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Short-term Assessment of Aesthetic Outcomes of Parenchymal Rotational Flap Reconstruction for Breast Cancer in Upper Outer Quadrant

Maged H. M. Ali^{1*}, Mohamed M. M. Farag¹, Mohamed I. M. Abdelaziz¹, Ayman M. A. Abdelkader¹

¹ General Surgery Department, Faculty of Medicine, Fayoum University, Fayoum 63511, Egypt.

*Correspondence: Maged H. M. Ali, mhm14@fayoum.edu.eg, Tel: (002) 01116811698.

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Abstract:

Introduction: Breasts, symbolizing femininity and body image, can be affected by cancer ablative surgery, potentially affecting perception, psychosexual well-being, and quality of life.

Aim of the study: To evaluate the early aesthetic outcomes of breast cancer in the upper outer quadrant using a parenchymal rotational flap.

Subjects and Methods: This prospective research was performed on 13 breast cancer cases surgically managed with volume displacement oncoplastic techniques (matrix dermo-glandular rotational flap) in Fayoum University Hospitals from March 2022 to March 2023. Patients were examined at the outpatient breast surgery clinic, and further surgical and medical evaluations were completed in the inpatient ward.

Results: The BCCT esthetic outcome was stated to be excellent in 2 (15.4%) cases, good in 9 (69.1%) patients, fair in 2 (15.4%) patients, and no patient was poor. The mean largest tumor diameter in studied patients was 3 ± 0.81 cm with a median largest tumor diameter of 3 cm ranging between 2 and 4 cm. ACR showed a significant relationship with BCCT esthetic outcome, in which excellent and good outcome was higher in B+C ACR than A+D ACR. There were no complications in the studied patients.

Conclusion: Parenchymal rotational flap repair for breast cancer is a novel technique that effectively addresses abnormalities and substantial volume loss. It suits this patient population because of its broad rotational range and consistent vascularity. It may provide a visually pleasing outcome and is regarded as a secure alternate method to more intricate procedures.

Keywords: Parenchymal rotational flap reconstruction; Breast cancer; Ecchymosis.

1. Introduction

The breast is often regarded as a highly respected symbol of femininity.

Following the cessation of their primary function of breastfeeding, these organisms

continue to play a substantial role in shaping body image and sexuality. The use of ablative cancer therapies, such as mastectomy or breast-conservative surgery (BCS), may lead to the development of a deformity that has adverse effects on an individual's self-perception of body image and psychosexual well-being. Consequently, this can eventually compromise their overall quality of life [1].

Currently, the use of plastic surgery principles in reconstruction is reliable, firmly established, and verified. The cosmetic technique known as oncoplastic breast surgery (OBS) integrates the principles of plastic surgery with recognized oncological constraints to get desirable outcomes [2].

OBS encompasses a variety of surgical methods, each with distinct surgical purposes. Nevertheless, the primary objective of all these procedures is to attain favorable oncological and cosmetic results [3].

The findings from patient-reported outcomes after oncoplastic breast reconstruction suggest that those who received immediate reconstruction experienced a significantly enhanced quality of life compared to those who just

underwent breast conservation surgery (BCS) [4]. Furthermore, previous studies have shown evidence of improved psychological well-being [5].

The attainment of a visually appealing result in oncoplastic surgery is contingent upon a multitude of patient and tumor-specific variables. Several factors have been identified as potential predictors of unfavorable esthetic results. These factors include variations in breast size, ptotic breast form, tumor size, tumor position within the central, medial, or lower quadrant, multifocal tumor distribution, tumor re-excision, and the removal of more than 20% of breast volume [6].

The primary point of contention centers on the optimal techniques for evaluating the visual appeal following BCS and OPS. Numerous individuals propose both subjective and objective procedures for this purpose. However, there remains a lack of agreement regarding the specific parameters that should be assessed and the appropriate timing for conducting this assessment [7].

The objective of the present work was to evaluate the early aesthetic outcomes of breast cancer in the upper outer quadrant using a parenchymal rotational flap.

2. Subjects and Methods

2.1. Subjects

This prospective research was performed on 13 breast cancer cases surgically managed with volume displacement oncoplastic techniques (matrix dermo-glandular rotational flap) in Fayoum University Hospitals from March 2022 to March 2023. Patients were examined at the outpatient breast surgery clinic, and further surgical and medical evaluations were completed in the inpatient ward.

Inclusion Criteria

All female breast cancer patients presented with a reasonable tumor-to-breast size ratio (expected specimen volume less than 30%), localized disease limited to the upper outer quadrant of the breast, including multifocal disease, and patients fit for general anesthesia (ASA I and II).

Exclusion Criteria

That included all female patients presented with large tumors with no size regression after neo-adjuvant therapy (expected specimen volume greater than 30%), multi-centric disease or extensive tissue involvement with micro-calcifications, a history of prior therapeutic chest wall irradiation, contraindications for

radiation therapy, and inflammatory breast cancer.

2.2. Study design

The present study is a prospective one on 15 breast cancer patients fulfilling our selection criteria and surgically managed with volume displacement oncoplastic techniques (matrix dermo-glandular rotational flap) in Fayoum University Hospitals from March 2022 to March 2023.

Patients were examined at the outpatient breast surgery clinic with further surgical and medical evaluations were completed in the inpatient ward.

2.3. Methods

Preoperative evaluation

That included history taking, general examination, breast examination, and investigations

Surgical techniques

A. Operative steps for all quadrants

Patient Position and Anesthesia

All patients underwent surgery in a supine position, with the operating table

adjusted to enable semi-sitting. Both arms were abducted 90° and secured, and all patients received general anesthesia.

Skin Preparation and Draping

The surgical site, including the neck, upper abdominal muscles, ipsilateral breast, axilla, and upper leg, was cleansed using a 10% antiseptic solution containing povidone-iodine. To facilitate intraoperative comparison, the contralateral breast was likewise prepped and draped. The researchers used sterilized drapes that were fastened with towel clips. Additionally, they separated the ipsilateral hand and forearm using an occlusive sterile drape.

B. Axillary Surgery

All patients underwent axillary clearing due to positive lymph nodes, as confirmed by both clinical and radiographic examinations. In several instances, Level 1 and 2 axillary lymph nodes were excised. Level 3 axillary lymph nodes were sometimes excised when positive level 2 axillary lymph nodes were present.

C. Excision of the tumor

To enhance palpable control during the surgical excision, the tumor was often raised to the underlying pectoral fascia by sharp incision and thereafter lifted through

the wound outside the skin envelope. The object was removed after a thorough examination of its boundaries, with a safety buffer of about 1 cm surrounding it.

D. Hemostasis and Marking

Thorough surgical hemostasis was achieved with the use of electrocautery, while the tumor bed was demarcated using titanium clips to facilitate the administration of a postoperative radiotherapy booster dosage specifically tailored for the tumor bed.

E. Skin Incision and De-epithelialization

Skin incisions were performed using a tiny scalpel with a blade number of 15. These incisions were made over the preoperative drawings, specifically targeting the epidermal layer. The region between the two incisions was then de-epithelialized using the same scalpel. The dermis next to the tumor site was incised using a sharp scissor, reaching a maximum angle of 180° around the areola.

F. Obliteration of the Defect

The resultant defect was closed using one of two main ways; via dual plane dissection above the pectoral fascia (pre-pectoral plane) and under the overlying skin (subcutaneous plane) to mobilize and

approach glandular flaps to each other. The second way is to mobilize the dermo-glandular flap via only pre-pectoral plane dissection. Fixation of the mobilized flaps was done with absorbable sutures.

G. Wound Closure

The dermis was closed with interrupted 4/0 absorbable sutures and the skin incisions were closed using a running subcuticular 4/0 absorbable sutures. All patients were drained with separate negative suction drains from lateral-dependent exits.

H. Postoperative hospital stays and follow-up

All participants in our study were admitted to the hospital on the night of the surgical procedure and were subsequently discharged on the morning of the first day after the operation. During their stay, the clinical follow-up focused on identifying

early surgical issues, such as bleeding, fluid collection, skin discoloration, and complications related to the nerve-attached catheter (NAC). Every patient received detailed instructions on the proper care of their wounds and axillary drains at home. The first outpatient clinic visit occurred within a week after surgery to monitor the axillary drain, identify any postoperative issues, and conduct a comprehensive review of the pathology report and subsequent care plans. The axillary suction drains were removed when the drainage volume fell below 50 mL for two consecutive days or after a maximum of fifteen days, regardless of the drainage volume. The assessment of visual results was conducted using both objective and subjective methods, throughout three to six months after surgery and before the commencement of radiation therapy (Figure 1).



Figure 1: Upper outer quadrant flaps.

2.4. Statistical analysis

The data were encoded and inputted using the statistical software SPSS version 28, developed by IBM Corp. in Armonk, NY, USA. The quantitative data was described using statistical measures such as the mean, standard deviation, median,

minimum, and maximum. For the categorical data, the summary included frequency (count) and relative frequency (%). A Chi-square (χ^2) test was used to compare categorical data. When the anticipated frequency was less than 5, a precise test was used. *P*-values below 0.05 were deemed statistically significant.

3. Results

The mean age in studied patients was 47.46 ±8.07 years with a median age of 45.00 years ranging between 36 and 63 years. The mean largest tumor diameter in studied patients was 3±0.81 cm with a median largest tumor diameter of 3 cm

ranging between 2 and 4 cm. The BCCT esthetic outcome was stated to be excellent in 2 (15.4%) cases, good in 9 (69.1%) patients, fair in 2 (15.4%) patients, and no patient was poor (**Table 1**).

Table 1: BCCT esthetic outcome in studied patients.

BCCT esthetic outcome	Studied patients (N=13)
Excellent	2 (15.4%)
Good	9 (69.1%)
Fair	2 (15.4%)
Good	0 (0%)

ACR showed a significant relationship with BCCT esthetic outcome, in which excellent and good outcomes were

higher in B+C ACR than A+D ACR (**Table 2**). There were no complications in the studied patients.

Table 2: Relation between ACR and BCCT esthetic outcome in studied patients.

BCCT esthetic outcome	ACR		P-value
	A+D (N=3)	B+C (N=10)	
Excellent	0 (0.0%)	2 (20.00%)	0.018*
Good	1 (33.30%)	8 (80.00%)	
Fair	2 (66.70%)	0 (0.0%)	

*: p-value is statistically significant ($p < 0.05$).

4. Discussion

Cancer of the breast is the most prevalent among women. At present, breast cancer stands as one of the most commonly diagnosed malignancies and ranks fifth in terms of cancer-related fatalities, accounting for an estimated 2.3 million newly diagnosed cases globally, as reported by GLOBOCAN 2020 [8].

The research revealed that the average age of the patients under investigation was 47.46 ± 8.07 years, with a median age of 45 years. The age range of the patients varied between 36 and 63 years.

The findings of our study align with the research conducted by Zhygulin et al. (2018), which reported a mean age of 49 years among the patients, with a range of 33 to 69 years [9].

Furthermore, our findings align with the research conducted by Galal et al. (2023), which indicated that a total of 30 individuals diagnosed with breast cancer in the upper/upper outer quadrant met the criteria for inclusion in our study [10]. The participants' ages spanned from 32 to 77 years, with a mean age of 47.53 ± 11.66 years.

Additionally, the study conducted by Soliani et al. (2023) examined a sample of 14 patients and determined that their ages varied between 42 and 67 years, with a mean age of 58.9 years and a standard deviation of 8.4 years [11].

In the present research, it was observed that the average greatest tumor diameter among the patients under investigation was 3 ± 0.81 cm, while the

median largest tumor diameter was 3 cm, falling within the range of 2 to 4 cm.

Similarly, Soliani et al. (2023) found that the size of the tumor varied between 2 and 7 cm, with a mean of 4.2 cm and a standard deviation of 1.6 cm [11].

According to Zhygulin et al. (2018), their study included a sample of 823 cancer patients diagnosed with locally advanced breast cancer who were having oncoplastic surgery [9]. The researchers reported that the mean size of the tumors was 2.8 cm, with a range of 0.2 to 15.8 cm.

Furthermore, our findings align with the research conducted by Kim et al. (2012), which revealed that a collective of 33 individuals diagnosed with breast cancer had surgical procedures [12]. The median size of the tumor was 2.3 cm, with a range of 0.7-3.5 cm.

According to our research, the esthetic result of BCCT was reported as great in 2 instances (15.4%), good in 9 cases (69.1%) of patients, fair in 2 cases (15.4%) of patients, and no patient exhibited bad outcomes.

Our findings are consistent with the research conducted by Soliani et al. (2023), which demonstrated that when assessing the

ultimate surgical outcome using the BCCT core program, 92.9% (13 instances) exhibited Excellent/Good outcomes, whereas 7.1% (1 case) exhibited Fair/Poor outcomes [11]. According to the BCCT core program, a significant proportion of cases, namely 78.6% in the early postoperative phase and 92.9% in the late postoperative period, received excellent or good ratings.

Zhygulin et al. (2018) reported a more favorable esthetic outcome, indicating that 87.2% of subjects exhibited satisfactory to outstanding visual outcomes [9]. The disparity may be ascribed to the increased magnitude of the sample size.

Furthermore, our findings align with the research conducted by Elsis et al. (2024), which showed that in terms of subjective patient satisfaction with esthetic outcomes, 3 (21.4%) patients reported excellent satisfaction, 7 (50%) patients reported good happiness, 3 (21.4%) patients reported fair satisfaction, and 1 (7.14%) patient-reported bad satisfaction [13].

In our study, we found that ACR showed a significant relationship with BCCT esthetic outcome, in which excellent and good outcomes were higher in B+C ACR than A+D ACR.

The results of our study align with the findings of Farag et al. (2019), who observed a statistically significant positive link between breast density assessment and aesthetic outcomes [14]. In comparison to patients with low-density breasts ACR B and ACR A, patients with high breast density ACR C and ACR D have shown satisfactory cosmetic outcomes, namely outstanding BCCT core outcomes, with rates of 90% and 80% respectively.

Furthermore, in contrast to our findings, Yu et al. (2016) observed that patients with excellent or good BCCT core exhibited smaller widths of the tangential field and excised tumor volume compared to those with fair or poor BCCT [16]. The width of the tangential field was 8.0 ± 1.1 cm compared to 8.6 ± 0.7 cm ($p = 0.034$), while the excised tumor volume was 64.0 ± 35.8 cm³ compared to 95.3 ± 54.4 cm³ ($p = 0.067$).

Our analysis revealed the absence of any problems among the participants under investigation.

The findings of our study align with the research conducted by Soliani et al. (2033), which demonstrated that no patients need re-excision and no post-surgical problems were seen [11].

Furthermore, our findings align with the research conducted by Sözer et al. (2023), which demonstrated that only two patients had minimal wound dehiscence during the first postoperative phase [16]. No instances of bottoming out were seen in any of the patients throughout the mean follow-up period of about two years.

In contrast to our findings, Zhygulin et al. (2018) reported that problems were seen in seven patients, accounting for 21.2% of the total sample [9]. These issues included hematoma (n=2, with one revision), cellulitis (n=3, with conservative therapy), and wound edge necrosis (n=2, with revision).

5. Conclusion

The present research elucidates that parenchymal rotational flap restoration for breast cancer is a novel approach that effectively addresses abnormalities and substantial volume loss. This treatment is particularly suitable for implementation in this specific patient population due to its extensive rotational range and consistent vascularity. It may provide a visually pleasing outcome and is regarded as a secure alternate method to more intricate procedures. Further studies with larger scales are needed to confirm our results.

Ethical approval and consent to participate:

An informed written consent was obtained from each individual for preoperative and postoperative photography (Ethical approval number: M362).

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Conflicts of Interest: All authors declare they have no conflicts of interest.

References

- Zehra S, Doyle F, Barry M, Walsh S, Kell MR. Health-related quality of life following breast reconstruction compared to total mastectomy and breast-conserving surgery among breast cancer survivors: a systematic review and meta-analysis. *Breast Cancer*. 2020;27(4):534-566. doi: 10.1007/s12282-020-01076-1.
- Macmillan RD, McCulley SJ. Oncoplastic Breast Surgery: What, When and for Whom? *Curr Breast Cancer Rep*. 2016; 8:112-117. doi: 10.1007/s12609-016-0212-9.
- Munhoz AM, Montag E, Gemperli R. Oncoplastic breast surgery: indications, techniques and perspectives. *Gland Surg*. 2013;2(3):143-157. doi: 10.3978/j.issn.2227-684X.2013.08.02.
- Salibian AA, Olson B, Shauly O, Patel KM. Oncoplastic breast reconstruction: Principles, current techniques, and future directions. *J Surg Oncol*. 2022;126(3):450-459. doi: 10.1002/jso.26897.
- Kelemen P, Pukancsik D, Újhelyi M, Sávolt Á, Kovács E, Ivády G, Kenessey I, Kovács T, Stamatiou A, Smánykó V, Mátrai Z. Comparison of clinicopathologic, cosmetic and quality of life outcomes in 700 oncoplastic and conventional breast-conserving surgery cases: A single-centre retrospective study. *Eur J Surg Oncol*. 2019;45(2):118-124. doi: 10.1016/j.ejso.2018.09.006.
- Waljee JF, Hu ES, Newman LA, Alderman AK. Predictors of breast asymmetry after breast-conserving operation for breast cancer. *J Am Coll Surg*. 2008;206(2):274-280. doi: 10.1016/j.jamcollsurg.2007.07.029.
- Cardoso MJ, Cardoso JS, Vrieling C, Macmillan D, Rainsbury D, Heil J, Hau E, Keshtgar M. Recommendations for the aesthetic evaluation of breast cancer conservative treatment. *Breast Cancer Res Treat*. 2012;135(3):629-637. doi: 10.1007/s10549-012-1978-8.
- Sung H, Ferlay J, Siegel RL, Laversanne M, Soerjomataram I, Jemal A, Bray F. Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. *CA Cancer J Clin*. 2021;71(3):209-249. doi: 10.3322/caac.21660.
- Zhygulin A, Palytsia V, Unukovych D. Rotation advancement flap—a novel technique for breast conserving surgery in tumors of the upper lateral breast quadrant. *Annals of Breast Surgery*. 2018;2:4. doi: 10.21037/abs.2018.01.02
- Galal AM, Abotaleb MA, Osman AG, El Azazy M. Comparative Study between Matrix Rotation Technique versus Wide Local Excision of Carcinoma of The Breast Located in The Upper/Upper Outer Quadrant. *The Egyptian Journal of Hospital Medicine*. 2023;90(2):2064-2070. doi: 10.21608/EJHM.2023.285033

11. Soliani Bastos MC, Bagnoli F, Rinaldi JF, João TBF, de Oliveira VM. Dermoglandular advancement-rotation flap for conservative treatment of breast cancer - description of technique, objective and subjective assessments. *Front Oncol.* 2023; 13:1137924.
12. Kim J, Yoo J, Lee J, Chang E, Suh K. Oncoplastic reconstruction with superior based lateral breast rotation flap after lower quadrant tumor resection. *J Breast Cancer.* 2012;15(3):350-355. doi:10.4048/jbc.2012.15.3.350
13. Elsisi AA, Rageh TM, Shahin MA. Modified Inferior Based Reduction Mammoplasty versus Matrix Rotational Flap in Upper Inner Quadrant Breast Cancer. *Menoufia Medical Journal.* 2024;36(4):10. doi.org/10.59204/2314-6788.1052.
14. Farag MM, Aziz MI, Essawy AM. Breast Density and Aesthetic Outcomes of Volume Displacement Oncoplastic Techniques for Breast Cancer. 2019; 9(6):12-15.
15. Yu T, Eom KY, Jang NY, et al. Objective Measurement of Cosmetic Outcomes of Breast Conserving Therapy Using BCCT.core. *Cancer Res Treat.* 2016;48(2):491-498. doi:10.4143/crt.2015.088
16. Sözer SO, Sibar S. Inferior and Medially Based Breast Parenchymal Rotation Flap: A New Mastopexy Technique for Replacing Breast Volume After Breast Implant Explantation. *Aesthet Surg J.* 2023;43(12):1458-1467. doi:10.1093/asj/sjad220.