Breast reconstruction in conserving breast cancer surgery

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ABSTRACT

Breast conserving treatment (BCT) combined with radiotherapy have proved the test of time as a sound oncological operation in terms of survival and local recurrence. Prospective randomized trials found no difference in local recurrence, disease-free interval, and long-term survival in the group using modified radical mastectomy compared to the BCT followed by whole breast irradiation. Successful breast conservation is a balance between surgical removal of cancer completely, with an adequate safety margin and maintaining the breast's shape and appearance. Preservation of body image, sensations of wellbeing, and positive psychological balance are added advantages to BCT. Unfortunately, 20-30% of patients have an unsatisfactory outcome, which could be attributed to excision of large volume in proportion of breast size, badly sited surgical incisions, poor tissue handling (fat necrosis and infection) and radiotherapy. The main objectives of this article are to shed light on different techniques adopted by surgeons to perform BCT in conjunction with various oncoplastic techniques and to discuss the factors that influence their applications to achieve best oncological and aesthetic outcome.


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Breast conserving treatment (BCT) combined with radiotherapy have proved the test of time as a sound oncological operation regarding survival and local recurrence. And training are required for sophisticated ones. The objectives of this article are to shed light on different techniques adopted by surgeons to perform BCT in conjunction with various oncoplastic techniques and to discuss the factors that influence their applications to achieve best oncological and aesthetic outcome.
main tumor is removed. Quadrantectomy seems to be too radical, associated with substantial loss of breast volume and adverse cosmetic outcome, especially of the tumor outside the upper outer quadrant.  

Lumpectomy as described by Fisher et al. involves the removal of the main tumor with a 0.5-1 cm margin of normal breast tissue. Negative pathological margin is a prerequisite to avoid local recurrence. The surgery is usually followed by whole breast radiation to eradicate any sub clinical tumor foci in the affected breast.

**Modification of standard techniques.** In order to achieve satisfying cosmetic outcome from BCT, and at the same time abiding to the principles of oncological surgery to maximize the local control, surgeons attempted to improve the surgical techniques. For full thickness excision of the tumor bearing area extending down to pectoral fascia and including the overlying skin to avoid the problem of fixation of the skin to the underlying fascia, some authors recommended dissection of the glandular plate from the underlying pectoralis muscle and fascia, which facilitates a proper contouring and easy obliteration of the dead space at tumor bed. The use of suitable incisions to be curvilinear or transverse in the upper half of the breast and radial incisions in the lower half of the breast claimed to improve the cosmetic outcome.

**Basic principles for oncoplastic surgeons.** Surgeons should appreciate the impact of breast shape on the surgical planning, the breast may rounded, and conical in young ladies, the upper half will change from being convex to concave shape with time due to the gravity effect. Tubular breasts are not uncommon. The breast size has an impact on planning oncoplastic techniques, the large breast may be more suitable for reduction techniques, while women who have small breasts will benefit from additive surgery. Tumor size was a significant variable in BCT, most of early studies recommended conserving surgery for small tumors of 2 cm or less, such limitation was criticized by other studies, which upgrade the allowable size to 5 cm. In fact, the tumor size in relation to the breast volume is more decisive than the absolute tumor volume. Oncoplastic techniques allow excision of large tumor as long as an adequate safety margin can be achieved and the resulting defect can be managed with reasonable outcome. The location of the tumor requires critical understanding; the classical division into 4 or 5 quadrants are inappropriate for precise planning, dividing the breast in 9 zones is more convenient for selection of suitable surgical intervention. Localization and distribution of the breast tumor within the breast are of extreme importance for adequate excision of the tumors with safety margin. The study carried out by Holland et al. revealed 55% of tumors were localized, while 35% had segmental distribution and the remaining are irregularly extended. In the localized type, safety margin can be achieved easily, while segmentally distributed tumors demand excision of the whole segment with subsequent larger defects. Irregularly distributed tumors require mastectomy in most cases. Breast clinical examination is helpful to excise breast tumors of localized type, but it has limited value in segmentally distributed tumors. Mammography and ultrasonography are routinely used in daily practice to predict the orientation and the extent of the tumor within the breast, but its value is low in determining the distribution of non-invasive components. Magnetic resonance imaging (MRI) is used more frequently in measuring the extent of breast tumors especially in dense breasts. The accuracy of MRI was higher compared with that of mammography and sonography for assessment of size and extent of breast tumors. Although data regarding MRI are encouraging, an important limitation of MRI is its high rate of false-positive results. Three dimensional CT scan and PET-CT play a significant role in precise localization of the tumors, but more evidence is required.

**Volume displacement oncoplastic procedures: Reduction mammoplasty for lumpectomy.** Surgeons experienced in various forms of reduction mammoplasty have unrestricted ability to widely excise breast cancer with a sufficient safety margin if the tumor could be included within the resected specimen. Lower central tumors can be excised by using a superior pedicle technique, while tumors located lower lateral and those located in the lower medial group can be dealt with using the inferior pedicle technique of reduction mammoplasty. Several modifications of mammoplasty techniques allow resection of tumors even located outside the proposed area of resection in conventional superior or inferior pedicle techniques. Reduction mammoplasty usually demands a skilful surgeon, reduction in the contra lateral breast makes the procedure of longer duration, more cost and more liable for complications. If further surgery due to involved margin or multicentricity is required, mastectomy may be difficult to include mammoplasty scars. Postoperative radiation may pose a challenge for the whole breast radiation and booster radiation to the tumor bed. Women who have had cosmetic reduction mammoplasty had shown lower risk of subsequent breast cancer. Therefore, reduction mammoplasty may reduce the risk of cancer in the treated contra lateral breast.

**Donut mastopexy lumpectomy.** Donut mastopexy is originally described to correct a protuberant nipple-areola complex (NAC) and mild ptosis, especially in tubular breast. A donut-shaped portion of periareolar skin is de-epithelialized. The radius of the skin to be removed is usually 2-3 cm and includes a portion of the areola when it is of large diameter. The resulting
wound is closed by a purse-string closure around the nipple, leaving only a periareolar closure at the end of the operation (Figure 1). The main advantages of such a procedure were minimizing scar of periareolar area, preservation of nipple sensation, easy to perform, and short duration of surgery.24 Donut mastopexy was integrated as an excellent approach to excise malignant lesions of the breast, in fact one can consider this approach as a midline incision to explore the abdominal cavity since different parts of the breast can be reached without difficulty. This technique is usually suitable for tumors segmentally distributed in the upper lateral or upper central locations and deeply seated in the breast away from the skin. If a large piece of glandular tissue was excised leaving redundant skin and underlying tissue hanging in the dead space as a result of large volume resection, the skin can be de-epithelized and buried to fill the dead space (Figure 2). It is occasionally feasible to approach the axilla through the same incision when the tumor is in the upper lateral location. Donut mastopexy lumpectomy allows surgeons to perform classical or skin sparing mastectomy (if an adequate margin could

Figure 1 • Donut mastopexy lumpectomy showing: a) Mammographic location of the tumor, b) periareolar marking.

Figure 2 • Donut mastopexy lumpectomy a) periareolar marking: The radially closed wound as a result of deepithelization of redundant skin, which was buried to fill the dead space. b) Results in the early postoperative period.
be achieved by BCT without leaving a violated previous skin incisions.

Batwing mastopexy lumpectomy. “Batwing” mastopexy can be considered for cancers located centrally and above the NAC, but not directly infiltrating the major ducts. Two similar half-circle incisions are made with angled wings to each side of the areola the tumor should be excised with safety margin and the fibroglandular tissue, incontinuity with NAC is advanced to close the subsequent defect. Adequate removal of skin overlying the lesion could improve local control of cancers located superficially. Nipple necrosis may take place if dissection extends directly behind the nipple.25 Patients with pendulous breasts are particularly eligible for this procedure, which can also be applied to the contra lateral breast to achieve symmetry.

Central lumpectomy. In this technique, the nipple-areola complex is circumferentially excised at the areola-skin junction as the superficial margin of tumors located immediately or involve the areola-nipple complex. The skin and the wound is closed in a transverse fashion or with a purse-string suture as preferred (Figure 3), with immediate or delayed reconstruction of the areola-nipple complex.26-28

Figure 3 - Central tumor resection including the areola-nipple complex and purse sting suturing of the wound.

Figure 4 - Latissimus dorsi flap for reconstruction after partial mastectomy: a) preoperative mammogram. b) Filling the defect with the flap.
**Volume replacement: Latissimus dorsi flap (LD).** Latissimus dorsi flap started to be used to fill and cover large defects after BCT since the 1990s. Techniques of raising the flap were described by several authors, the procedure may be performed immediately to compensate for the resulting defect or at a later stage. This flap is an excellent option in women with large tumor of moderate or small size breast, where an additive procedure is required or mastectomy otherwise. A mini LD is usually sufficient and can be raised with less morbidity and good cosmetic outcome following the procedure. The latissimus dorsi flap is mainly used for defects in the lateral half of the breast, but practically can be used to fill defects in any part of the breast, but skin color mismatch, donor site morbidity and position change during operation are known disadvantages (Figure 4).

**Local flaps (LF).** We mean the use of juxta skin and its underlying soft tissue with or without glandular tissue to fill and cover defects in the upper lateral and upper central segments of the breast after conserving surgery for breast cancer. The LF is a promising procedure to compensate for large defects in small and medium sized breasts. The technique as described elsewhere is simply summarized as in Figure 5, the pre operative and intra operative marking and planning are essential (Figure 5a).

While waiting the results of frozen section, the site of incision for access to axilla is marked below the axillary hair line or even at a lower level to be the upper boundary of the designed local flap. A composite of tissue between the upper or lateral border of the post surgical defect and axillary incision are raised after making a third incision to communicate the previous 2 incisions. The flap is usually composed of skin and subcutaneous tissue in case of upper outer quadrant defects, while in upper central defects, glandular tissue is incorporated in the flap. Raising the flap will provide very wide access to the axilla, which greatly facilitates axillary dissection. This option of reconstruction is infrequently described in the literature. A report of 25 cases with extended follow up, local recurrence was 8%, cosmetic was very good, and good in 84% of women in the study with no poor aesthetic outcome (Figure 6). Local flaps is an added assets to other oncoplastic procedures, but supportive studies are required in the future.

In conclusion, in the last 2 decades, the spectrum of conserving breast surgery has been widened by incorporating various oncoplastic techniques in the management of breast cancer. These procedures have a definite positive impact on aesthetic outcome, are oncologically sound and provide an opportunity for more women to live with 2 breasts. Many of these
techniques can be easily learned and practiced, special training and expertise are required for some techniques. In the future, the results of the reunion of plastic surgery with surgical oncology will produce competent breast surgeons who will routinely practice these techniques with more favorable outcome.

References
