

Volume displacement onco-plastic surgery techniques for early stage primary breast cancer

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Abstract

Background: Until recently, the breast surgery could provide only two options for patients with primary stage breast cancer, either modified radical mastectomy or segmental excision followed by radiation, but the introduction of the onco-plastic surgery (OPS) techniques at the time of tumor excision has delivered a third pathway, enabling surgeons to perform major resections involving up to 50% of breast volume without causing deformity. Volume displacement techniques are only possible in patients with medium to large breasts, whereas replacement techniques are suited to small breasted women. The choice of method is determined by both the breast volume and the size of the surgical cavity for infill.

The aim of this study: Was to assess the outcome of applying volume displacement onco-plastic surgery techniques for early stage primary breast cancer regarding resection margins of the tumor, rate of recurrence and the aesthetic outcome.

Patients and methods: This retrospective study was carried out on twenty-six female patients with early stage primary breast carcinoma treated by volume displacement onco-plastic surgery techniques throughout the period from September 2008 to September 2010. Patients within the inclusion criteria were evaluated by clinical examination, mammography and biopsy. Follow up ranged from 6 months to 2 years with a mean of 20 months. Assessment of the cosmetic outcome was an integral part.

Results: Age of patients ranged from thirty to sixty-five years with a mean of 47.7 years. Fourteen patients in the study (54%) had previous history of breast disease or had previous breast biopsy or operation for suspected malignancy. Metastatic work up revealed no distant metastasis. By clinical examination, mammographic and ultrasonographic assessment, the pre-operative mass size in 77% of cases ranged from 2 to 5 cm. One patient had a mass smaller than 1 cm(4%) and five patients had no masses (post-excision) (19%), most patients (73%) were in grade II category, five were grade III (19%) and two were grade I (8%). Racquet mammaplasty was done in 15 cases (57.4%), the round block technique in 7 cases (27%) and the Grisotti technique in 4 cases (15.6%). All our specimens showed adequate free margins, and all our cases showed no recurrence. One case (3.9%) in grade III category developed distant metastasis. The cosmetic outcome was satisfactory.

Conclusion: OPS allowed large-volume resections with free margins and fewer re-excisions and mastectomies than that reported with standard BCS. Volume displacement represents the simplest option for partial breast reconstruction and is usually preferred over techniques for volume replacement which involve more extensive surgery with harvesting of a myocutaneous or subcutaneous flap. The cosmetic outcome was satisfactory both for the surgeons, as the general rule, it is much easier to prevent than to correct deformity; and for the patients, as the tumor was excised without amputation of their breasts and their body image was preserved.

Introduction:

The breast is the most common site of cancer

in women worldwide.¹ And according to the National Cancer Institute, breast cancer

accounts for about 35% of the total malignancies among Egyptian females.²

Until recently, the breast surgery could provide only two options for patients with primary stage breast cancer, either modified radical mastectomy or segmental excision followed by radiation, but the introduction of the onco-plastic surgery (OPS) techniques at the time of tumor excision has delivered a third pathway, enabling surgeons to perform major resections involving up to 50% of breast volume without causing deformity.³

This can eliminate the need for complex delayed reconstruction of deformities after breast conserving surgery, which often has poor results especially after radiotherapy. As a general rule it is much easier to prevent than to correct deformity.⁴

Preserving the woman's self-image by keeping her breast with a normal look greatly improves the patient adherence to treatment and may also result in increased disease free survival, because of the psychological repercussion on the immune system.⁵

There are three elements that are important in the identification of patients who would benefit from the OPS, namely, the excised volume (an average of 1000g can be excised compared to 80g in breast conserving surgery), the tumor location and lastly the glandular density.⁶⁻⁸

Resection defects on oncoplastic surgery can be reconstructed by either volume replacement (Improving volume from elsewhere to replace the amount of tissue removed especially in small sized breasts) or volume displacement (recruiting and transposing local dermoglandular flaps into the resection site).⁹

Volume displacement techniques are only possible in patients with medium to large breasts, whereas replacement techniques are suited to small breasted women. The choice of method is determined by both the breast volume and the size of the surgical cavity for infill.¹⁰

The common aim of volume displacement is to utilize the remaining breast tissue to fill the defect resulting from extirpation of the tumour. As previously discussed, resections which lead to loss of >10-20% of breast volume

are likely to incur significant cosmetic detriment and to demand some form of 'infill' to create an acceptable cosmetic outcome in the longer term. Displacement techniques re-shape the breast through advancement, rotation or transposition of existing parenchyma and skin with a resultant decrease in overall breast volume.¹⁰

Aim of the work:

The aim of this study was to assess the outcome of applying volume displacement onco-plastic surgery techniques for early stage primary breast cancer regarding resection margins of the tumor, rate of recurrence and the aesthetic outcome.

Patients and methods:

This retrospective study was carried out on twenty-six female patients with early stage primary breast carcinoma admitted and had volume displacement onco-plastic breast surgery at the National Cancer Institute (17 cases) and Tanta University Hospital (9 cases) throughout the period from September 2008 to September 2010.

Exclusion criteria are

- 1- Advanced stages.
- 2- Multi-centricity.
- 3-No tumor-free margins obtained.
- 4- Inflammatory breast cancer.
- 5- Unfavorable tumor to breast size ratio that results in an inferior cosmeses.
- 6-Patients had a contraindication to radiotherapy.
- 7- No changes or progression after neo-adjuvant therapy.
- 8- Patients who had serious co-morbidities.
- 9- Small sized breast where the volume replacement techniques are preferred.

Pre-operative evaluation:

All Patients had triple assessment including:
1-Thorough clinical examination: A) Local for asymmetry, enlargement, skin dimpling, skin puckering, peau d'orange, skin nodules or ulceration, assessment of breast lump: its texture, mobility, fixation to the skin, underlying muscles or chest wall, nipple retraction, axillary lymph node palpation for number & mobility. B) General for distant metastasis including chest

examination, abdominal examination, for hepatomegaly or ascites, pelvic examination for hard deposits or Krukenberg 's tumor.

2-Radiological evaluation: All patients had soft tissue mammography and complementary ultrasonography of the breast.

3-Pathological evaluation: All patients had fine needle aspiration cytology and /or incisional or Tru-cut biopsy from the mass.

In addition, metastatic work up in the form of bone scan, abdomino-pelvic ultrasound, chest X-ray & when needed MRI evaluation, complete blood picture and liver functions were done.

Required preoperative laboratory investigations were done to all patients.

Neo-adjuvant therapy was given to four patients preoperatively for down-staging.

Intra-operative frozen section assessment was done to evaluate the resection margins of the excised specimens.

Axillary dissection through separate incision or from the same incision was done in all cases.

Post- operative excision biopsy specimens were sent for definitive pathological examination, for assessing tumor type, size, grade, safety margins, in-situ component, hormone receptor status and axillary lymph nodes status, malignant metastasis and invasion or rupture.

Post-operative treatment: Regular antibiotics and analgesia were given to patients.

Operative techniques:

1-Lateral (racquet) mammo-plasty:

A large portion of the upper outer quadrant can be excised by direct incision over the tumor, from the nipple-areola complex (NAC) towards the axilla, similar to quadrantectomy. After wide excision the re-shaping is performed by mobilizing lateral and central glands into the cavity and suturing them together. Central gland advancement is accomplished through NAC undermining, complete detachment of retro-areolar gland from the NAC for maximal mobility of the central gland for volume redistribution. Once the defect is eliminated, the NAC is placed in its optimal position, at the center of the new breast mound. This mammo-plasty results in a long radial scar.

2-Round block (Benelli) technique:

The Round block mammo-plasty utilizes a periareolar incision and was originally described by Benelli. The procedure starts by making two concentric periareolar incisions, followed by de-epithelialization of the inverting skin. The outer edge of de-epithelialization is incised and the entire skin envelope is undermined in a similar manner to performing a mastectomy. The NAC remains vascularized by its posterior glandular base. Wide excision of the tumor and surrounding tissue is performed from the subcutaneous plane down to the pectoralis muscle. The medial and lateral glandular flaps are then mobilized of the pectoralis muscle and sutured together. The periareolar incisions are then approximated, resulting only in a periareolar scar.

3 -Grisotti technique:.

Preoperative drawings: With the patients in the sitting or standing position, skin markings are done.

A circle outlining the areola is drawn. A smaller circle is then drawn marking the new nipple-areola complex to be created adjacent to the native areola. Next, the submammary fold is marked.

Excision of the NAC included in the pattern of central quadrantectomy. The excision is extended down to the pectoralis fascia.

De-epithelialization of the flap except for a skin island which is preserved for reconstruction of the areola. Then the medial and inferior margins of the flap are incised down to the fascia and the flap is advanced and rotated to fill the defect.

Suction drains, and wound closure are then performed in all techniques.

Post-operative radiotherapy: Was offered to all patients, and according to tumor type and nodal status, chemotherapy and hormonal therapy were given.

Follow up: All patients were followed up monthly for 3 months, three monthly for the first year, then yearly thereafter.

Follow up ranged from 6 months to 2 years with a mean of 20 months.

All patients were evaluated on visit by, clinical examination, sono-mamography and metastatic work-up. Also assessment of the cosmetic outcome was an integral part.

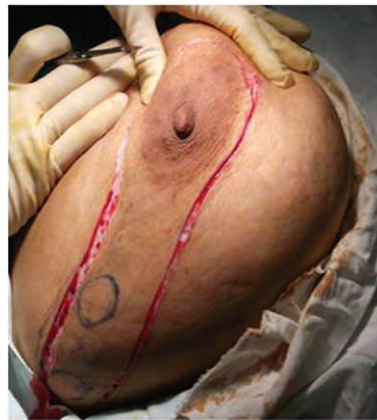
Study design:

This is a retrospective study on twenty-six females with early stage cancer breast operated on by volume displacement techniques OPS. Data were collected, tabulated and then analyzed using SPSS® computer software

version 16.0. Firstly, numerical variables were examined for normality then were presented as median, mean \pm standard deviation (SD). On the other hand categorical variables were presented as number of cases.



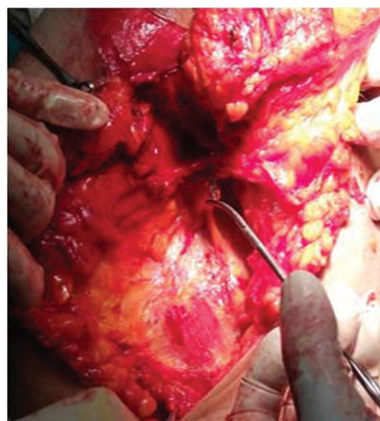
a- Pre-operative drawing.



b- Peri-areolar and radial lateral incision over the tumor.



c- De-epithelialization of the inverting skin.



d- Excision of the tumor down to the pectoralis muscle.



e- The cavity left after wide local resection of the tumor.



f- Closure of the defect and NAC positioning on top of the breast mound.



g- At the end of the operation.



h- After 1 week.

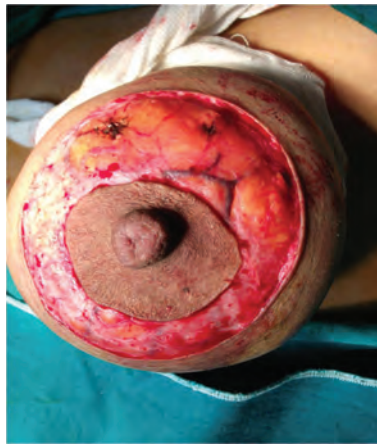


i- After 1 year.

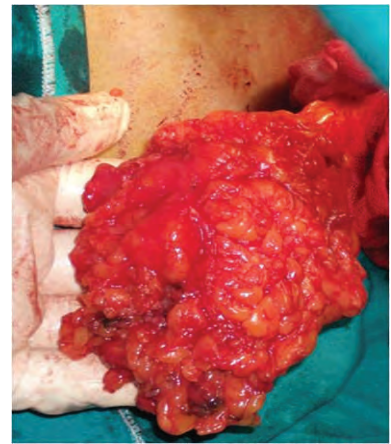
Figure (1): Racquet mammoplasty.



a- Two concentric periareolar incisions.



b- De-epithelialization of the inverting skin.



c- Excision of the tumor with good safety margin.



d- Closure of the defect.



e- After 1 month.



f- After 1 year

Figure (2): Round block technique.



a- Pre-operative skin marking.



b- Excision of the central tumor with NAC.



c- The new nipple-areola complex to be created.



d- Positioning of the new NAC.



e- At the end of the procedure.



f- After 1 month. This case was diabetic and had wound infection.

Figure (3): Grisotti technique.

Results:

The results were tabulated as follow:

Table (1): The demographic data and clinical presentation.

Patient characteristic	Data
Total patients, n (%)	26 (100)
Age, y; Range Mean	30-65 47.7
Past history: Known cases of fibroadenosis Previous biopsy Tumorectomy	2 cases 9 cases 3 cases
Tumor location: Upper outer quadrant Upper inner quadrant Central retro-areolar No residual palpable masses Post-excisional biopsy Close margin after tumorectomy	10 cases (38.4%) 4 cases (15.6%) 2 cases (7.8%) 5 cases (19.2%) 2 cases (7.8%) 3 cases (11.7%)
Multiplicity: Multiple tumors (same quadrant) Single tumor No masses	5 patients (19.2%) 16 patients (61.6%) 5 patients (19.2%)
Preoperative mass size: <1cm 2-5cm No mass (post-excision)	1 patient (3.9%) 20 patients (76.9%) 5 patients (19.2%)

Table (2): Operative results.

Operative procedure Lateral (racquet) mamoplasty) Round block technique Grisotti technique	No. of patients 15 patients (57.4%) 7 patients (27%) 4 patients (15.6%)
Specimen size Range Mean	90-550cc 247cc
Skin ellipse Ranged from	3.5X3cm-14X9 cm
Axillary lymph nodes Positive Negative	No. of patients 15 patients (57.4%) 11 patients (42.6%)
Resection margins Free Close Positive Range Mean	No. of patients 26 patients (100%) 0 0 0.4cm-10cm 2.4cm
Histological type Invasive duct carcinoma Invasive lobular carcinoma Mixed ductal-lobular Papillary carcinoma Medullary carcinoma Tubular carcinoma No residual malignancy	No. of patients 18(69.2%) 2(7.6%) 2(7.6%) 1(3.9%) 1(3.9%) 1(3.9%) 1(3.9%)
TNM classification T0N0M0 T1N0M0 T2N0M0 T2N1M0	No. of patients 5 (19.2%) 1(3.9%) 5 (19.2%) 15 (57.4%)
Hormone receptor status Estrogen and progesterone receptor positive Estrogen receptor positive Progesterone receptor positive Her2/neu positive patients	13 (50%) 4 (15.6%) 2(7.6%) 2 (7.6%)

Table (3): Tumor mass size.

Parameter	Median	Mean	Standard deviation	Range
Tumor mass size (No.21)	3	2.75	0.99	0.7 to 5cm
Cavity measurement (No.5)	12	8.6	5.64	2-14cc
Specimen size	205	247.04	138.82	90-550cc
Skin ellipse	8	8.13	2.9	3-14cm

Table (4): Relation between grade and prognosis.

Grade	No. of cases	Local recurrence	Distant recurrence
I	2 cases (7.6%)	0	0
II	17 cases (65.5%)	0	0
III	5 cases (19.2%)	0	1 case (3.9%)

Table (5): Early post-operative complications.

Early post-operative complications	No. of patients (%)
Wound infection	6 patients (23.4)
Seroma	1 patient (3.9)
Minimal skin slough	1 patient (3.9)

Table (6): Cosmetic outcome (according to the surgeons).

Surgeon opinion	No. of patients
Excellent	17 (65.5%)
Good	8 (30.9%)
Fair	1 (3.9%)
Bad	0

According to patients, they were satisfied by the result that their breasts were not amputated (by their expression), preserving their body image with complete tumor removal.

Discussion:

The aim of the local treatment of breast cancer is to achieve long term loco-regional control with minimal morbidity.

With advances made in radiotherapy breast conserving surgery had become established with equivalent survival rates to mastectomy.¹¹

Preserving the breast as much as possible and satisfying the patient physically and psychologically is one of the goals of modern breast cancer surgery, if it does not preclude onco-logical rules.^{12,13}

Onco-plastic surgery (OPS) is defined as tumor excision with wide safety margin followed by immediate reconstruction based on pre-operative designing with any of the mammoplasty techniques to prevent local deformity.⁹

The aim of this study is to determine whether

oncoplastic breast surgery ensures a better outcome, regarding sound tumor excision, satisfactory cosmetic appearance and low recurrence rates.

By clinical examination, mammographic and ultrasonographic assessment, pre-operative mass size in 77% of cases ranged from 2 to 5 cm, one patient had a mass smaller than 1 cm (4%) and five patients had no masses (post-excision) (19%). Most patients (73%) were in grade II category, five were grade III (19%) and two were grade I (8%).

Thus, pre-operative assessment of patients showed that they were candidates for breast conservation rather than mastectomy, the two options were discussed with patients and after consent taking, patients had oncoplastic surgery.

The mean age of our cases was 47.7 years. This is the same as the mean age of cases in the study by Kaur et al. In a comparative study conducted by Giacalone et al, the mean age of patients undergoing oncoplastic surgery was 51.3 years and that of patients who had quadrantectomy was 58.5 years, indicating that younger age groups are more concerned about the cosmetic outcome.

Age of patients ranged from thirty to sixty-five years with a mean of 47.7 years. Fourteen patients in the study (54%) had previous history of breast disease or had previous breast biopsy or operation for suspected malignancy, metastatic work up revealed no distant metastasis.

The upper outer quadrant was the commonest site (38.4%). This location is considered the most favorable site for major resections without deformity in breast conserving therapy, in contrast to other zones of high risk of deformity such as the upper and the lower poles where "a birds beak" deformity is classically seen on excision of tumors in the lower pole of the breast.⁸

Patients with central retro-areolar tumors constitute from 5-20% of breast cancer and were considered for mastectomy until recently because of the risk of tumor multicentricity and the poor cosmetic outcome.¹⁴

Volume displacement represents the simplest option for partial breast reconstruction and is usually preferred over techniques for

volume replacement which involve more extensive surgery with harvesting of a myocutaneous or subcutaneous flap. These flaps cannot subsequently be used for whole-breast reconstruction should the patient develop local recurrence and require mastectomy.¹⁰

In our study, racquet mammoplasty was done in 15 cases (57.4%), the round block technique in 7 cases (27%) and the Grisotti technique in 4 cases (15.6%).

According to the post-operative histopathology reports, specimen sizes ranged from 90cc to 550cc, with a mean value of 247cc, with tumor sizes ranging from 0.7cm to 5cm with a mean of 2.75cm. This is more than those of Kaur et al, in their study: the mean volume was 200.18cc while the mean volume of quadrantectomy group in the same study was 117.5cc.⁷

Also in the study conducted by Giacalone et al, the mean volume of tissue resected by oncoplastic techniques and by quadrantectomy was 234cc and 114cc respectively. These results show that the amount of breast tissue excised during oncoplastic surgery is higher than that excised during standard quadrantectomy.¹⁵

Margin width correlate with the volume of the breast specimen; Vicini et al concluded that the risk of recurrence was directly correlated with the volume of the glandular specimen. They found that patients with smaller excised volumes (<60cm³) had higher rates of local recurrence than patients with excised volumes of more than 60cm³. This is more pronounced as tumor size increased. The 5- and 10- year local recurrence rate decreased as the specimen volume to tumor volume ratio increased.¹⁶

So OPS allowed large-volume resections with free margins and fewer re-excisions and mastectomies than that obtained with standard BCS.

As regard resection margins, all specimens in our research showed free resection margins with an average of 2.5cm, the least resection margin obtained was 0.4cm as the deep margin in a patient with invasive ductal carcinoma, grade II, who received post-operative radiotherapy and hormonal therapy and has close follow up, and yet, no recurrence detected. The largest resection margin was 10cm as the

deep margin in an excised upper outer quadrant tumor.

All our specimens showed adequate free margins, and all our cases showed no recurrence, but this also might be due to the relatively short time of follow up. One case (3.9%) in grade III category developed distant metastasis; histologic grade III has the highest frequency of distant metastasis. This reflects the fact that a higher grade means a higher risk; that is a tumor with more abnormal looking cells tends to grow and spread more quickly.

Clough et al reported a local recurrence rate of 9.4% with a mean follow up of 3.8 years.¹⁷

Raja et al reported a local recurrence rate of 3% with a mean follow up of 5 years.¹⁸

Most authors define a positive margin as less than 1mm and a close margin as less than 2mm of normal breast tissue between the resection margin and the next cancer cell.¹⁹⁻²¹

Post-operative pathological assessment showed that variable histological types could be handled using OPS; that 68% of cases had invasive ductal carcinoma, 8% had mixed ductal-lobular carcinoma and 4% had tubular carcinoma.

Five patients had associated carcinoma in situ, four of them with ductal carcinoma in situ (DCIS), and one of them lobular carcinoma in situ (LCIS). No recurrences were detected among patients with associated carcinoma in situ, with free resection margins, the smallest being 5mm and the largest 4.5cm.

Five cases had multiple tumors (multifocal) and were successfully managed without recurrences except for one case that had distant metastasis in the form of malignant pleural effusion as described earlier, but no breast local recurrence.

These results are in agreement with that of the study done by Staub et al., that oncoplastic techniques allow for excision of multifocal tumors located in the same quadrant without oncological compromise.²²

Wound infection occurred in 6 cases (23.4%) three of them were diabetics, seroma in one case (3.9%) and minimal skin slough in one case (3.9%).

Ghon et al; 2008 stated that, there are less likely to be problems with skin viability when completion mastectomy is undertaken after

simple excision of tumour compared with a more complex oncoplastic procedure with parenchymal undermining and transposition. There is a higher chance of wound infection and fat necrosis in patients who smoke, are obese (body mass index >30), have large breasts or are diabetics, and these potential complications and their effect on further oncological treatment should be fully discussed with the patient.¹⁰

The cosmetic appearance was scored according to both the surgeon and patient satisfaction as follows: from the surgeon's point of view: 17 patients were scored as excellent, 8 as good, 1 as fair, taking into account the preservation of the normal breast shape in spite of the large volume of resection obtained with wider free resection margins.

As mentioned above, resection volumes of 90 to 550cc could be obtained without compromise of the cosmetic outcome as stated by the operating surgeons with wider free margins. Also, the ability to conservatively excise tumors from less favorable locations, such as the upper inner quadrants or central retroareolar area of the breast, which often create a major risk for deformity, made oncoplastic surgery a favorable substitute for breast conserving surgery.

According to patients, they were satisfied by the result that their breasts were not amputated (by their expression), preserving their body image with complete tumor removal.

Patient decision may be motivated by different factors including preservation of the breast, cosmetic results, operative morbidity, treatment duration and convenience.²³

Conclusion and recommendations:

OPS allowed large-volume resections with free margins and fewer re-excisions and mastectomies than that reported with standard BCS.

Volume displacement represents the simplest option for partial breast reconstruction and is usually preferred over techniques for volume replacement which involve more extensive surgery with harvesting of a myocutaneous or subcutaneous flap.

The cosmetic outcome was satisfactory, both for the surgeons as the general rule, it is

much easier to prevent than to correct deformity; and for the patients, as the tumor was excised without amputation of their breasts and their body image was preserved.

Large number of patients and longer follow-up period are required for better assessment of this promising technique.

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