in relation to the volume of the breast. It involves reconstruction of the resection defect either by volume displacement or by volume replacement. OBS should be considered when > 10–15% breast volume loss is anticipated [4, 5].

Volume displacement involves either mobilization or transposition of local dermo-glandular flaps to reconstruct resection defects of 10–20% breast volume or a more extensive mammoplasty procedure for larger resections to avoid cosmetic failure. Glandular flap is easy, quick and acceptable method to fill breast defects after BCS so that the breast shape can be preserved and the original breast size is being only marginally reduced [6, 7].

The utility of the omentum as a flap in reconstructive surgery is well documented, although the omentum was used for intra-abdominal reconstruction by the late 1880s when used in buttressing intestinal anastomoses and closing perforated duodenal ulcers. The value of the omentum in extra-peritoneal reconstruction was not appreciated until the mid-20th century when O'Shaughnessy performed cardio-omentopexy for the relief of angina and Thompson used omentum for the treatment of broncho-pleural fistula [8-10].

Many of the new objective methods developed that are not relied on subjective professional judgment, the newly developed soft ware's like breast analyzing tool (BAT) or breast cancer conservative treatment (BCCT.core) are now used for objective assessment of breast aesthetics [11, 12]. The aim of this study was to assess the aesthetic outcome after immediate breast reconstruction either with laparoscopic harvested omental flap or glandular flap in cases with breast cancer legible for breast conserving surgery.

2. PATIENTS AND METHODS

This prospective randomized study included 44 patients with early breast cancer eligible for breast conservative surgery in Surgical Oncology Unit, General Surgery Department, Tanta University Hospital during the period October 2017 to May 2018. All patients underwent breast conservative surgery followed by immediate breast reconstruction either by glandular flap in 20 patients (group I) or Omentoplasty in 24 patients (group II).

The patients included in the study had stage I-II breast cancer, had solitary clinical or mammographic lesion. Patients with locally advanced breast cancer, stage III, IV disease, multicentric breast cancer, persistent positive margins after two attempts, history of collagen disease and those with history of intra-abdominal malignancy, chronic inflammation (tuberculosis), or previous upper abdominal open surgeries (in cases of breast reconstruction with laparoscopic omen-

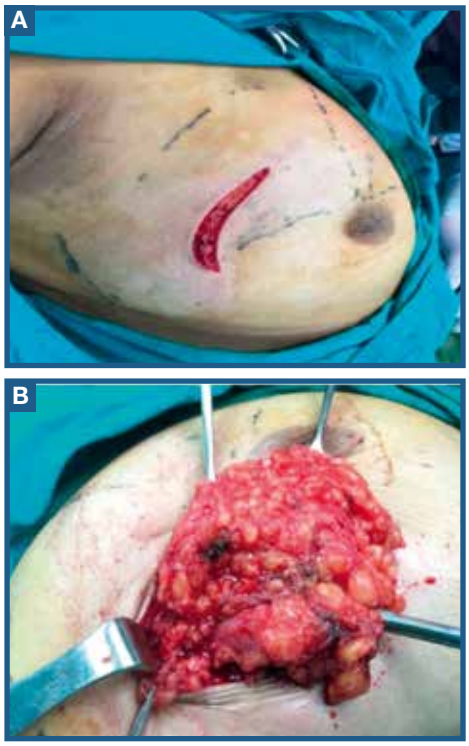


Figure 1.
A curvilinear incision over the tumor (A) and the tumor dissected with a safety margin (B).

tal flap) were excluded from the study.

Every patient was subjected to; history taking, general and local breast and abdominal examination and investigations that included renal function tests, liver function tests, complete blood count, coagulation profile, bilateral breast mammography and ultrasound, fine needle aspiration cytology (FNAC) and/or Trucut biopsy, ER, PR, HER2 receptor and metastatic work up in the form of, Chest x ray or CT scan, Abdomino-pelvic ultrasound or CT scan and bone scan. A baseline preoperative photography of the breasts were taken then at every follow up visit.

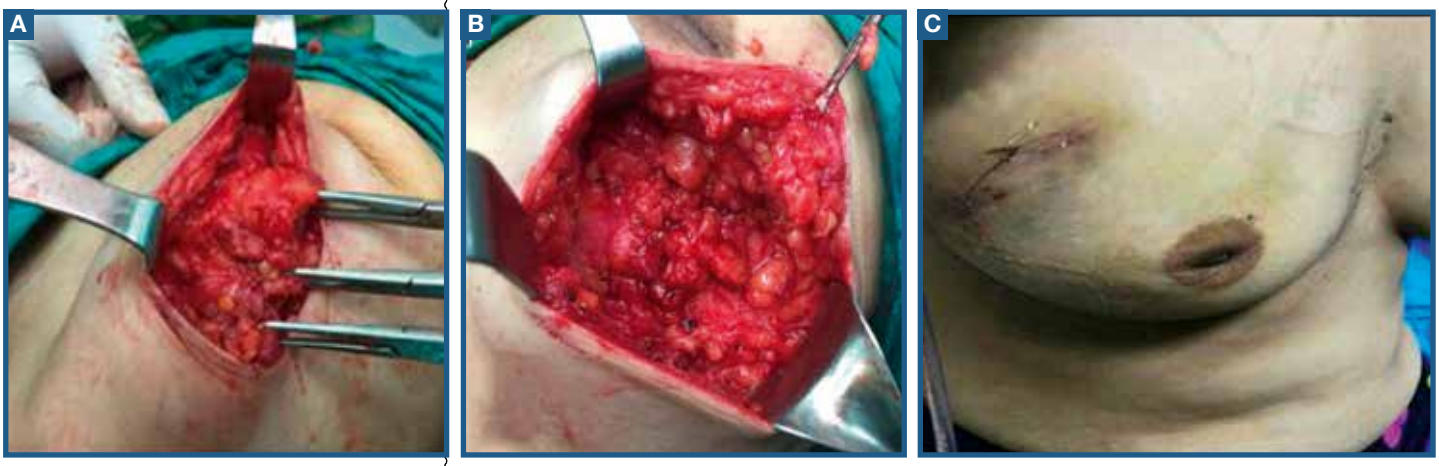
The surgical procedures

Breast conservative surgery (BCS) was conducted to every patient then breast reconstruction was done with either method. A prophylactic antibiotics (Ceftriaxone 1 gram) was administered IV, one hour before surgery. The tumor was approached through a curvilinear incision of the skin over the tumor. All patients underwent wide local excision of the tumor with at least 1 cm safety margin which confirmed by intraoperative frozen section. Standard level I & II axillary lymph node dissection was done. The specimen and axillary lymph nodes sent for histopathological examination **(figure 1)**.

The glandular flap technique

The breast tissue was mobilized from the subcutaneous plane to the level of the pectoral fascia to allow mobilization and displacement of the breast gland over the underlying pectoral fascia. The edges of the glandular flaps were sutured together and fixed to the pectoral fascia using Vicryl 2/0. The layered closure of the glandular tissue was applied without tension to avoid tissue strangulation and necrosis. The skin was then sutured over a suction drain **(figure 2)**.

Figure 2.
Steps of glandular flap; the flap was advanced to fill the defect (A), Then approximated and sutured together and fixed to pectoral fascia to close the defect (B) and the skin was closed over a suction drain (C).



THE LAPAROSCOPICALLY HARVESTED PEDICLED OMENTAL FLAP

A. Harvest of the omental flap

A camera port (10-mm 30°) was inserted just above the umbilicus, and additional two ports were placed 5-6 cm above and lateral to the umbilicus in the mid-clavicular line, one 5-mm port for the surgeon on the left side of the patient and another 5-mm port for the assistant on the right side. Pneumoperitoneum was maintained at 12-14 mm Hg. Laparoscopic inspection of the entire abdominal cavity was then performed. The omentum was evaluated for size, thickness, vasculature or adhesion. The patient was placed in anti-Trendelenburg position with right lateral rotation. The starting point of dissection was chosen in an a vascular point to the left of the middle of transverse colon with creation of small window which provides easier access to the omental bursa that is evidenced by exposure of the posterior wall of the stomach.

The dissection was carried out by monopolar electrocautery. The dissection was advanced leftward while maintaining appropriate tension between the omentum and transverse colon. The gastric branches of the gastro-epiploic vessels were divided one by one at a site close to the stomach wall going towards the pyloric ring. Careful blunt dissection between the gastro-colic ligament and the transverse mesocolon was advanced until the root of the right gastro-epiploic vessels was confirmed **(Figure 3)**.

B. Tunneling and fixation of the omentum

A 2-finger wide transverse incision was made in the epigastrium 2 cm below the xiphoid process to communicate with the abdominal cavity. From that point subcutaneous tunnel was created to continue with a subglandular tunnel between the breast and the pectoral fascia in the lower medial quadrant directed toward the breast defect. The pedicled omental flap was then carefully delivered extra abdominally avoiding any twisting then it was passed through the created subcu-

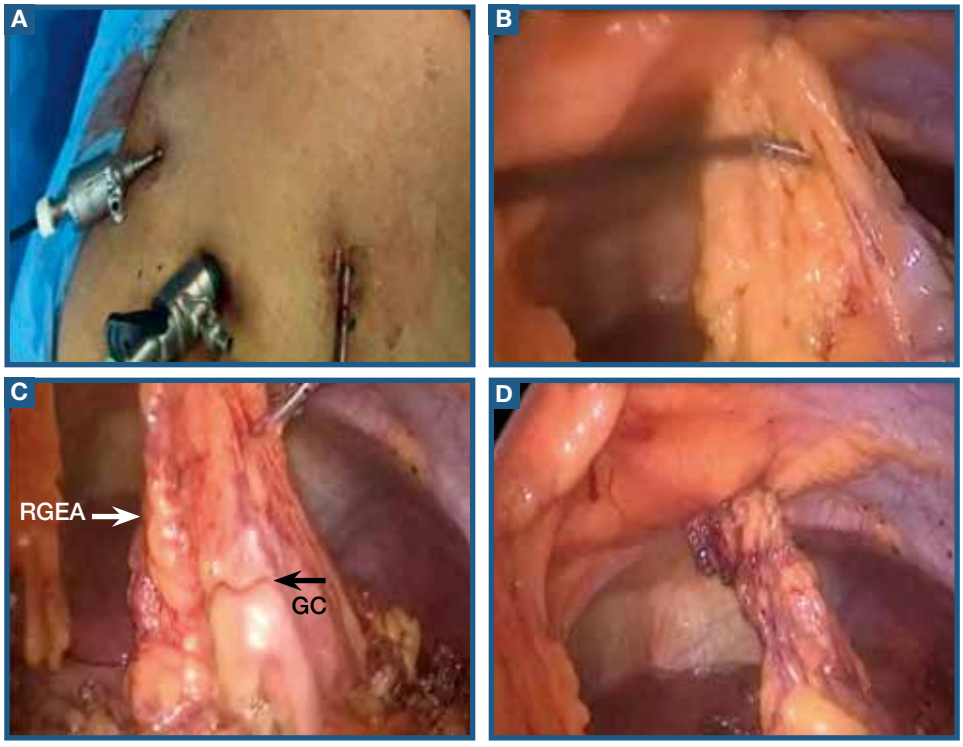


Figure 3.
Steps of laparoscopicaly harvested omental flap; the port sites (A), Liberation of the omentum from transverse colon (B), liberation of the omentum from greater curvature of the stomach (black arrow), the omentum was pedicled on right gastro-epiploic vessel (white arrow, C) and the pedicled omental flap (D).

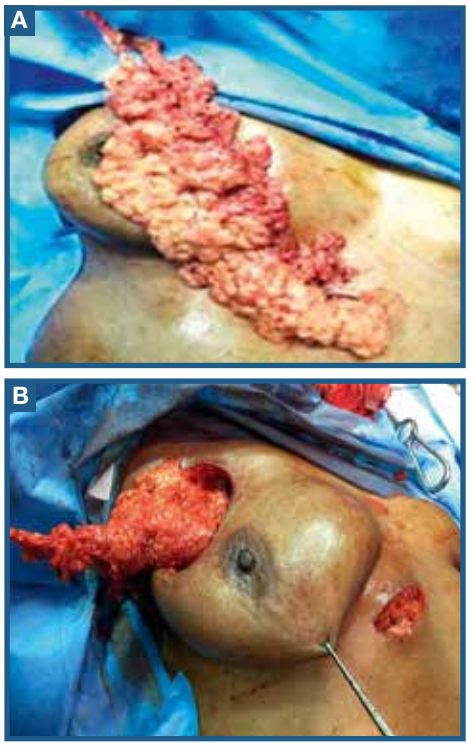


Figure 4.
Trying the length of the harvested omentum before tunneling (A) and the omentum filling the defect after passing through the tunnel (B).

taneous and subglandular tunnel up to the site of the defect. An intra -peritoneal drain was inserted and left for 48 hours. The port sites were closed with 2/0 Vicryl suture. The omental flap was shaped to adequately fill the breast defect space without any twist then fixed with 2/0 Vicryl suture to the edge of the defect. A drain was inserted to drain the omental- filled area and removed when the daily output is less than 25 cc for two successive days and he skin was closed with subcuticular sutures **(figure 4)**.

FOLLOW UP

On the third postoperative day; a doppler ultrasonographic examination of the breast in group II was done to check the viability of the omental flap. The operative time, post-operative complications and the length of hospital stay were compared between both groups. The first visit was one month after operation, then after completion of chemo-radiotherapy and Six months later for the final assessment of the aesthetic outcome. During every follow up visit, the patient was assessed clinically, sonographically and photographically for assessment of aesthetic outcome of reconstructed breast using the patient self-evaluation [12] alongside with BCCT. Core evaluation [13].

A. Patient self-evaluation

During the last follow up visit the studied patients were asked to evaluate the reconstructed breast concerning different aspects of the aesthetic outcome in **table 1**.

Table 1.

Variable	Dissatisfied	Not entirely satisfied	Satisfied	Very satisfied
Symmetry				
Size of the operated breast				
Scar acceptance				
Nipple position				
Nipple sensation				
Overall aesthetic outcome				

Table 1.
The parameters of patient self-evaluation [12]

B. Breast Cancer Conservation Treatment Cosmetic results (BCCT.core) software version 3.1 [13]

The surgical team evaluated the standardized photographs in frontal view only. The BCCT.core program categorizes the cosmetic outcome according to Harvard scale introduced by Jay Harris in 1979. It classifies the overall aesthetic result into four categories ranging from excellent, good, fair and poor [14]. The seteps of BCCT.core program shown in **figures 5-8**. The program uses seven variables for asymmetry index [15].

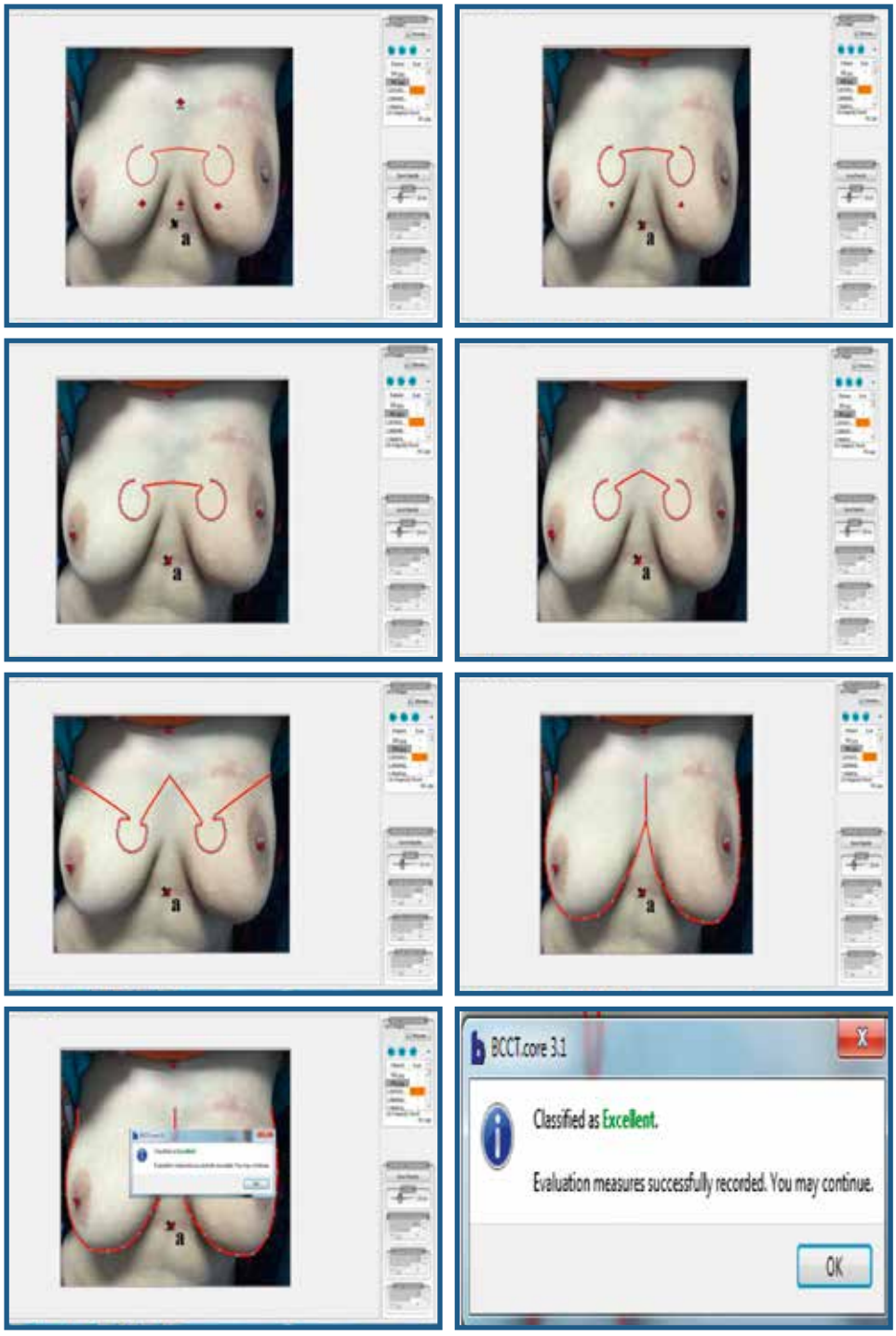


Figure 5. *Loading the photograph on the BCCT. core software (left). One red dot was adjusted to the sternal notch and other one was adjusted on the midline 25 cm from inferior to the sternal notch (a), (right).*

Figure 6. *The red dots were adjusted on both nipples (left). Adjustment of the red dot to the uppermost medial point of both breasts (right).*

Figure 7. *The red dot was adjusted to the upper most lateral point of the breast outline in the anterior axillary line (left). Complete outlining of both breasts (right).*

Figure 8: *Automatic displaying of the result of aesthetic assessment.*

STATISTICAL ANALYSIS

The data were collected, tabulated and statistically analyzed using SPSS® software statistical computer package version 22. For quantitative data, the mean and standard deviation were calculated. The difference between two means was statistically analyzed using the student-t test. For qualitative data, the number and percentage distribution were calculated and statistically analyzed using Fisher exact test. The 5% level of significance was adopted for interpretation of results of tests of significance. A written informed consent was obtained from the patients participating in the study. The study was approved by Tanta Faculty of Medicine ethical committee.

3. RESULTS

Patients' demographic data

The patients' age in group I ranged from 28 to 65 years with a mean of 46.0 ± 10.82 years while the patients' age in group II ranged from 32 to 58 years with a mean of 44.92 ± 9.65 years **(table 2).**

Table 2.

	Group I (N=20)		Group II (N=24)		P
	No.	%	No.	%	
Age in Years					
Range	28-65		32-58		0.798
Mean ± SD	46 ± 10.82		44.92 ± 9.65		
Menopausal state					
Premenopausal	12	60.0	16	66.7	1.000
Post-menopausal	8	40.0	8	33.3	
Family history of breast cancer	0	0.0	2	8.3	1.000
Comorbidities					
DM	4	20	6	25	1.000
Hypertension	4	20	4	16.6	
Neoadjuvant chemotherapy					
Yes	4	20	8	33.3	1.000
No	16	80	16	66.7	

Table 2.
Patients' demographic data

Operative details, hospital stay and complications

The operative time in group I ranged from 90-120 minutes with a mean time of 113.33 ± 16.70 minutes while the operative time in group II ranged from 110-160 minutes with a mean time of 133.33 ± 17.23 minutes **(table 3).**

Aesthetic outcome

The follow up period ranged from 6 to 13 months with a mean of 9 months. The aesthetic outcome has been assessed using patient self examination and BCCT. core. In group I: excellent results were founded in the upper outer quadrant and poor results were obtained in inner quadrant tumors while in group II, excellent results were obtained in inner quadrant tumors and poor results were obtained in upper outer quadrant (**tables 4, 5 & figures 9-14**).

Table 3.
Operative details, hospital stay and complications

Operative Details	Group I (N=20)	Group II (N=24)	P
Whole oparative time (min.)			
Range	90-120	110-160	0.002*
Mean ± SD	133.33±16.70	133.33±17.23	
Harvest time of omental flap (min.)			
Range		50.0-100.0	-
Mean ± SD	-	69.17±14.43	
Glandular flap design (min.)			
Range	40.0-80.0	-	-
Mean ± SD	55.00±12.43	-	
Hospital stay (days)			
Range	4.0-5.0	4.0-6.0	0.066
Mean ± SD	4.17±0.39	5.0±0.43	
Complications			
Seroma	2 (10%)	-	-
Fat necrosis	2 (10%)	8 (33.3%)	0.088
Incisional hernia	-	2 (8.3%)	-

Variable	Dissatisfied				No entirely satisfied				Satisfied				Very satisfied			
	Group I		Group II		Group I		Group II		Group I		Group II		Group I		Group II	
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%
Aesthetic outcome	4	20.0	2	8.3	2	10.0	0	0.0	10	50.0	10	41.7	4	20.0	12	50.0
Symmetry	4	20.0	4	16.7	0	0.0	0	0.0	12	60.0	16	66.7	4	20.0	4	16.7
Size of the operated breast	4	20.0	0	0.0	2	10.0	0	0.0	10	50.0	24	100.0	4	20.0	0	0.0
Scar acceptance	4	20.0	0	0.0	4	20.0	4	16.7	12	60.0	20	83.3	0	0.0	0	0.0
Nipple position	4	20.0	0	0.0	0	0.0	0	0.0	16	80.0	24	100.0	0	0.0	0	0.0
Nipple sensation	0	0.0	0	0.0	0	0.0	0	0.0	20	100.0	24	100.0	0	0.0	0	0.0

Table 4.
Patient satisfaction using patient self evaluation

Objective assessment BCCT.core software	Excellent		Good		Fair		Poor		P
	No.	%	No.	%	No.	%	No.	%	
Group I	4	20.0	8	40.0	4	20.0	4	20.0	0.799
Group II	10	41.7	8	33.3	4	16.7	2	8.3	

Table 5.
Assessment of the aesthetic outcome using BCCT.core

Figure 9.
An example of excellent result by BCCT.core software in group I.

Figure 10.
An example of good result by BCCT.core software in group I.

Figure 11.
An example of poor result by BCCT.core software in group I.

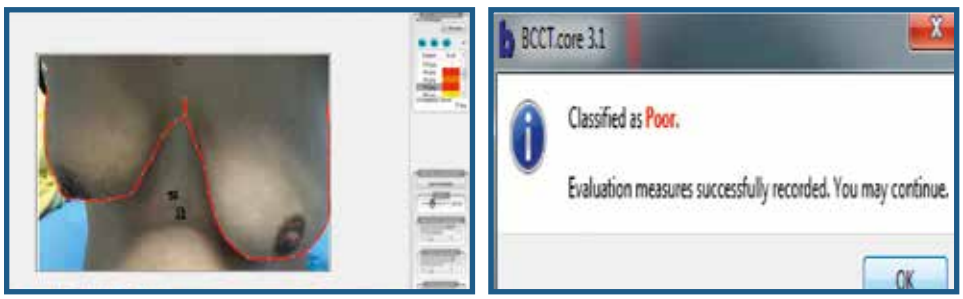


Figure 12.
An example of excellent result by BCCT.core software in group II.

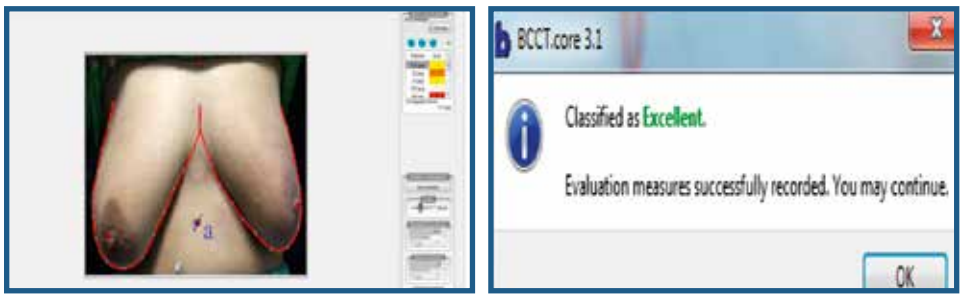


Figure 13.
An example of good result by BCCT.core software in group II.

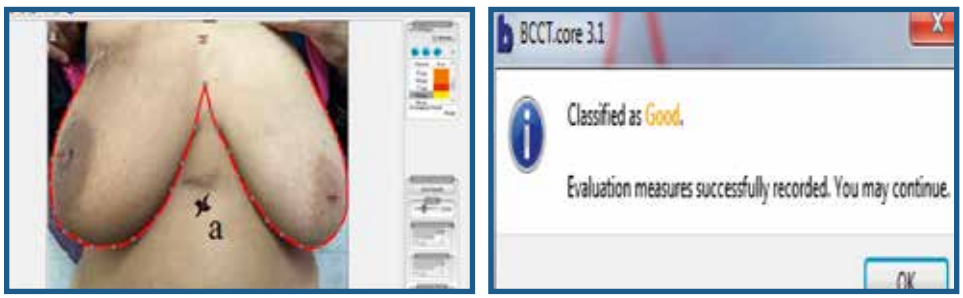
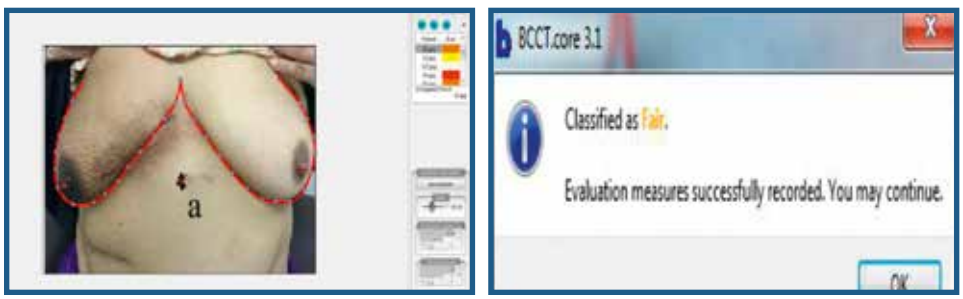


Figure 14.
An example of fair result by BCCT.core software in group II.



4. DISCUSSION

In oncoplastic surgery, the breast is reconstructed by plastic surgery techniques using the remaining breast tissue after tumor excision or using autologous tissue flaps. The advantages of oncoplastic surgery are wider free margins and better cosmetic results. Disadvantages of oncoplastic surgery as compared with BCS alone include longer operation time, morbidity, or scarring of the donor site, and the need for an experienced surgeon [16, 17].

In the present study; the patient age in group I ranged from 30 to 58 years with a mean of 46.00 ± 10.82 years while the age of the patients in group II ranged from 31 to 65 years with a mean of 44.92 ± 9.65 years. This agrees with Hille et al [18] who reported in their retrospective study that the mean age of their patients was 54 years. Also Cothier-Savey et al [19] studied 10 patients with laparoscopic harvested omental flap (LHOF) founded that the mean age was 48 years (rang 35-57). Similarly Zaha and Inamine [20] published a large study examining LHOF among 96 women. They evaluated a relatively older group of women (mean age 49 years).

In this study; in group I, the total operative time ranged from 90-120 minutes with a mean 113.33 ± 16.70 minutes which is comparatively shorter than that of group II where the mean operative time ranged from 110-160 minutes with a mean of 133.33 ± 17.23 minutes. This finding was supported by Lee et al [21] who found that the glandular flap reconstruction has a shorter operative time, less extensive procedure and did not leave any donor site morbidity. The harvest time of omental flap ranged from 50 – 100 minutes with a mean of 69.17 ± 14.43 minutes, this was comparable with the finding of Zaha et al [22] who found that all omental flaps were harvested laparoscopically within 1 hour, without the need for conversion to open surgery. Also Guan D et al [23] had done laparoscopic omental flap for 24 cases of breast cancer with a harvest time ranged from 40-110 minutes with a mean of 70 minutes.

In the current study; the hospital stay in group I ranged from 4–5 days with a mean of 4.17 ± 0.39 days while in group II it ranged from 4-6 days with a mean of 5 days. This agrees with Cothier-Savey et al [19] in his study on partial breast reconstruction with LHOF who found that the hospital stay ranged from 4 to7 days. Also Khater [24] in his study on 24 patients with breast cancer found that the mean hospital stay was 3.8 days (range 3–5 days).

In this study; in group I, two patients (10%) developed wound seroma, two patients (10%) developed fat necrosis while in group II, 8 patients (33.3%) developed fat necrosis with no wound seroma reported. In both groups, fat necrosis presented only after completion of radiotherapy. Imaging and FNA were done and documented its benign nature. Guan et al [23] observed 3 cases of fat necrotic nodule in 24 cases with laparoscopic harvested omental flap. Zaha et al [25] had observed fat necrosis occurred in 5.2% of patients and was treated conservatively in all cases. Also Khafagy et al [26] reported 6.67% incidence of fat necrosis with no seroma. Also in our study; two patients (8.3%) in group II developed epigastric incisional hernia for whom a mesh hernioplasty was done with complete disconnection of the omental flap that was intact and viable. Van Garderen et al [27] reported occurrence of hernia in (20%) of the patients who underwent extra-abdominal pedicled omentoplasty. Zaha and Inamine [20] described a 1% incidence of incisional hernia during laparoscopic retrieval.

In this study, we did not report local recurrences or distant metastasis in either group. This coincides with Gurleyik G et al [28] who reported neither locoregional recurrence nor distant metastases in their

study on 75 patients with invasive breast cancer most of them were subjected to breast conserving surgery and glandular flap rotation (73%). Also Mustafa and Fakhr [29] who reported in their study a 5-year recurrence-free and overall survival rates of 93.7% and 94.6% respectivel. Similarly Zaha et al [25] reported lower local recurrence rate which suggests the oncological safety of the LHOF procedure. While Moran et al [30] in a recent meta-analysis of 33 studies for patients who underwent BCT and omental flap reconstruction for stage I and II invasive breast cancer revealed a median prevalence of ipsilateral breast tumor recurrence of 5.3% of cases.

In the current study; as regard the aesthetic outcome using patient self-evaluation, in group I, 70% patients were satisfied with the overall aesthetic results, 20% dissatisfied and 10% not entirely satisfied. The ages of the studied patient in this group ranged from (30-58 years), we found that younger patients may have higher expectations than older age group and therefore tend to rank the cosmetic result lower in cases of smaller deviations Contrary to this finding; Steeves et al [31] had found a significant association between young age and better satisfaction. Also Touboul et al [32] concluded that age affected significantly cosmetic results, obtaining more excellent and good results in younger patients. In group II, 91.7% of patients were satisfied with the aesthetic results and 8.3% were dissatisfied. Comparable results were reported by Guan Det al [23] who found that the overall satisfaction rates of the patients after laparoscopic harvested omental flap was 95.8%.

In group I, 20% of cases were dissatisfied by the size of the reconstructed breast and 10% not entirely satisfied. A similar finding was observed by Lee et al [21] who found that in all volume displacement techniques including glandular flap, size reduction is inevitable and the main value of the flap was to preserve the overall shape and contour of the operated breast while all patients within group II were satisfied by the size of the reconstructed breast. Zaha et al [25] found that the size of the reconstructed breast after LHOF is basically did not change even after radiotherapy.

In our study; as regard aesthetic outcome using objective assessment with BCCT core, in group I, excellent results obtained in 20% of cases, good results in 40% of cases, fair results in 20% and poor results in 20% of cases. This agrees with Ogawa et al [33] who found more than 50% of the patients had a good results while in group II, excellent results obtained in 41.7% of cases, good results obtained in 33.3% of cases, fair results in 16.7% of cases and poor results in 8.3% of cases. This coincides with Zaha [34] who found that more than 80% of the patients scored excellent or good after LHOF with BCCT.core.

5. CONCLUSIONS

The glandular flap has shorter operative time and less extensive surgery than omental flap. It did not leave any donor site scars or related morbidity. Despite omental flap reconstruction is a longer procedure and needs longer recovery; it has the potential to recreate a soft, naturally ptotic breast shape that is ideal for matching with the contralateral breast. In case of voluminous breast; glandular flap can give an equal results with omental flap but in case of small breast; omental flap is always indicated. The BCCT.core is an objective, reproducible, fast and reliable method for comparative analysis as it provides an objective data about breast symmetry.

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