

Oncoplastic Surgery for Upper Inner Quadrant Breast Cancer: A Comparative Study between Two Oncoplastic Techniques

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Abstract

Background: Oncoplastic techniques in breast cancer therapy allows for extending the indications of breast-conservative surgery plus improving cosmetic outcomes. Breast tumors located at the upper inner quadrant particularly represent a challenge for conservative surgery due to the scarcity of breast tissue and the risk of skin involvement.

Aim of Study: This study aims to compare the outcomes of inferior pedicle mammoplasty and matrix rotation flap in medium-sized to large-breasted females with breast cancer located in the upper inner quadrant.

Patients and Methods: From August 2013 to August 2021, 27 females patients with medium-sized to large-sized breasts diagnosed with early upper inner quadrant breast cancer and suitable for breast conservation underwent therapeutic mammoplasty depending on either inferior pedicle technique (group I) or matrix rotation mammoplasty technique (group II). Patients with multicentric breast cancer and those with persistent involved resection margins after excision were excluded from the study. Surgical outcomes, oncologic safety, and cosmetic results were assessed and compared between both groups.

Results: There is significant difference between the two groups as regards the operative time, intraoperative blood loss, hospital stay, postoperative complications, cosmetic outcome and the need for contralateral symmetrization. Inferior pedicle mammoplasty needs longer operative time and post-operative hospital stay with more intraoperative blood loss in comparison to matrix rotation mammoplasty. As regards the postoperative complications, we found that there are more complications in inferior pedicle mammoplasty than matrix rotation mammoplasty as wound infection and nipple areola ischemia.

Conclusion: Patients with early breast cancer located in the upper inner quadrant are candidate for either inferior pedicle mammoplasty or matrix rotation mammoplasty. Matrix rotation mammoplasty is better in some concerns as there is less morbidity, no need for contralateral symmetrization and fewer complications, so no delay in radiotherapy.

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Introduction

BREAST-CONSERVING surgery (BCS) has been proven to achieve excellent oncologic results and became the standard surgical treatment for breast cancer in early stages. Successful BCS depends on resecting the tumor with clear margins followed by post-operative radiation therapy coupled with accepted cosmetic outcome [1].

In conventional BCS, approximately 5%-18% of cases had positive margins, which led to high re-excision rates. This can be explained by surgeons trying not to excise too much breast tissue to achieve better cosmesis [1,2].

Oncoplastic breast surgery (OPBS) was first introduced more than 20 years ago, aiming at achieving both oncological safety and better cosmetic results, and studies have proved that oncological safety regarding local recurrence and survival are comparable to rates after conventional CBS [3].

OPBS involves 2 levels. Level 1 is addressed when less than 20% of breast volume is resected. Level 2 is applied when more than 20% of breast volume is resected resulting in larger defects requiring either volume displacement or volume replacement [4]. Level 2 OPBS involves removing the mass and then reshaping the breast using different glandular flaps from within the breast or replace the defect by nearby local flaps such as mini-latissimus flap [4,5].

An Atlas and OPBS guideline was proposed by Clough et al., in 2010 to help surgeons in choosing the best technique for each breast quadrant. The most challenging breast quadrant is the upper inner

quadrant [6]. A wide resection in that area may cause upward displacement of the nipple-areola complex (NAC) resulting in poor aesthetic outcome. The reason for that is the little breast parenchyma present in this quadrant. Tumors arising in this quadrant are usually very near to the overlying skin and/or to the underlying pectoralis fascia. Unfortunately, there is no standard technique described in literature to manage this difficult location [7].

Aim of the work:

The aim of our study is to compare the surgical, oncological and aesthetic outcomes of inferior pedicle mammoplasty versus matrix rotation mammoplasty in treatment of breast cancer located in upper inner quadrant in females with medium to large sized breasts.

Patients and Methods

Between August 2013 and August 2021, 27 females patients with medium-sized to large-sized breasts with early upper inner quadrant breast cancer admitted to oncology centre Mansoura University and Meetghamr oncology centre, and suitable for breast conservation participated in this retrospective comparative study. Ethical Committee approval was given for the study and written informed consent was obtained from all participants. Patients were divided into two groups: Group I (inferior pedicle group; 12 patients) and group II (matrix rotation group; 15 patients). The choice of the procedure was based on breast size, degree of ptosis, surgeon preference and acceptance of the patient with contralateral surgery. The inferior pedicle procedure was suitable for larger breasts with marked ptosis especially when the patient was accepting contralateral symmetrisation surgery.

Exclusion criteria were multicentric disease, recurrent carcinoma and inability to obtain tumor-free safety margins after repeated excision where the procedure was converted to mastectomy.

Preoperative assessment:

All patients had conventional clinical examination for exact tumor location, skin affection, possibility of multicentricity and lymph node status. All cases had undergone a tru-cut needle biopsy, with histopathological and immunohistochemical (IHC) staining for ER, PR, HER2, and Ki67. Breast imaging included sonomammogram and breast MRI (if indicated). Routine metastatic work up was done: Alkaline phosphatase for early stage disease, whole body CT scan and bone scan if indicated. According to our MDT decisions, the

patients had primary BCS based on the biological subtyping and the tumor/breast ratio. Cases with carcinomas larger than 5cm received primary systemic therapy. Obesity, diabetes, and smoking were reported as they represent risk factors for local complications.

Preoperative skin markings and surgical technique for inferior pedicle group:

Preoperative marking was performed according to the standard inverted T (Wise pattern) or the standard vertical scar (Le jour) pattern.

Skin markings are done while the patient is in standing position. The site of the lesion is marked. The middle line, the breast meridian, inframammary fold (IMF) and breast boundaries are drawn. The position of future nipple is then marked either opposite the mid arm at the breast meridian or by placing the index finger at the level of the original (IMF) and mark a point opposite it anteriorly on the meridian line. We have adjusted the distance between suprasternal notch and future nipple to be (19-23cm). An inferior pedicle is drawn out (~6-10cm wide). The 2 vertical lines, the transverse lines and the future areola were drawn according to standard Wise pattern. For the Le jour skin markings, we have drawn a circle of (14-16cm) diameter around the future nipple point then the vertical lines were drawn to be met above the IMF by about 3cm at the meridian. A similar pattern is drawn on the contralateral breast for symmetry, whenever indicated. Fig. (1) illustrates the inferior pedicle skin drawings by wise pattern technique.

The skin of the pedicle was deepithelialized (Fig. 1-C). After resection of the carcinoma with gross adequate surgical margins, the specimen was marked with threads, weighed, and sent for frozen section examination to confirm negative margins. Axillary surgery was done from the same incision markings. Among the 12 cases, 6 cases were planned for bilateral surgery, 3 patients refused immediate breast reconstruction so, we have addressed first the pathologic breast, and after confirmation of clear surgical margins, the same operation was done in the contralateral breast to achieve symmetry. In the other 3 patients who were planned for skin reducing mastectomy and immediate reconstruction and contralateral symmetrisation if CBS has failed, we have worked on both breasts by two teams simultaneously.

Preoperative skin markings and surgical technique for matrix rotation mammoplasty group:

Skin markings were drawn with the patient in a standing position. The midline, breast footprint,

inframammary fold and tumor location were marked. We draw an inverse triangle around the tumor with its apex towards the areola then extend a lateral concave line along the upper lateral border of the breast to the mid-axillary line. A small triangle (Burow's triangle) is drawn in the axilla to allow flap advancement and lymph node management. In semi-sitting position and under general anaesthesia, we perform a triangular incision, with excision of the whole wedge, involving the carcinoma, whole thickness of the breast from the skin till the pectoralis fascia. The specimen is marked,

weighted and histologic tumor margins were evaluated by intraoperative frozen section exam. The small triangle in the axilla is incised from which axillary surgery was performed. The curved concave line between both triangles was incised down to the pectoralis major muscle. Then, we have sharply raised this laterally based dermo-glandular flap from the pectoralis and advanced it medially to reach the medial border of the main triangle excised before. Periareolar deepithelialization was done in 3 cases (donut technique) (Fig. 2).

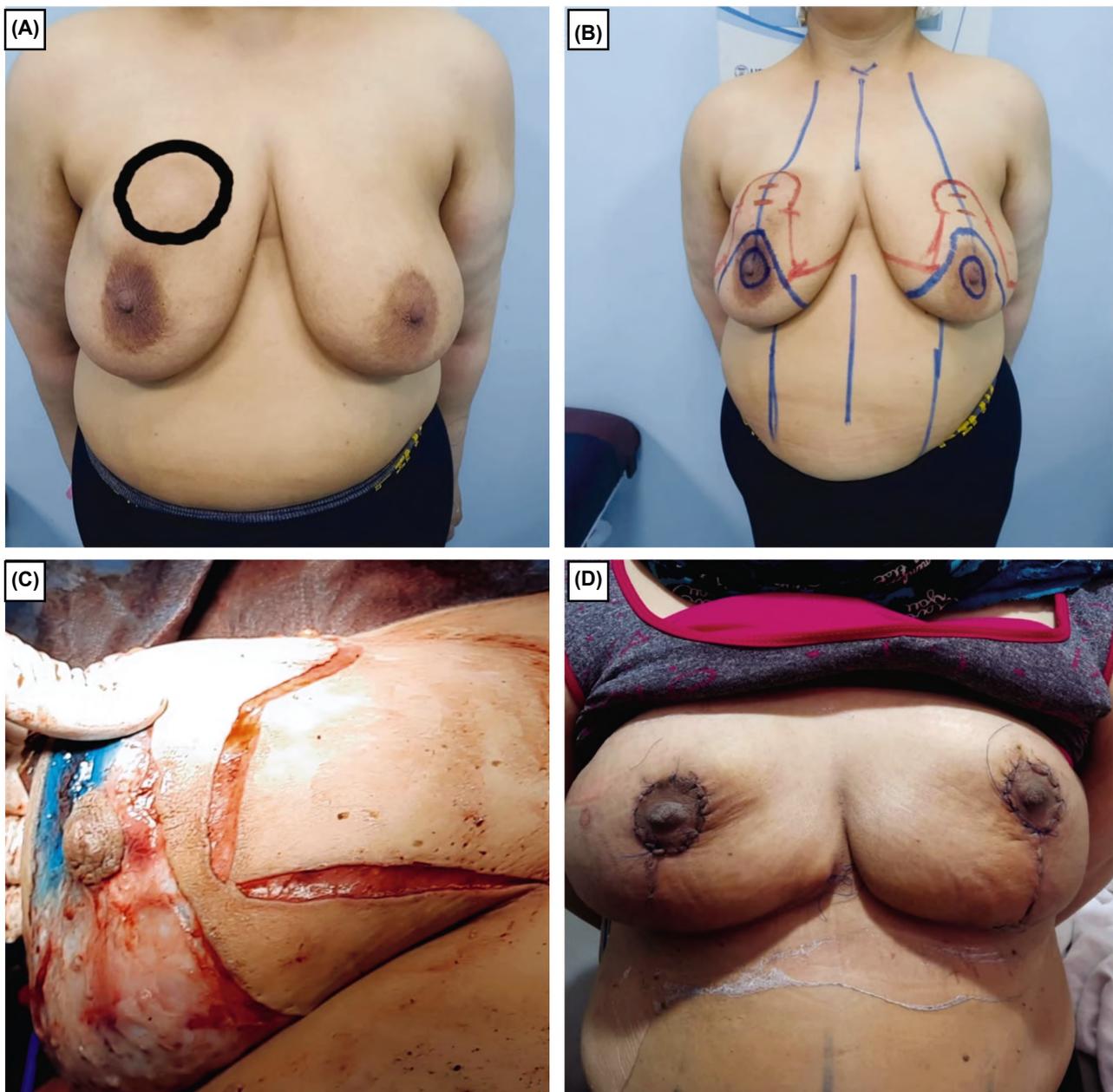


Fig. (1): Inferior pedicle technique. (A): Large tumor occupying upper central and inner quadrant. (B): Skin markings in standing position. (C): Deepithelialized pedicle. (D): Result after 2 week.

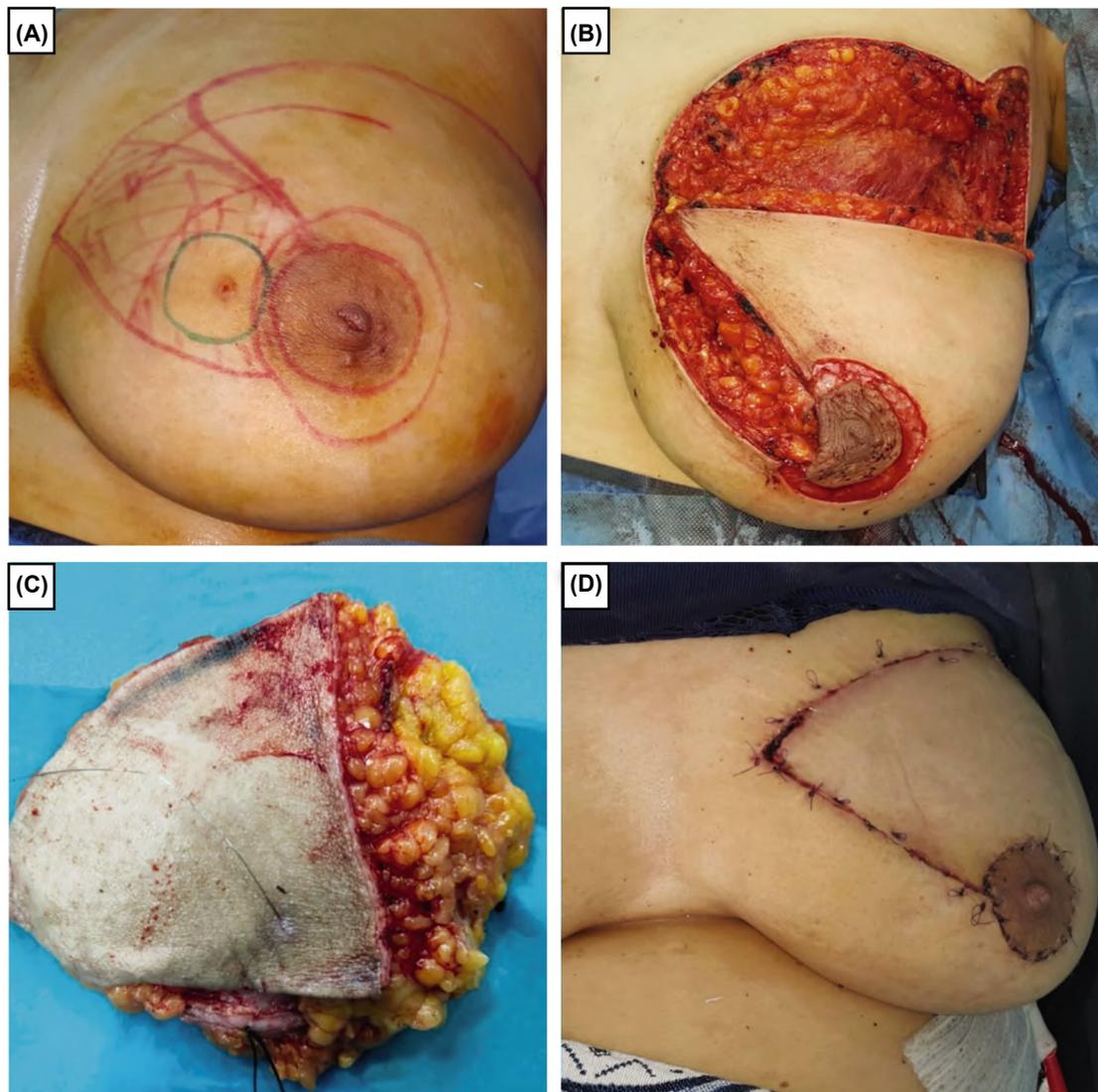


Fig. (2): Matrix rotation technique. (A): Pre- operative skin markings. (B): Skin incisions, tumor resection and flap mobilization. (C): Lumpectomy specimen marked by threads. (D): Final result after one week.

Operative time, estimated blood loss and excised breast volume were reported in both groups. During early postoperative days, patients were evaluated for the onset of wound dehiscence, infection, hematoma formation and nipple-areola ischemia.

For 1 month postoperatively, the outpatient visits were done on a weekly basis, where assessment was made for presence of complications including wound infections, nipple areola necrosis and persistent seroma in the breast and axilla, and then the patients were followed-up monthly till the next 3 months after completion of the radiotherapy course. All cases have been delivered radiation therapy and adjuvant systemic therapy based on tumor stage and biological type.

The cosmetic assessment was done 3 months after the completion of radiation therapy course

and reported as excellent, good, fair, and poor according to both surgeon and patient judgment.

The patients were followed-up for 1 year every 3 months and every 6 months for the second year with at least 1 year of follow-up (12 months).

Statistical analysis and data interpretation:

Data analysis was performed by SPSS software, version 18 (SPSS Inc., PASW statistics for windows version 18. Chicago: SPSS Inc.). Qualitative data were described using number and percent. Quantitative data were described using median (minimum and maximum) for non-normally distributed data and mean \pm Standard deviation for normally distributed data after testing normality using Shapiro Wilk test. Significance of the obtained results was judged at the 0.05 level.

- Chi-Square was used to compare qualitative data between groups as appropriate.
- Student *t*-test was used to compare 2 independent groups for normally distributed data.

Results

Twenty seven patients with solitary upper inner quadrant breast cancer were enrolled in our study. All patients were listed for CBS; 12 patients had inferior pedicle technique (group I) and 15 patients had matrix rotation mammoplasty (group II). There were no statistically significant differences in age, weight, comorbidities, pathological type and tumor stage between groups ($p>0.05$). The mean age of the cases in group I was 43.5 years (range 26-74 years). The mean age of cases in group II was 46.8 years (range 31-75 years). At diagnosis, one patient had stage I and 11 patients had stage II disease in

group I. Two patients had stage I and 13 patients had stage II in group II. Eleven patients had invasive duct carcinoma (IDC) and one patient had invasive lobular carcinoma (ILC) in group I. Thirteen patients had IDC and 2 patients had ILC in group II.

There was no statistically significant difference in the median initial clinical tumor size between groups; it was 4.62 ± 1.7 cm in group I, however; it was 4.38 ± 1.8 cm in group II ($p=0.206$). Seven cases received neoadjuvant chemotherapy; 3 cases from group I and 4 cases from group II.

When comparing mean excised breast volume of both groups, it was statistically significant. The mean excised breast volume in group I was 210g (range 100-300g) however, it was 105g (range 80-170g) in group II ($p<0.001$). The patients and tumor characteristics are provided in Table (1).

Table (1): Patients and tumor characteristics.

	Group I	Group II	<i>p</i> -value
<i>Patients:</i>			
Age	36-60 years Median (42)	34-56 years Median (40)	34-60 years Median: 41 $p>0.05$
Weight	60-90kg Median 80.9	58-85kg Median 80.2	$p=0.841$
Presence of comorbidity	2 (16.6%)	3 (20%)	$p=0.666$
Mean initial tumor size	4.62 ± 1.7 cm	4.38 ± 1.8 cm	$p=0.206$
Mean excised breast volume	210g (range 100-300g)	105g (range 80-170 g)	$p<0.001$
<i>Tumor pathology:</i>			
IDC	11	13	$p>0.05$
ILC	1	2	$p>0.05$
<i>Tumor stage:</i>			
Stage I	1	3	$p>0.05$
Stage II	11	12	$p>0.05$
<i>Operative considerations:</i>			
Operation time (on average)	4.5h	2h	$p<0.001$
Intraoperative blood loss (on average)	200cc	100cc	$p<0.001$
Contralateral surgery	6	0	$p=0.004$

There was significant statistical difference in both group as regards the operative time, estimated blood loss and postoperative complications.

As regards the operative time and the intraoperative blood loss, the operative time was longer and blood loss was more in group (I) than group (II) with mean: 4.5 hours, and 100- 300ml (average 200ml) in group (I) versus mean: 2 hours, and 50 -150ml (average 100ml) in group (II) ($p<0.001$).

Regarding the postoperative complications (Table 2), there was significant statistical difference in both groups. In group (I) (Inferior pedicle mammoplasty), the overall rate of complications was 25% (3/12); one patient had wound infection, one

had wound dehiscence and one had partial NAC necrosis. However, in group (II), the overall rate of complications was 6.6% (1/15); one patient had wound dehiscence ($p<0.001$).

Table (2): Overall complication rate.

	Group I (n=12)	Group II (n=15)
Wound dehiscence	1 (8.33%)	1 (6.6%)
Infection	1 (8.33%)	0
Fat necrosis	0	0
Partial areola necrosis	1 (8.33%)	0
Total areola necrosis	0	0
Seroma	0	0

The need for contralateral breast surgery for symmetrisation was statistically significant between both groups; half of the patients needed symmetrisation surgery in group I, however, none of the patients needed symmetrisation surgery in group II ($p < 0.001$).

The cosmetic outcome was evaluated according to subjective patient satisfaction and subjective surgeon judgement to the final breast shape and it was 50% excellent (6/12), 25% good (3/12) and 25% (3/12) fair in group (I). While in group (II) it was excellent in 4 patients (26.6% of cases), good in 3 patients (20%), fair in 6 patients (40%), and poor in 2 patients (13.3%). There was significant statistical difference in both groups as regards the excellent final outcome; 50% vs 26.6% ($p < 0.001$).

Regarding rate of involved margins, we had only two patients showed positive margins at frozen section that became clear after one attempt of re-excision and mastectomy was not needed; one patient from each group ($p > 0.05$).

We did not report any local recurrence or distant relapse in the period of follow-up, which ranged from 12 to 36 (median 24) months.

Discussion

Oncoplastic techniques in breast cancer treatment permits increasing indications of breast-conservative surgery and improving cosmetic outcomes. Oncoplastic breast surgery is safe in terms of local recurrence and survival rates and is comparable to traditional breast-conserving surgery [8]. Thus, oncoplastic breast surgery offers a meet half way between the traditional BCS & mastectomy. It permits larger excisions, hence decreasing the rate for positive margins, and expand the spectrum for CBS [8,9]. Each breast quadrant can be addressed by several techniques; however, the upper inner quadrant represents a real challenge. The upper inner quadrant of the breast is called "no-man's land" due to deficient glandular tissue, so excision of tumors in this area may lead to upward displacement of NAC coupled with marked deformity [9]. Multiple techniques were designated for this area, such as: The modified round block oncoplasty, the batwing mammoplasty and the crescent mastopex. In medium and large sized breasts, inferior pedicle mammoplasty and matrix rotation flap were described. However, none of these procedures has achieved the optimal outcome [10,11,12]. The latissimus dorsi myocutaneous flap and immediate lipofilling are volume replacement techniques that showed promising outcomes [13].

That is why there was no standard technique described by Clough et al., to manage this difficult-to-treat area [14].

In our study we have compared two oncoplastic techniques in addressing this challenging quadrant in medium sized and large breasted females.

Despite traditional lumpectomy in patients with large breasts may lead to accepted cosmetic results, inferior pedicle breast reduction may improve the quality of life by decreasing symptoms such as back and shoulder pain [15]. Furthermore, the homogeneity of the distribution of the dose of radiotherapy may be altered in huge breasts. Pain, burn, fibrosis, and a poor cosmetic outcome after radiotherapy are common complications which are exaggerated in large breasts. Typically, adjuvant radiotherapy side effects may be lowered by breast reduction in large breasted women [16]. Essentially, most clinical oncologists recommend breast reduction surgery for large breasted patients undergoing CBS [17]. The main advantages of the therapeutic reduction mammoplasty (TRM) should involve reproducibility, good oncological outcome and long-term results. Moreover, this technique is versatile as it can be addressed in all breast quadrants in medium to large-sized breasted patients [18].

In the early 19th century, the matrix rotation flap was described to reconstruct facial defects then was applied to the breast yielding very nice results [14,15]. This technique is composed of two-steps. First, excision of a wedge-shaped block of tissue containing the tumor (including the overlying skin till pectoral fascia) and second, reconstruction with matrix rotation flap advancement is performed [16]. "Matrix rotation" can be a nice alternative procedure for upper inner tumors owing to the following advantages: (1) Large resection volumes with short operative time (about one hour), (2) Does not cause major NAC displacement, (3) Symmetrisation surgery is not required, so a second surgical team is not needed, (4) Axillary surgery can be done easily, (5) Minimal blood loss (approximately 50mL on average), and (6) very low complication rate [17]. Thus, matrix rotation mammoplasty can be a reliable alternative to treat upper inner tumors especially if the case is in need of larger excisions or if the breast is mainly fatty (ACR A or B), where level I oncoplasty is not preferred [18,19].

In our study, we divided our patients into two groups: Group I (inferior pedicle group; 12 patients) and group II (matrix rotation group; 15 patients). The choice of the procedure depends on the size

of the breast and degree of ptosis. The inferior pedicle procedure was applied for larger breasts with marked ptosis, whereas the matrix rotation flap was applied for medium sized breasts with moderate ptosis.

In this series, only two cases (7.4%) of our 27 patients had positive margins and needed reexcision; one patient from each group. Fortunately, they did not convert to mastectomy. This is comparable to or even lower than other studies.

In 2003 Clough et al. [20] reported involved margins in 11 (10.9%) of their 101 cases of breast cancer whom were managed with oncoplastic surgery.

Three different oncoplastic techniques were used by McCulley and MacMillan [21] in 2005 on 50 patients with breast cancer managed with therapeutic mammoplasty. They have reported four (8%) patients required reoperation owing to positive margins. Involved margin and re-operation rates were lower in the oncoplastic surgery group, with 42 oncoplastic surgeries and 57 conventional (BCS) applied patients, in the study done by Giacalone et al., in 2006 [22]. Further recent studies have shown the same result.

(9.4%) of the patients operated by Fitoussi et al. [23] in 2010 had to be converted to mastectomy due to positive margins, with 540 patients in their oncoplastic surgery-related study.

This low rate of positive margins in our study can be explained by the appropriate preoperative breast imaging, the use of frozen section examination during surgery, and the large resection volumes routinely done in oncoplastic breast surgery that leads to lower incidence of involved margins and secondary reexcisions.

Regarding complications, in the literature, the complication rate for oncoplastic breast reduction ranges between 17 and 24%. Common complications include skin necrosis, infection, and partial or complete nipple areolar complex necrosis [24]. The complication rate in the study done by Munhoz et al., was 17.6%. They reported the complications as the following: Skin necrosis (8.1%), partial nipple-areola necrosis (2.7%), infection (2.7%), dehiscence (1.35%), and total nipple-areola necrosis (1.35%) [25].

On addressing matrix rotation mammoplasty, Letzkus et al., reported one out of 8 patients (12.5%) who underwent this technique to have minor wound dehiscence [26].

Our complication rate is comparable to these results as in our study we reported complications as follow: In inferior pedicle group the overall complication rate was 25% (3/12); one case developed wound dehiscence, one case developed wound infection, and one case developed partial areolar necrosis. However the overall complication rate in the matrix group was 6.6%; only one case reported wound dehiscence.

These complications neither affected the general health of any patient nor caused a delay in adjuvant treatment. It should be noted that the inferior pedicle technique shows longer operative time, more blood loss and a higher percentage of complications compared with the matrix rotation technique as listed in Table (2). This can be explained by the fact that inferior pedicle is more complex technique with more scars and larger resection volumes. It also requires more experienced oncoplastic surgeons. Moreover, half of the patients had undergone contralateral symmetrisation surgery.

In our study we reported the cosmetic outcome according to subjective patient satisfaction and subjective surgeon judgement to the final breast shape and it was 50% excellent, 25% good and 25% fair in group (I) (Inferior pedicle mammoplasty). While in group (II) it was excellent in 26.6%, good in 20%, fair in 40% and poor in 13.3%. The 50% in group (II) (Inferior pedicle mammoplasty) that underwent contralateral breast surgery for symmetrization are those who were given excellent cosmetic result. Lower cosmetic outcome in group II was mainly attributed to the long lazy S visible scar.

This is agreed with Chang et al. [27] who assessed the aesthetic outcome of 57 patients. They divided the patients into 2 groups; conventional CBS group and oncoplasty group. 20/37 (54%) women and 14/20 (70%) women reported excellent results, respectively.

There are little publications of the therapeutic mammoplastic techniques discussing the aesthetic results. Moreover, the methods of cosmetic assessment are different and variable [28,29,30]. Clough et al, in a panel of three, evaluated aesthetic outcome at 2 and 5 years. At 2 years, 88% and at 5 years, 82% of patients had a fair to excellent outcome [31,32]. A similar aesthetic evaluation method was retrospectively used by Fitoussi et al., with a panel made up of a surgeon, a nurse and a layman, using a five-point scale from excellent to poor. The aesthetic results in this retrospective study

were satisfactory in 98% of patients at 12 months and in 90% of patients at 5 years after therapeutic mammoplasty [33].

Regarding local recurrence rate, we did not report any local recurrence in the follow up period, that ranged from 12 to 36 (median 24) months.

Our study agreed with Chang et al. [34] who showed a zero recurrence rate. Caruso et al. [35] in 2008 described one (1.6%) case of local recurrence within 68 months follow-up period.

Conclusion:

Patients with breast cancer located in the upper inner quadrant are candidate for either inferior pedicle mammoplasty or matrix rotation flap. Matrix rotation is better in some concerns; less morbidity, no need for contralateral symmetrization and fewer complications, so no delay in adjuvant treatment. However, inferior pedicle mammoplasty provides better aesthetic outcomes if bilateral surgery is performed by more experienced oncoplastic surgeon.

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دراسة مقارنة بين طريقتين للاستئصال التحفظى التجميلى لأورام الثدي السرطانية فى المربع العلوى الداخلى

المقدمة : علاج أورام الثدي السرطانية تمثل تحدى كبير للوصول لأفضل النتائج من ناحية الشفاء ومن ناحية الشكل الجمالى للثدى.

التدخل الجراحى إلى وقتنا الحالى يتم عن طريق الاستئصال الكامل للثدى أو جراحات الثدي التحفظية. دخول مصطلح جراحات الثدي التحفظية التجميلية أدى إلى تحقيق نتائج جيدة من حيث استئصال الورم بحزام أمان كبير مع المحافظة على الشكل الجمالى للثدى عن طريق إعادة تشكيل الثدي استخدام والسدلات الموضعية.

من أكثر الاجزاء صعوبة فى التعامل الجراحى معها هو المربع العلوى الداخلى من الثدي بسبب نقص أنسجة الثدي فيه.

الغرض من البحث : يهدف هذا البحث لمقارنة طريقة سدلة دوران ماتريكس وطريقة العنق السفلى فى علاج أورام الثدي السرطانية فى هذا الجزء الصعب من الثدي ودراسة مدى أمانهما من حيث الاستئصال الكا مل للورم بحزام أمان سليم وتحقيق شكل تجميلى مقبول لدى السيدات.

طريقة البحث دراسة : مقارنة أجريت بأثر رجعى على حالات أورام الثدي بمركز أورام المنصورة ومركز أورام ميت غمر فى الفترة من أغسطس ٢٠١٨ إلى أغسطس ٢٠٢١. كل الحالات خصعت للجراحة حسب توصيات اللجنة العلمية بالمرکز. سبعة وعشرون حالة تمت دراستها. تم تقسيمها إلى مجموعتين : خمسة عشر أجرت سدلة ماتريكس وأثنا عشر أجرت طريقة العنق السفلى.

النتائج : الرقم الوسيط لحجم الورم إكلينيكيا كان ١.٦ ± ٥.١ سم فى المجموعة الأولى و ١.٨ ± ٤.٤ سم فى المجموعة الثانية . لم يكن هناك فرق بين المجموعتين من حيث أعمار المرضى وأوزانهم ومرحلة الورم ونوعه. وأظهرت النتائج أن سدلة ماتريكس أقل فى حدوث مضاعفات. ولم يكن هناك فرق فى حالة حزام الأمان أو معدل ارتجاع الورم.

الاستنتاج : كلا الطريقتين تصلحان لمعالجة أورام الثدي فى المربع العلوى الداخلى. طريقة سدلة ماتريكس أسهل فى الأجراء و أقل فى المضاعفات ولكن طريقة العنق السفلى تؤدي إلى نتائج تجميلية أفضل خاصة عند عمل جراحة مشابهة على الثدي الأخر.