ORIGINAL ARTICLE

Oncoplastic volume replacement with latissimus dorsi myocutaneous flap in patients with large ptotic breasts. Is it feasible?

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Abstract Background: Oncoplastic breast conservative surgery has evolved as a safe alternative to the standard mastectomy in the treatment of early breast cancer. The procedure involves tumour resection with an adequate safety margin and either breast reshaping with volume displacement procedures (large or ptotic breasts) or volume replacement with latissimus dorsi myocutaneous flap (LDF) (small to medium sized non-ptotic breasts). A contra lateral mastopexy procedure is usually necessary with the volume displacement oncoplastic surgery, a procedure that is often rejected by a significant number of patients. This limits the choice of the reconstruction of breast defects in such patients to autologous tissues i.e. LDF.

Aim: Aim is to evaluate the feasibility of volume replacement oncoplastic breast conservative surgery with latissimus dorsi myocutaneous flaps for patients with large ptotic breasts. This involves testing the oncologic safety in terms of adequate safety margin, the complications rate and the final cosmetic outcome. The loco regional recurrence rate will be recorded and compared with oncoplastic volume displacement for similar sized breast defects.

Patients and methods: A group of 50 female patients with early breast cancers (T2) who presented to the department of surgery at the National Cancer Institute, Cairo, Egypt in the period between January 2004 and November 2009 were included in the study. Bilateral soft tissue mammography
Introduction

Until recently, the surgical management of breast cancer has been based on two main options; either tumour resection with safety margin (breast-conserving surgery) (BCS) or the standard mastectomy with or without reconstruction [1]. Breast conserving treatment (BCT) combined with radiotherapy has stood the test of time as a sound oncological treatment regarding survival and local recurrence rates. Successful BCT requires a balance between adequate surgery and maintaining the breast’s appearance. Nonetheless, unsatisfactory aesthetic outcome reaches 20–30% in the standard techniques of BCS [2].

The extent of local excision remains a controversial issue in breast-conserving surgery. The wider the margins of clearance, the lower the risk of local recurrences, but higher the risk of visible deformity leading to unacceptable cosmetic results [3]. Type-1 breast deformity CS1 is defined as an asymmetry between the two breasts, with no distortion or deformity of the irradiated breast. Type-2 CS is an obvious breast deformity that can be corrected with partial reconstruction of the breast. Type-3 CS is such deformity that only a mastectomy with total reconstruction of the breast can be performed. Most of the patients present with type-2 CS, but are reluctant to undergo what they feel is a major reconstructive procedure [4].

For type-1 deformities, surgery to the irradiated breast should be avoided when possible. Type-2 deformities raise the most difficult therapeutic problems because they are mainly postoperative complications that could have been prevented by performing immediate remodelling of the treated breast before radiotherapy. This demands the integration of plastic surgical techniques at the time of the original lumpectomy, thus reducing the need for delayed reconstructive surgery [5].

In one series of patients with BCT, 56.5% of the deformities were type-1 cosmetic sequelae (CS1) and 38.8% were type-2 CS and 4.7% were type-3 CS. Type-1 patients should be managed essentially by contra lateral symmetrising procedures. Type-2 was the most difficult to manage and required all the techniques of breast reconstructive surgery. The insetting of a myocutaneous flap was often necessary and autologous fat grafting was a promising tool in selected cases. Type-3 CS required mastectomy and immediate reconstruction with a myocutaneous flap [4]. In another series of patients, following BCT 33% had a type-1 deformity; all but one patient was treated with contra lateral mammoplasty. 42% had a type-2 deformity and were treated by various techniques (implant, mammoplasty, latissimus dorsi flap, or transverse rectus abdominis musculocutaneous flap). Only 43.8% of patients in this group had a late satisfactory cosmetic result [5].

Lately, techniques that combine the skills of resection with those of reconstruction in one procedure have lead to the development of oncoplastic breast-conserving reconstruction. This approach involves reconstruction of resection defects either by volume replacement or by volume displacement. Both techniques are adaptations of conventional methods of breast reconstruction or breast reduction mammoplasty [1]. Concepts described have widened the spectrum of BCT, and have made an improvement of cosmetic outcome, and facilitated a liberal safety margin. Volume displacement techniques, such as glandular flap, mammoplasty, donut mastopexy, and batwing mastopexy proved useful in large breasts. On the other hand volume replacement, such as latissimus dorsi flap and local flaps are of great advantage to replace defects in small and medium sized non-ptotic breasts [2].

Oncoplastic surgical resection is designed to follow the cancer’s contour, which generally follows the segmental anatomy of the breast. With negative surgical margins, the lumpectomy is equivalent to the quadrantectomy in achieving the goals of breast conservation as measured by local recurrence and survival. However, the lumpectomy is less versatile for resection of larger cancers, and can be more prone to creating suboptimal cosmetic defects [6]. Oncoplastic surgery achieves more accurate tumour resection than standard quadrantectomy with no reconstruction. In a recent study the median volume of the excised specimen in the oncoplastic volume displacement group was found to be larger than in the quadrantectomy group without volume replacement. The nearest
lateral margin widths were larger in the oncoplastic group than in the quadrantectomy group [7].

Partial mastectomy and immediate reconstruction with a myocutaneous latissimus dorsi flap allows more extensive resection, which fits oncologic requirements, without serious morbidity and a good cosmetic outcome. In a recent study the free margins were obtained in all cases and the cosmetic outcome was found to be good in 44% of the cases and satisfactory in the remaining 56%. Symmetry and the scar of the reconstructed breast were the most influential criteria in the quantitative assessment of overall cosmetic results [8].

Latissimus dorsi miniflaps can be also used to reconstruct central and upper quadrant resection defects, replacing the volume excised with autogenous tissue. Partial mastectomy, axillary dissection, flap harvest and reconstruction of the resection defect are performed as a one-stage procedure through a single lateral incision. This oncoplastic approach particularly with central defects, allows extensive local excision during BCS without cosmetic penalties in a group of patients normally treated by mastectomy [9]. The extended LDF has made the reconstruction of relatively large breast defects even more feasible. This was found to be beneficial in treating large T2 breast cancer by BCS. This did not demand any implant insertion to supplement the volume restoration with extended LDF in all cases [10].

This prospective study was undertaken to evaluate the accuracy of breast tumour resection and the lateral margin in a group of patients with large ptotic breasts who underwent oncoplastic breast conservative surgery and volume replacement with LDF. The final cosmetic results after completing the radiotherapy treatment were evaluated. The late follow up and the rate of loco regional recurrence was also assessed.

**Patient and methods**

A group of 50 female patients with early breast cancers (T2) presented to the Department of Surgery at the National Cancer Institute, Cairo, Egypt presented between January 2004 and November 2009 were included in the study. All patients were T2 N0 breast cancer by both clinical and radiological examination. All patients underwent routine laboratory investigations including complete blood count, liver and kidney functions as well as chest X ray. The staging process was based on carrying out routine digital mammography complemented with an ultrasound examination to both breasts and the axilla. Histopathological examination was performed through a free hand core biopsy for superficial tumours and an ultrasound guided biopsy for deeply seated tumours. The inclusion criteria included tumour sizes up to 4 cm in maximal diameter with N0 axilla. Breast size was taken into consideration and patients' moderate or large ptotic breasts were counselled with regards to performing breast reshaping with one of the volume displacement procedures. Patients who rejected the option of immediate contra lateral breast surgery were given the option to go through breast conservative surgery and an immediate augmentation mammoplasty with one of the LDFs. Types of breast deformities if the reconstruction were not to be performed were mentioned to the patients and photographs of each were provided and viewed by the patients themselves as well as their partners (Fig. 1).

All patients who elected to go through the operation of an augmentation mammoplasty with one of the LDFs were consented for this option. The potential complications of the procedure such as flap necrosis, haematoma, infection, and seroma as well as donor site morbidity were discussed with the patients. Further surgery to treat such complications as well as late auxiliary surgery to achieve the maximal symmetry was also discussed.

The final aesthetic results were evaluated after completion of the BCT. The evaluation parameters included the breast shape, volume, projection and the nipple and areola symmetry. A score of 1–4 (poor, fair, good, and very good or excellent) was given by 2 independent observers, none of whom was involved in the surgical procedure. A similar score was given to the patients themselves (1–4) (not satisfied, fairly satisfied, satisfied, and very satisfied).

**Results**

Fifty female patients with early breast cancer (T2) who underwent oncoplastic breast conservative surgery with volume replacement LDF were evaluated. All patients had a moderate to large ptotic breasts and rejected volume displacement combined with contra lateral breast mastopexy procedures as a
first reconstructive option to the defects created by the resection of cancer. The average age at presentation was 46.5 ± 9 years and the range was 26–65 years. The average follow up period was 33 ± 9 months and the range was 20–54 months. All patients were T2 (tumour more than 2.5 cm in largest diameter) and N0 where no clinically palpable lymph node could be detected (Table 1).

Most of the patients were subjected to partial mastectomy (30) (60%), Excision of a single quadrant from the major four quadrants (upper outer, lower outer, upper inner, and lower inner) was carried out in 15 (30%) of patients while skin sparing wide local excision was carried out in only 5 (10%) of patients (Table 2). The defects were upper outer in 62%, upper inner in 8%, central in 20% and inferior defects in 20% of cases.

All the patients who underwent quadrantectomy or partial mastectomy operation required an augmentation mammoplasty operation to restore the breast volume with the standard latissimus dorsi myocutaneous flap (90%), and the rest were reconstructed with LD miniflap (10%) (Table 2 and Figs. 1–4).

Histopathological assessment revealed that the average size of the resected tumour was 3.5 × 2.8 × 2 cm when measured grossly. The safety margin ranged from 1.1 to 3.2 cm with a mean of 1.8 ± 0.5 cm. Pathologically affected axillary lymph nodes were reported in only 20% of patients. Most of the involved lymph nodes were less than three in number (80%) with only two cases showing capsular rupture. With regards to the histology of the disease we found out that most of these were

toma; and late hypertrophic scarring in two patients. Seroma in the breast or the axilla were reported in 10 patients and in the donor site in six patients.

Table 1 Tumour size, site, safety margin and lymph node status in 50 breast cancer patients.

<table>
<thead>
<tr>
<th>Tumour parameters</th>
<th>Number</th>
<th>Percentage</th>
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<tbody>
<tr>
<td><strong>Largest diameter</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.5–2.9 cm</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td>3.0–3.5 cm</td>
<td>16</td>
<td>32</td>
</tr>
<tr>
<td>3.6–4.0 cm</td>
<td>29</td>
<td>68</td>
</tr>
<tr>
<td><strong>Tumour site</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Upper outer</td>
<td>31</td>
<td>62</td>
</tr>
<tr>
<td>Upper inner</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Lower outer</td>
<td>4</td>
<td>8</td>
</tr>
<tr>
<td>Lower inner</td>
<td>6</td>
<td>12</td>
</tr>
<tr>
<td>Central</td>
<td>5</td>
<td>10</td>
</tr>
<tr>
<td><strong>Safety margin</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.0–1.5 cm</td>
<td>32</td>
<td>64</td>
</tr>
<tr>
<td>1.6–2.0 cm</td>
<td>10</td>
<td>20</td>
</tr>
<tr>
<td>&gt;2.0 cm</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td><strong>Lymph nodes metastasis</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>40</td>
<td>80</td>
</tr>
<tr>
<td>1–3 lymph node</td>
<td>8</td>
<td>16</td>
</tr>
<tr>
<td>&gt;3 lymph node</td>
<td>2</td>
<td>4</td>
</tr>
</tbody>
</table>

Table 2 Type of surgery performed and complications rate in the study group (50 patients).

<table>
<thead>
<tr>
<th>Type of surgery</th>
<th>Patients (No. and %)</th>
<th>Complications (No. and %)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quadrantectomy + LDF</td>
<td>15 (30%)</td>
<td>3 (6)</td>
</tr>
<tr>
<td>Partial mastectomy + extended LDF</td>
<td>30 (60%)</td>
<td>5 (10)</td>
</tr>
<tr>
<td>Skin sparing wide local excision + mini LDF</td>
<td>5 (10%)</td>
<td>1 (2)</td>
</tr>
</tbody>
</table>

Figure 2 Quadrantectomy and a standard latissimus myocutaneous flap (score = 4).

Figure 3 Skin sparing wide local excision and LD miniflap (score = 4).

Figure 4 Central mastectomy and extended latissimus flap reconstruction (score = 3).
either invasive duct carcinoma or mixed duct and lobular carcinoma (82%). Lobular carcinoma was only detected in 10% of cases. The majority of the disease was grade two (80%) where the rest was either grade one (6%) or three (14%).

The vast majority of our patients received postoperative radiation therapy (92%), and 86% received chemotherapy and the indications were tumours more than 2 cm, receptor negative, higher grade of the disease, nodes positive, capsular rupture, and young age <40 years at presentation. Hormonal treatment was required in 74% of cases for those who confirmed to be ER or PR positive in histological examination or the resected specimens.

During the follow up period we detected only two local recurrences and 1 distant metastasis (bone). Fat necrosis was reported in six patients (12%) all required surgical intervention after radiological and histological assessment to confirm the diagnosis.

The final aesthetic assessment showed that the vast majority of patients were either satisfied (score 3 out of 5 or more) (62%) or very satisfied (score 4 or more) (18%) with the results of reconstruction. Those who were not satisfied or fairly satisfied were those who suffered some complications that affected the breast volume, projection or symmetry with the contra lateral side (Table 4).

Table 3 Final assessment of cosmetic results after completion of treatment by two independent observers in 50 patients.

<table>
<thead>
<tr>
<th>Final score</th>
<th>Number (n = 50)</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Poor (score &lt; 3)</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>Fair (score 3)</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>Good (3–4)</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>Very good (score &gt; 4)</td>
<td>15</td>
<td>30</td>
</tr>
</tbody>
</table>

The patient expectations have matched independent assessment where the observers thought that the majority of the results were either good (60%) or very good (30%). This was based on comparing breast volume, projection, symmetry and nipple and areola shape with the contra lateral side (Table 3).

Discussion

The term oncoplastic surgery refers to surgical techniques on the basis of oncological principles during which the plastic surgery techniques are used, mostly for reconstructive and cosmetic purposes. Oncoplastic breast conservative surgery is a broad concept that comprises several different combinations of oncological surgery and plastic surgical procedures: Volume displacement involves excision of the tumour using reduction mammoplasty techniques, or tumour excision followed by remodelling mammoplasty. Volume replacement involves partial mastectomy with immediate reconstruction of the breast with prosthesis or one of the LD flaps. The advantage of the oncoplastic surgery for breast cancer is the possibility of performing a wider excision of the tumour with immediate breast reconstruction aiming at good cosmetic results [11].

Trends in the management of unilateral breast cancer from delayed to immediate reconstruction and from implants to autologous tissue have reduced the incidence of contra lateral symmetrisation procedures. Reduction mammoplasty is the most common symmetry procedure used for autologous tissue reconstruction [12].

Attempting breast-conserving surgery in patients with large breasts carries many challenges related to the varieties of defects and their anatomical sites. Partial mastectomy defects can be usually reconstructed by volume displacement, recruiting and transposing local glandular or dermoglandular flaps into the resection site, or less commonly by volume replacement, importing volume from elsewhere to replace the amount of tissue resected [3].

Cultural issues in relation to patient selection and thereby the indications of each technique have not been sufficiently addressed in the literature. In the Egyptian culture most women decline contra lateral breast surgery, a procedure that is considered necessary to achieve an acceptable symmetry with volume replacement oncoplastic surgery. The majority, regardless and irrespective to the size of the breast or the degree of ptosis, prefer an augmentation mammoplasty procedure based on autologous tissue reconstruction rather than a contra lateral mastopexy. This means that some patients who could have benefited from oncoplastic volume displacement have preferred the option of volume replacement by autologous breast reconstruction.

In the current study we tested the feasibility of oncoplastic breast conservative surgery with volume replacement in patients with large ptotic breasts. This is contrary to its original indication in the literature i.e. small to medium sized non-ptotic breasts. There were three main parameters of assessment; the adequacy of safety margins, the complications rate, and the final cosmetic results.

The safety margin was satisfactory in all of our patients (1.8 ± 0.5 cm) with no single case that required further excision matching the reported studies of volume replacement for a variety of breast defects [9,10,13]. The results were even better than the reported studies of oncoplastic volume displacement [14], where a close or involved margin in that study were reported in 18.9%, with mastectomy being necessary in 9.4%.

Latissimus dorsi miniflaps can be also used to reconstruct central and upper quadrant resection defects, replacing the volume excised with autogenous tissue. Partial mastectomy, axillary dissection, flap harvest and reconstruction of the resection defect are performed as a one-stage procedure through a single lateral incision. This oncoplastic approach particularly with central defects, allows extensive local excision during BCS without cosmetic penalties in a group of patients normally treated by mastectomy [9]. The extended LDF had made the reconstruction of relatively large breast defects even more feasible. This was found to be beneficial in treating large T2 breast cancer by BCS and this did not demand any implant insertion to supplement the volume restoration with extended LDF in all cases [10]. In the current study the standard latissimus myocutaneous flap was used to fill defects following
quadrantectomy procedures (30%) (Fig. 2) where the extended latissimus myocutaneous flap was required for more extensive defects following partial mastectomies where more than one quadrant was excised (60%) (Fig. 4). The LD mini flap was only required for defects following non-anatomical skin sparing wide local excision, such as for deeply seated lesions (10%) where the skin envelope was preserved (Fig. 3).

Partial mastectomy and immediate reconstruction with a myocutaneous latissimus dorsi flap allows more extensive resection, which fulfils oncologic requirements, without serious morbidity and a good cosmetic outcome [8]. The complications rate of the current study was 18% and that was very acceptable compared to reported studies [8,10] where complications were reported in 38% and 48% of their patients respectively. However, we also reported an incidence of seroma in 20% of cases in the breast and in 12% of cases in the donor site; both were treated conservatively with repeated aspiration. We also reported an incidence of 12% of minimal fat necrosis that was excised under local anaesthesia and resolved over the period of follow up with no significant effect on the breast size, shape or contour.

Highly satisfactory cosmetic outcomes extend the indications for conservative surgery, and further reduce the mastectomy rate [13,15]. In the present study a satisfactory or very satisfactory aesthetic outcome was obtained in 90% of our patients. In spite of the relatively short follow up period, this was comparable to other studies where 5 years satisfactory aesthetic results were reported in 80–90% of cases [8,14]. Moreover there was an agreement between the observers who reported good or very good results in 90% of patients. The views were aided by a photographic study in the assessment of the LDF reconstruction; however, all evaluations remain subjective, and objective assessment of the results especially the degree of regaining a normal nipple sensation is recommended. Also the long term psychological evaluation of the long term results could be useful in determining the psychological advantages and the degree of satisfaction after such procedure.

In a study involving a larger series of patients the five-year overall and the disease-free survival rates were 93% and 88%, respectively, with a local recurrence rate of 7% [18]. We reported only two cases (4%) of local recurrence and one case of distant metastasis (2%) over the period of follow up. The results of this series ensure the safety of oncoplastic breast surgery for tumours both high in volume and difficult in location. However, a larger series of patients and a longer follow up would be required to confirm the significance of such results.

Advanced volume-displacement techniques, which are based on the key principles of breast reductive surgery, can greatly increase the options for breast conservation in complex cancer cases [14]. However, detailed studies are small and outcome measures vary [16]. More over, these techniques require detailed assessment of the oncological and cosmetic outcomes and long-term results in comparison to volume replacement procedures for a variety of breast defects and with different breast sizes. On the other hand cancers with large in situ component can be particularly problematic during resection with the standard lumpectomy, when they extend both centrally toward the nipple and peripherally to distal terminal ductulo-lobular units. Ductal segments, each of which ultimately drains to a single major lactiferous sinus at the nipple, vary in size and depth in the breast [6,13,15]. Those tumours with segmental spreading would need an extensive resection and are best excised by oncoplastic techniques according to their distribution and reconstruction with volume replacement by autologous tissues.

In conclusion, oncoplastic approach will be an integral element of the surgical treatment of breast cancer in the future. The choice between volume displacement and volume replacement autologous reconstruction must consider patients preference after proper counselling. Cultural backgrounds should be considered and patient involvement in the decision of which oncoplastic procedure to select, is fundamental. The results of the current study show that volume replacement with autologous tissues i.e. LDF can be a suitable alternative to volume displacement in patients with large ptotic breasts, particularly if they object to a combination of volume displacement with immediate contra lateral breast mastopexy.

References


Further reading