Feasibility and safety of oncoplastic breast-conserving surgery through an inframammary incision

Haytham Mahmoud Fayed (✉ haytham.fayed@alexmed.edu.eg)

Alexandria University

Joseph Yousry

Alexandria University

Tarek El-Fayomi

Alexandria University

Mahmoud Al-Husseini

Alexandria University

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Abstract

Background: Breast-conserving therapy (BCT) became the treatment of choice for early breast cancer due to a better understanding of the disease's biological activity and natural history. With the addition of oncoplastic breast surgery (OPS), conservation could be conducted in relatively large tumors with the best possible cosmetic results and without jeopardizing oncological safety. OPS procedures are by incising the skin envelop of the breast and then dissection of the dermoglandular breast tissue. An inframammary crease incision is a suitable choice as a hidden scar in the breast envelope because one of the primary considerations for good oncoplastic methods is the cosmetic outcome. It also provides easy access to the retromammary region. This study aims to assess the feasibility of adopting the retro glandular approach for breast-conserving surgery by making a skin incision in the inframammary fold (IMF)

Patients and methods: This study involved 67 female patients with breast cancer who were candidates for BCS and had tumors deeply seated between January 2019 and July 2021. An incision is made in the inframammary fold, its length depends on the tumor site, the tumor was excised after retroglandular exploration. Reapproximation of the glandular pillars was done and the wound was closed after a closed suction drain was inserted. SPSS software package version 20.0 was used for statistical analysis.

Results: All patients were presented with mass, most of them (53.7%) had breast cup size B. 55.3% of cases had their tumor in the lower half of the breast. The median operative time was 125 (110 – 140) minutes. Seroma was the most common complication (8.9% of cases). 62.7% of cases had excellent results as judged by breast surgeons other than the operating surgeon. 82.1% of patients were satisfied with the aesthetic results.

Conclusion: The Inframammary approach for breast-conserving surgery is feasible and safe for surgical treatment of patients presented with deeply seated breast cancer.

Trial registration: This study protocol was reviewed and approved by the Ethical Committee of Alexandria Faculty of Medicine on 16- 7- 2020. Approval number: 0106451.

Introduction:

Breast carcinoma is considered the most common site-specific cancer among females, and it is the first cause of cancer-related deaths among them. It accounts for 29% of all newly diagnosed females' cancers and is responsible for 14% of the cancer-related deaths among them. [1] Breast-conserving therapy (BCT) has become the treatment of choice for early breast cancer due to a better understanding of the disease's biological activity and natural history. [2,3] The primary goal of BCS is to achieve a tumor excision with a satisfactory cosmetic outcome. This, however, is only achieved in 60–80 percent of patients. [4] The efforts that have been made to improve the aesthetic outcome after BCS led to the emergence of oncoplastic breast surgery that was created by merging standard breast surgery procedures with novel oncological principles to treat breast cancer with improved aesthetic outcomes. [5,6] Oncoplastic breast

surgery aims to treat breast cancer without deviating from oncological principles while also making the patient feel better by improving their appearance. [7] The Inframammary approach for BCS was first described by Domenico Gerbasi [8] who presented a case study of early breast cancer treated by BCS through an inframammary incision. An inframammary incision allows good access to breast tissue for excision of the tumor with an adequate safety margin, leaving a cosmetically accepted scar located in a hidden area.

This study aims to assess the feasibility of adopting the retroglandular approach for breast-conserving surgery by making a skin incision in the inframammary fold (IMF), combined with a retro glandular exploration in a cohort group of patients in a single-center experience.

Materials And Methods:

All methods were performed in accordance with the Declaration of Helsinki guidelines and regulations. This study involved 67 female patients with breast cancer who were candidates for BCS and had tumors deeply seated. A study was done between January 2019 and July 2021 at the Surgical Oncology Unit of Alexandria Main University Hospital. All patients gave their informed written agreement and undertook the necessary pre-operative examinations, investigations, and preparation. Solitary tumor, tumor size less than 3 cm, any breast size, but ideally a B-cup size or greater, are all inclusion criteria. Patients with breast parenchymal involution or fatty degeneration, an unfavorable tumor-to-breast volume ratio, previous mastopexy, or multicentric breast lesions were excluded from the study.

First, the tumor outline and the incision were drawn with a marker pen with the patient in a standing position at the inframammary fold; the length of the incision is determined by the location of the tumor (figure 1a). Surgery was performed in a supine position with the arm abducted at 90 degrees under general anesthesia.

Access to the retro mammary space for retroglandular exploration requires an "inverted" perspective of the operating surgeon.

After anesthesia, sterilization, and draping, the incision is extended inferiorly as marked, following the inframammary fold according to the site of the mass. Elevation of the dermoglandular flap forms the upper wound edge with hooks held by the assistant. Separating the breast parenchyma from the pectoralis major muscle (retromammary space) was done by cautery in the plane between the two. The dissection was extended as far as possible beyond the tumor's site (figure 1b). Grasping and elevating the mobilized parenchyma of the breast along with the intact, complete covering skin gently, after localizing the tumor by palpation (or with guidewire localization), a 10-mm large macroscopic safety margin is marked. The margin is circularly incised along the continuous shining surface of the pectoral fascia with electrocautery. The specimen is dissected from the surrounding parenchyma by sectioning deeper and deeper with electrocautery. The specimen is grasped with atraumatic forceps to avoid disturbing the assessment of the gross macroscopic margins (figure 1c). Because the surgeon is working

with an inverted perspective, the anterior margin needs to be clarified according to the in vivo orientation of the specimen.

After excision of the mass with adequate safety margins all around, label the margins and send them for intraoperative histopathological assessment to achieve free margins from tumor cells. Axillary surgery (either SLNB with blue dye or axillary clearance, if necessary) was done through the same skin incision in laterally located breast tumors or a separate axillary incision. After clip marking of the tumor bed, a suction drain was placed in the space above the pectoralis major muscle, followed by closure of the defect by reapproximating the glandular pillars. The wound is narrowed with absorbable subcutaneous sutures and closed with continuous subcuticular sutures (figure 1d).

Methods of Assessment of the results:

1- Surgeon aesthetic assessment:

Patients were examined regularly every two weeks after discharge then the cosmetic outcome was assessed by breast surgeons who were not involved in the operation after 2, 4, 6 months postoperatively using the Harvard scale (4-point Likert scale). [9]

Excellent: Breasts that have been treated are nearly identical to breasts that have not been treated.

Good: Breasts that have been treated differ slightly from breasts that have not been treated.

Fair: The treated breasts are visibly distinct from untreated ones, yet they are not significantly deformed.

Poor: The breast that had been treated was severely deformed.

2- Patient Satisfaction:

Patient satisfaction was assessed as regard cosmetic outcome according to size, shape, the appearance of scar, symmetry, cleavage, the appearance of nipple/areola complex, body wholeness/harmony, proportionate and feels to touch. They were categorized as satisfied or not satisfied. [10]

All patients were followed up for a mean of 6 months (range 3 – 9 months) for the possible complications and aesthetic outcome.

All patients who underwent retroglandular exploration approach were statistically assessed as regards the following data:

- Demographic data and patient history.
- Clinical presentation and tumors criteria.
- distance of the tumor from skin.
- Operative time, frozen time.

- Postoperative Complications.
- Post-operative pathology and hormonal profile.
- Cosmetic outcome assessment, this was done both by Surgeons and patients.
- Oncologic outcome was assessed based on the occurrence of local recurrence or distant metastasis during the follow-up period.

Statistical analysis of the data

Data were fed to the computer and analyzed using IBM SPSS software package version 20.0. (Armonk, NY: IBM Corp) Qualitative data were described using numbers and percentages. **The Kolmogorov-Smirnov test** was used to verify the normality of distribution Quantitative data were described using range (minimum and maximum), mean, standard deviation, median. The significance of the obtained results was judged at the 5% level.

Informed consent was taken from all patients involved in the study. The study was approved by the local ethical committee of Alexandria University.

Results:

This study had been conducted on 67 female patients who had been admitted to the Surgical Oncology Unit of Alexandria Main University Hospital with a diagnosis of deeply seated breast cancer in the period from January 2019 and July 2021.

Table 1 shows the demographic data and the medical history of the studied patients. In table 2, the presenting symptoms and the clinicopathological data of the patients. All patients were presented with mass, most of them (53.7%) had breast cup size B. 55.3% of cases had their tumor in the lower half of the breast. Luminal types were the most common biological subtypes (79.2%) among our patients. The distance of the tumor from the skin, total operative time, and complications are shown in Table 3. A free resection margin was achieved from the first attempt of resection in 59 patients (88%) while 9 patients required re-resection to achieve a negative margin, none of our cases proceeded to mastectomy. 62.7% of cases had excellent results as judged by breast surgeons other than the operating surgeon and 82.1% of patients were satisfied with the aesthetic results. Examples of cases operated through inframammary incision are shown in Figs. 2 and 3.

Discussion:

Surgery is the main line of treatment of non-metastasizing breast cancer either breast-conserving surgery or modified radical mastectomy (MRM).[11]

Post-BCS cosmetic results are inversely proportional to specimen weight and scar length and are adversely affected by smaller breast cup size, medial tumor localization, and inappropriately located incision. [12, 13]

Zoltán Mátrai et al performed the retro glandular approach as a level I oncoplastic breast conservative surgery. Zoltán Mátrai et al study was done during the period from February 2016 and October 2017 on 102 females with breast malignancy. [14]

The current study was done on 67 patients admitted to the Surgical Oncology Unit in Alexandria Main University Hospital with breast cancer diagnosis in the period from January 2019 to July 2021.

In Zoltán Mátrai et al study, the median age of patients was 55 years (range from 31–80 years) with a mean BMI of 26.5 ± 6.2 . It was nearly the same as our study in which the median age of the studied patients was 52 years old (ranging from 31–63 years) with a mean BMI of 33.4 ± 3.4 .

In Zoltán Mátrai et al study, the tumor was located in the upper outer quadrant in 44 patients (43.1%) and the lower outer quadrant in 20 patients (19.6%). In our study, the tumor was in the lower outer quadrant in 33 patients (49.3%) and in the upper outer quadrant in 14 patients (20.9%).

In our study only 14 patients received neoadjuvant chemotherapy (20.9%) in whom the hormonal profile was triple-negative and her2 neu positive, to reduce tumor size and achieve negative resection margins easier.

The average tumor size in Zoltán Mátrai et al study was 1.5 cm, but it was 1.9 cm in our study. Axillary lymph node dissection was done in only 6.9% of Zoltán Mátrai et al study in contrary to our study in which about 46.3% of the cases had positive axillary lymph nodes and subsequently ALND.

In the Zoltán Mátrai et al study, breast cup size was assessed preoperatively, and 30 patients (29.4%) were found to have to cup C, 30 patients (29.4%) were cup D, 17 patients (16.7%) were cup B, 14 patients (13.7%) were cup A and only eleven patients (10%) were cup E. In our study, breast cup size was also assessed preoperatively and 53.7% of patients were found to have cup size B while 14.9% had cup size A and 31.3% patients had cup size C.

Also, Zoltán Mátrai et al reported that the median operative time was 40 minutes (20–80 min) while in our study the median operative time was 125 minutes (110–140 min). This might be attributed to the longer time of frozen section examination in our institution and more cases that required ALND.

According to margin positivity, Zoltán Mátrai et al stated that only 17 patients (16.6%) had a positive margin on frozen section. In 14 patients, a negative margin was achieved after re-excision while only three patients had undergone mastectomy as a negative margin could not be achieved.

In our study 59 patients (88%) had a negative margin on frozen section from the first attempt while 9 patients (12%) needed re-excision to achieve negative margins. None of our patients proceeded to mastectomy. Yet, if MRM had been done, we believe this will be due to tumor factors, not technique failure i.e., it would have occurred with any frontal approaches. Skin-sparing or nipple-sparing mastectomy can be done through the same incision.

In Zoltán Mátrai et al study, about 67.7% were found to be IDC and 2.9% only showed DCIS only 23.5% were ILC. 57 patients (55.9%) were found to be at stage II and 22 patients (21.5%) were at stage I and 21 patients (20.6%) were stage III ⁽¹²⁾. In our study, 70.1% of our patients showed IDC NOS as a final pathology while 6% showed IDC with DCIS and 23.9% as ILC. 30 patients were diagnosed as stage I while 37 patients as stage II.

Seroma formation was the commonest complication in the Zoltán Mátrai et al study seen in 25 (24.5%) patients. Limited fat necrosis was found in 3 (2.9%) patients. Wound dehiscence was seen in 2 (1.9%) patients. Fat necrosis was seen in 4 (3.9%) patients in the follow-up.

The incidence of complications in our study occurred in 14.9% of cases, in whom seroma was the most common complication and was seen in 6 patients (8.9%) and it was treated with repeated aspirations. Wound infection and dehiscence were seen in 4 patients (6%). It was treated by frequent dressing and systemic antibiotics after culture and sensitivity.

Jenny Heiman Ullmark et al ⁽⁴⁾ reported complications in 11% of their patients, also in the form of seroma and wound infection.

In the Zoltán Mátrai et al study the median follow-up time of the patients was about 11 months with no evidence of locoregional or distant recurrence. In our study, the follow-up period was shorter ranging from 3 to 9 months with no signs of recurrent disease. In fact, in both studies, the follow-up period is not sufficient to judge the rate of recurrence. However, it is worth mentioning here, that the recurrence rate is related to the ability to achieve safe margins rather than the technique. Jenny Heiman Ullmark ⁽⁴⁾ reported that after a median follow-up of 35 months (29–40 months), all patients were alive and free of disease.

Cosmetic outcome after BCS is influenced negatively by increased specimen weight, inappropriate incisions, and increased scar length. Inframammary incision allowed resection of the tumor while preserving the skin envelope of the breast giving better cosmetic results.

In Zoltán Mátrai et al study, according to the results of the 4-point Likert score and the BCCT score points most of the patients had an excellent or good esthetic outcome. Thus, retro glandular OPS was able to fully preserve the initial natural appearance and shape of the breast while accomplishing radical tumor resection.

In our study cosmetic outcome was assessed by both surgeon aesthetic assessment 4-point Likert scale and patient satisfaction. According to surgeon assessment, 62.7% of patients showed excellent results, while 16.4% showed good results and 20.9% had fair results. 82.1% of our patients were satisfied with their results and only 12 patients (17.9%) were not satisfied with their results. Unsatisfactory results occurred in patients who needed re-resection that resulted in skin or nipple retraction. In Jenny Heiman Ullmark ⁽⁴⁾ post-operative patient satisfaction was assessed using the validated BREAST-QTM questionnaire, Breast-conserving therapy (BCT) module. The item 'Breast Satisfaction' had a mean RASCH score of 72.5, with a range of 18–100.

Conclusion:

Inframammary incision for retroglandular tumor excision is an acceptable and feasible oncoplastic technique that permits the excision of deeply seated breast cancer without incising the skin envelop of the breast. A longer follow-up period is required to assess the oncological safety of the procedure. Acceptable cosmetic results were achieved in 82.1% of cases.

Abbreviations:

BCT: Breast-conserving therapy

BCS: Breast-Conserving Surgery

OPS: oncoplastic breast surgery

IMF: Inframammary Fold

Declarations:

Ethics approval: This study protocol was reviewed and approved by the Ethical Committee of Alexandria Faculty of Medicine on 16- 7- 2020. Approval number: 0106451.

Consent to participate: A written informed consent was obtained from patients to participate in the study.

Consent for publication: not applicable

Data availability: The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Competing interests: The authors declare that they have no competing interests.

Funding Sources: No fund was received to accomplish this study.

Author contributions:

Haytham fayed designed work, performed the surgical procedures, collected the data, helped in data analysis, article drafting, and critical revision of the article.

Joseph Yousry helped in work design, data collection and analysis, article drafting, and final revision.

Tarek El-Fayomi helped in the work design collection of the data, performed surgical procedures, helped in data analysis, drafting, and final revision of the article.

Mahmoud Al-Husseini shared in work design, performed surgical procedures, shared in data collection and analysis, and revised the article's final draft.

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retroglandular oncoplastic technique as a standard Level I oncoplastic breast-conserving surgery: A retrospective clinicopathological study of 102 breast cancer patients. Clinical Breast Cancer (2019).

Tables:

Table (1): Demographic data and medical history (n=67)

Demographic and Medical history	No. (%)
Age (years)	
Median (Min. – Max.)	52 (31 – 63)
Mean ± SD.	48.3 ± 8.6
Marital status	
Unmarried	8 (11.9%)
Married	59 (88.1%)
Number of children	
Median (Min. – Max.)	2 (0 – 4)
Mean ± SD.	2.3 ± 1.4
Lactation	55 (82.1%)
Use of OCPs	6 (9%)
BMI (kg/m²)	
Median (Min. – Max.)	33 (28 – 41)
Mean ± SD.	33.4 ± 3.4
Family history	12 (17.9%)
HTN	7 (10.4%)
DM	18 (26.9%)

SD: Standard deviation

Table (2): Distribution of the studied cases according to pre-operative assessment (n=67)

Pre-operative assessment	No. (%)
Complaint (Mass)	67 (100%)
Neoadjuvant chemotherapy	14 (20.9%)
Breast size	
A	10 (14.9%)
B	36 (53.7%)
C	21 (31.3%)
Tumor size (cm)	
Median (Min. – Max.)	1.8 (1.2–3.5)
Mean ± SD.	2 ± 0.7
Axillary LNs	
Clinical	10 (14.9%)
Mammogram	31 (46.3%)
Side	
RT	30 (44.8%)
LT	37 (55.2%)
Site	
UOQ	14 (20.9%)
LOQ	33 (49.3%)
UIQ	2 (3%)
LIQ	4 (6%)
Central	14 (20.9%)
Micro calcification	4 (6%)
Hormonal profile (ER - PR _ KI 67)	
A	33 (49.3%)
B	20 (29.9%)
Triple negative	6 (9%)
Her2 enriched	8 (11.9%)
Type of the tumor by core	

ILC	16 (23.9%)
IDC	51 (76.1%)

SD: Standard deviation

Table (3): Distribution of the studied cases according to post-operative assessment (n=67)

Post-operative assessment	No. (%)
Stage	
I A	30 (44.8%)
II A	16 (23.9%)
II B	21 (31.3%)
Grade	
II	44 (65.7%)
III	23 (34.3%)
Operative time in min	
Frozen	
Median (Min. – Max.)	45 (35 – 55)
Mean $\pm$ SD.	45.2 $\pm$ 5.5
Total	
Median (Min. – Max.)	125 (110 – 140)
Mean $\pm$ SD.	126.4 $\pm$ 7.1
Complications	10 (14.9%)
Seroma	6 (8.9%)
Hematoma	0 (0%)
Wound dehiscence and infection	4 (6%)
Distance of the tumor from skin (cm)	
Median (Min. – Max.)	2.5 (2 – 4)
Mean $\pm$ SD.	2.7 $\pm$ 0.7
Post-operative pathology (paraffin)	
IDC	47 (70.1%)
ILC	16 (23.9%)
IDC + DCIS	4 (6%)
Axillary management	
Sentinel LN biopsy	36 (53.7%)
Axillary clearance	31 (46.3%)

Cosmetic result	
Surgeon assessment	
Fair	14 (20.9%)
Good	11 (16.4%)
Excellent	42 (62.7%)
Patient Satisfaction	
Not satisfied	12 (17.9%)
Satisfied	55 (82.1%)

SD: Standard deviation

Figures

A

B

C

D

Figure 1

A. Marker pen was used to delineate the tumor and the proposed incision, B. Dissection in the plane between the breast parenchyma and the pectoralis major muscle, C. Specimen dissected from the surrounding parenchyma, D. Final incision after closure.

A

B

C

D

Figure 2

A. Preoperative mammogram craniocaudal view, B. Preoperative wire localization, C. Immediately postoperative, D. 1-month post-operative.

A

B

C

D

E

F

Figure 3

A. Preoperative mammogram mediolateral view, B. Inframammary crease incision, C. Marking of resection margins, D. Immediately postoperative, E. 2 weeks post-operative, F. 3 months post-operative (post-radiotherapy).