



The interface between breast conserving surgery with oncoplastic techniques and mastectomy: when to perform one or the other – a narrative review

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Objective: The aim of this review is to describe different oncoplastic surgery techniques and indications versus mastectomy.

Background: Oncoplastic breast surgery has emerged in last 2 decades as an alternative to mastectomy. It refers to the resection of the breast tumour with clear margins followed by the reconstruction of the defect using surgical plastic techniques. Oncoplastic breast surgery allows women to keep their breast with tumours that otherwise would imply a mastectomy performed. The concept of oncoplastic breast surgery requires in one side a complete oncological surgical technique and in the other performing that surgery using plastic surgery techniques. If a breast symmetry is needed or demanded by the patient it should be performed in the same operation. Oncoplastic breast surgery is a safe oncological option, and it maintains the shape of the breast without the secondary effects of foreign bodies, re-do surgery and its complications. In oncoplastic breast surgery there are two different groups of techniques available to correct the defect created after the surgical excision of the tumour: volume displacement and volume replacement. In the volume displacement technique following the resection, the defect is filled with the rest of the available breast. In volume replacement technique, autologous flaps and tissue are dissected and transposed from a close or distant place. It requires special training program that must be facilitated to all breast surgeons. Mastectomy remains the main option for patients who wish their breast to be removed or for those when breast conserving surgery is not suitable.

Methods: We have searched the most relevant publications in PubMed from 1981 up to date using the keywords.

Conclusions: Oncoplastic breast surgery techniques have become the best new surgical options to treat breast cancer.

Keywords: Conservative breast surgery; oncoplastic breast surgery; mastectomy; indications; contraindications

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Introduction

Rationale

The dilemma between conserving breast surgery with oncoplastic techniques and mastectomy is difficult to solve. The final decision has to be taken by the patient after detailed information of both procedures and before the consent has been signed.

Breast surgery has evolved over the past two decades. What it used to be considered a “simple” surgical procedure has become sophisticated techniques that require high level of skills and training. Mastectomy has been the surgical procedure for a T3 tumour for decades. However, currently, the same tumour has a variety of surgical options all of which have excellent cosmetic results. Mastectomy, therefore is not always mandatory.

The patient wishes after a detailed information will always remain the main factor to decide the technique.

Surgical skills, training, knowledge and experience will remain the pillars that will move the balance and the surgeon has to be able to explain all the different options to the patient.

Breast conservative surgery (BCS) followed by radiotherapy (RT) have become the gold standard for patients with small breast carcinomas achieving good oncological and aesthetic outcomes in most patients (1). The most important goal of BCS comprises the complete cancer resection with clear margins maintaining cosmesis. Mastectomy would therefore remain as the gold standard only for large and locally advanced tumors always considering the relation between the size of the tumor and the size of the breast.

Prospective randomized trials have compared mastectomy with BCS and no survival difference was observed between both techniques (2,3). Recent reviews (4) observational studies (5) and population-based studies or reviews (6,7) have pointed a better survival after BCS compared with mastectomy. We present the following article in accordance with the Narrative Review reporting checklist (available at <https://abs.amegroups.com/article/view/10.21037/abs-21-35/rc>).

Objectives

The aim of this review is to describe different oncoplastic surgery techniques and indications versus mastectomy.

Methods

The most relevant publications in PubMed from 1981 up

to date related to breast conservative surgery, oncoplastic breast surgery techniques and mastectomy have been searched including meta-analysis. Case reports and short series have been excluded.

Discussion

Oncoplastic breast surgery (OBS)

OBS was introduced by Audretsch in the 1990s (8). OBS comprises the resection of the tumour with clear margins followed by the reconstruction of the defect using surgical plastic techniques. This eventually will improve the cosmetic results avoiding deformities after BCS and RT. However, BCS may have complications. Deformities in the operated breast originating asymmetry with the contralateral side have been described in 30% of the patients after the operation. These complications will affect the quality of life and distress on the body image (9).

OBS allows women to keep their breast with large tumors that otherwise would imply a mastectomy performed. It comprises the complete resection of the tumor and the immediate reconstruction of the operated breast using plastic replacement or displacement techniques. If the patient requires contralateral symmetry, it can be performed at the same time (10). Eventually, it will avoid the secondary effects of the mastectomy or the prolonged multistage reconstruction with autologous tissue or implants techniques. It should be delivered by surgeons trained as breast oncoplastic specialists with knowledge of both surgical disciplines and oncological principles.

So far there are no published studies comparing the overall survival, disease-free survival and local recurrence between standard BCS and mastectomy with OBS. There is a growing evidence that OBS is safer from the oncological point of view. A recent systematic review has confirmed its safety for T1–T2 invasive cancer, as the patients show a high rate of disease free and overall survival and also low local and distant recurrence rates. These data suggest that OBS is safe for invasive tumors up to 5 cm. (11).

Rietjens *et al.* published long term results in patients with T1–T3 with OBS (12). There was no local recurrence in the T1 patients. Patients with T2–T3 had a 5-year local recurrence rate of 3% comparable with the 14.3% local recurrence in the NSABP trial (13) and the 0.5% local recurrence in the Milan study (14) where only T1 tumors were included.

The main indication for OBS is women whose cancer is

not small enough to be treated by a simple technique and not large enough to dictate mastectomy (1). The concept also sits well with the increasing use of neo-adjuvant therapy to downsize cancers that previously have been managed with mastectomy.

OBS can improve the outcomes of BCS in four aspects:

- (I) It allows removal of large tumors, without risking major local deformity;
- (II) For surgical procedures where a high percentage of the breast needs to be excised (20%) with adequate margins and cosmetic outcomes, OBS is the standard procedure;
- (III) OBS techniques are able to correct deformities after breast conservative surgery in patients treated also with radiotherapy (15);
- (IV) OBS optimizes the breast radiation therapy of patients with macromastia (16).

Mastectomy remains the main option for patients who wish their breast to be removed or for those whom breast conserving surgery is not suitable. However, all women undergoing mastectomy should be offered the opportunity to discuss reconstruction.

OBS techniques avoid secondary surgery for reconstructions as prevent major deformities of the breast (17). It is essential to perform all the reconstructions at the same time in order to avoid reconstructive surgery of important defects after radiotherapy (18).

Classification of oncoplastic procedures

Clough classified oncoplastic procedures within two levels (19)

Level I procedures include resections in which up to 20% of breast tissue needs to be removed. This includes glandular re-approximation and re-positioning of the nipple-areolar complex (NAC). Lumpectomy through low-visibility incisions and extramammary incisions for lateral resection with NAC mobilization are included. This technique should be performed by all breast surgeons.

Level II are procedures with the resection of more than 20% of the breast volume. This Level also requires re-shaping the contours and, nearly always, symmetrization of the contralateral breast. Within level II OBS, we identified patients with extreme oncoplasty. Extreme oncoplasty is defined as surgical procedures, which most of the surgeons would consider a mastectomy instead of BOS. These techniques are based in breast reduction mammoplasty and require specific oncoplastic surgical training.

Volume replacement/volume displacement techniques

Volume replacement and volume displacement are the two different group of plastic technique procedures used by breast surgeons for immediate reconstruction of resection defects.

In volume replacement procedure, tumourectomies larger than 20% of the breast volume are performed and the defect is repaired with the transposition of autologous tissue from elsewhere.

In volume displacement surgery after the high volume tumourectomy the defect is filled with the tissue left after the excision of the tumour.

Volume replacement

It is most appropriate for patients with small to medium size tumors that cannot be repaired by volume displacement techniques, or who wish to avoid contralateral surgery.

Transpositions flaps

- (I) The latissimus dorsi flap: It is a musculocutaneous flap that can be used to fill lateral, superior, inferior and medial defects. It should have a bigger volume that the defect to cover as the surgical de-innervation and radiotherapy will create atrophy of the flap.
- (II) Chest wall perforators flap only use de-epithelised skin with adjacent fat. The main advantage over other methods of reconstruction is the use of well-vascularized tissues to spare the underlying muscles in order to reduce the site morbidity and the seroma formation (20). They are classified according to the source of the vessel from which the perforator arises (21).
 - (i) Thoracodorsal artery perforator (TDAP) flap: The flap is raised from a septocutaneous perforator from the thoracodorsal artery at the anterior border of the latissimus dorsi muscle and more commonly as a musculocutaneous perforator. The base of the flap in its medial part is placed at the lateral breast crease. The perforators have to be identified with the patient in a lateral decubitus position using a 5- to 8 MHz hand-held acoustic Doppler close to the medial border of the latissimus dorsi muscle and the rest of the flap, as in the other perforator flaps, has to be drawn with account of perforator position, size of flap required and availability skin laxity (22). Usually, the height of the flap has a maximum of 8 to 10 cm and can be as long as 30 cm always trying to conceal it with the bra strap line. Usually, these flaps are used to fill defects close to

100 cc. Dissection has to be careful with the patient in lateral decubitus position, the same as when the perforators were identified. The shoulder abducted onto a support and in some cases a complete lateral position is needed to dissect the flap and close the incision. The dissection is performed medial to lateral. All perforators have to be identified eliminating only those that can restrict the movement of the flap. Once the flap has been de-epithelised it can be transposed into the defect. Sometimes a suture is placed trying to avoid the movement of the flap induced by gravity but in most of the cases it is not necessary. Identification of the perforators by doppler, marking the skin, dissection of the flap from medial to lateral and filling the defect with the flap are all required steps for these procedures.

- (ii) Lateral thoracic artery perforator (LTAP) flap (22). This flap is based on single or multiple perforators of the lateral thoracic vessels that are usually found 1-2 cm lateral to the breast crease and in the 3rd to 4th intercostal spaces in the inferior outer quadrant of the breast and the surface of the flap can be very similar to the TDAP flap.
- (iii) Intercostal artery perforator (ICAP) originating from the lateral region (LICAP) or from the anterior region upon the rectus muscle (AICAP). The LICAP perforators are commonly found between the 5th and 7th intercostal spaces. The patient's position is the same as for the LTAP and TDAP and sometimes it will be difficult to differentiate these perforators and the final decision of the type of flap used will be based on perforator exploration. In the AICAP flaps are based on perforators originated from the rectus muscle and are used to fill defects in the superior or inferior interior quadrants. The scar will remain in the inframammary fold.
- (iv) The branch to the serratus anterior perforator (SAAP). If this branch can be identified and it comes from the artery to the Serratus Anterior side branches should be ligated and the pedicle dissected with the fascia of the Serratus.
- (v) The superior epigastric artery perforator (SEAP). There are usually four to six SEAPs from the superior epigastric artery and the biggest perforator are usually localized in an area 2 cm from the midline and 0-10 cm below the xiphoid (23).

- (vi) Local fascio-cutaneous flaps can also be used in the case of small lateral defects (<10% of the breast size).
- (vii) Other less common volume replacement techniques are omental flaps first used in 1963 (24). This technique initially did not achieve popularity because of the severe laparotomy-associated complications that sometimes occurred. In 1998, however, Costa reported the successful performance of breast reconstruction with a laparoscopically harvested omental flap (25).

Autologous fat graft

Autologous fat graft is a common technique also used to improve aesthetic outcomes after conservative surgery. The fat is obtained with hand held syringes and special cannulas or ultrasound assisted in continuous aspiration from different part of the body such as abdomen, flanks and thighs. Tumescence anesthesia with saline, lidocaine and adrenaline in donor area before liposuction reduces pain, blood loss and fat removal is easier to perform. Larger diameter cannulas (5 mm) fat grafts demonstrated better histologic integrity when compared with 2-4 mm cannulas (26). There are different processing techniques; centrifugation, washing, gravity separation and filtration. Once the processed lipoaspirates are obtained they have to be delivered at the recipient side. Coleman originally described the placement with a Luer-Lock syringe connected to a 17-gauge blunt cannula (27). Fatty tissue is injected while withdrawing slowly the cannula in different directions.

Fat grafting can be used to protect the skin after radiotherapy and at the same operation of exchanging the expander by the permanent implant, to fill conservative surgery defects and it has also been described its use in the breast to create breast in successive operations until the desired volume is reached.

Volume displacement techniques (28)

- (I) The ideal technique for medium to large breasts with ptosis is probably mastopexy or therapeutic mammoplasty (29). The tumour is included within the breast resection pattern and the remaining breast tissue is used to re-shape the breast. Using a Wise pattern any tumour can be operated irrespectively to its location.
- (II) Inferior pedicle approach. After a resection of a

tumor in the upper pole and a thin superior or superomedial pedicle performed an inferior pedicle can be used to cover the defect after a vertical or Wise pattern.

- (III) Round block approach (upper pole, inner quadrant, outer quadrant) is a technique more suitable for upper pole tumours close to the areola in ptotic breasts, which will be improved with mastopexy at the same time through the round block.
- (IV) Grisotti flap technique is useful for retro-areolar tumors. It uses an inferiorly based dermal-glandular pedicle to advance a skin island into the central defect. Once the flap has been done the skin island is suitable for a nipple reconstruction with a skin flap or tattooing.
- (V) J mammoplasty is useful for lower outer pole tumors. It avoids lateral retraction of the breast and deviation of the nipple-areola complex. It comprises a central and lateral breast flap, which is rotated towards the defect and the nipple-areola complex is re-positioned with a superior pedicle.
- (VI) V-mammoplasty (lower inner quadrant). The tumour is excised “in block” with a pyramidal section of the gland with the apex of the pyramid in the areola and the base in the inframammary fold.
- (VII) Superior pedicle approach (lower pole). A superior or supero-medial pedicle, similar to the one used for reduction mastoplasty, obtains good aesthetic results as the inferior pole is usually part of the breast excised during those procedures.
- (VIII) Batwing technique (upper inner, central and outer quadrant). It combines resection of a crescent-shaped area of skin and gland above the nipple-areolar complex plus two adjoining triangle or winglike areas of the skin and breast parenchyma extending from both sides of the areola. It is useful for large volume glandular resection of tumors in the central upper pole between 8H and 4H position
- (IX) Incisions in the lateral border of the breast are used with lateral mammoplasty for the outer quadrants and are associated with very good cosmetic outcomes.

Indications for oncoplastic breast surgery

Excision volume

OBS is indicated when the breast volume excised is over 20% of the overall breast tissue as there is a high probability of deformity, asymmetry and poor cosmetic results (17).

It is also indicated when the resection of the parenchymal tissue exceeds 70–100 cc or a tumour-to-breast weight ratio is over 10%. Patient satisfaction rates are over 90% if 5% or less of breast tissue is excised, but only 25% satisfaction is reached if 20% of breast volume is lost (19). For excisions higher than 20% of the total breast volume a standard tumourectomy would lead to a major deformity.

Tumor location

In some areas of the breast, it is more difficult to resect tissue maintaining at the same time good cosmesis. Unfavourable tumour locations are medial, superomedial, central or inferior parts of the breast. Excision of tumors on the upper inner quadrant may lead to scars in the cleavage or indentation as there is less parenchymal volume. Excision of tumors from these areas may also result in nipple malposition due to scar retraction. Resection of inferiorly sited tumors may also cause a bird’s beak deformity. Tumors closer than 2 cm to the nipple may require nipple sacrifice (30). If the resection includes the nipple and is performed as an ellipse, it will flatten the breast shape. Oncoplastic techniques allow better cosmesis following resection of this areas.

Multifocal and multicentric disease

Expert consensus supports the technical feasibility of OBS as a therapeutic mammoplasty for surgical treatment of multiple ipsilateral breast carcinomas (31). Nonetheless, the evidence for clinical equivalence in terms of outcomes such as locoregional recurrence, breast cancer-specific outcomes and overall survival rates compared to mastectomy is of only of moderate quality (32).

Re-operation after conservative surgery

Before radiotherapy

If the patient needs a re-excision for one or more affected margins and where a simple re-excision may end up in shape deformity (33).

If the margins are free but the patient seeks correction of deformity for cosmetic reasons after BCS.

After radiotherapy

When corrections of the defect after BCS and RT are needed, caution is mandatory as these patients will be at higher risk of wound healing problems and pedicle hypo-

vascularity. The oncological safety of these procedures is not supported by high-level evidence

Extensive DCIS

It is possible to perform therapeutic mammoplasties for extensive DCIS tumors up to 5 cm with a small percentage of margins involved (1.9%). This percentage increases when the tumor size is over 5 cm (64%) (34). For tumors over 50 mm better preoperative localization is recommended.

Invasive lobular carcinoma

Invasive lobular carcinoma grows in a diffuse pattern and it is sometimes very difficult to perform a complete surgical excision with adequate margins. Oncoplastic techniques and selective margins shavings is associated with a lower rate of positive margins and conversion to mastectomies (35).

Poor response to neoadjuvant chemotherapy

Oncoplastic breast surgery after neoadjuvant chemotherapy is as effective as standard breast conservative surgery allowing similar rates of re-excision (2% *vs.* 9%) and mastectomies (18% *vs.* 24%) (P=0.22 and P=0.30) with similar probabilities of survival and recurrence. Volume was larger in the oncoplastic group (180 cc) compared to the conservative group (98 cc) (P>0.0001) (36).

Macromastia

Women with large breasts may be technically challenging for the administration of whole breast radiotherapy. Many of them will suffer significant complications such as breast oedema and skin reactions.

Therapeutic mammoplasty is the term for the oncoplastic application of breast reduction and mastopexy techniques to treat selected breast tumors by breast conserving surgery enabling OBS for larger breast cancers (34). The majority of studies of therapeutic mammoplasty for macromastia in breast cancer achieve low rates (8%) of incomplete excision (35). Given the rates of involved margins reported for invasive cancer (15–20%) and DCIS (30%), this benefit is worthwhile. The tumor may be excised in bloc with the reduction sample but special care must be taken with margins marking and orientation. Recurrence rate from studies analyzing oncological outcomes following

therapeutic mammoplasty are between 0% and 9.2% (33).

A detailed review (36) concluded that therapeutic mammoplasty has oncological outcomes comparable to BCS. However, they note that no randomized trials have been performed and the evidence in support of these techniques is all derived from case series and cohort studies.

Contraindications of oncoplastic breast surgery

- (I) Inflammatory breast cancers: Treatment of inflammatory breast cancer includes trimodal therapy with chemotherapy, surgery (with modified radical mastectomy enhancing survival outcomes) and radiation.
- (II) Recurrent cancer following BCS and whole breast RT: These patients are at high risk of fat necrosis and vascular insufficiency of the pedicle and wound edges due to the previous RT.
- (III) Oncological contraindications: If there is no possibility to achieve free margins after multiple operations even with the use of OBS. Multicentric invasive lobular disease: in these cases, there is higher risk of margin involvement due to the diffuse spreading nature of this subtype of cancer and the poor response to neoadjuvant chemotherapy. Failure of neoadjuvant chemotherapy: when there is no response to NAC or progression is noted during the treatment OBS is not a safe possibility if the patient didn't have an indication for conservative surgery initially.
- (IV) Cosmetic contraindications: unfavorable tumor to breast size ratio.
- (V) Inability to deliver indicated radiotherapy (37).
- (VI) Small breast without ptosis and conical breast.
- (VII) Special comorbidities such as diabetes, heavy smoking, obesity and concomitant (IX) Physical and psychological illness as they have an increased risk of complications.

Complications

The major concern for complications of oncoplastic techniques is not interfering with the time of adjuvant therapies (38). A meta-analysis comparing oncoplastic and standard breast-conserving surgery showed that early complications rates in the oncoplastic surgery group did not delay the initiation of adjuvant therapies (39).

Overall complications following volume replacement

techniques are slightly higher (2–77%) (39) than in volume displacement techniques (3–15%) (40).

Cosmetic sequelae are also an event that can affect up to 17% of patients who undergo OBS. Most of them appear during the first 5 years of follow-up. Insufficient re-shaping, fat necrosis, and postoperative complications are the main risk factors for deformity (41).

Follow up

Follow up for OBS is the same as for CS. Ultrasonography combined with MRI can identify cancer recurrence. Qualitative changes seen in the mammography are similar between lumpectomy and oncoplastic techniques (42). The time required for OBS to achieve radiologic stability tends to be 25.2 months (43).

Conclusions

After reviewing the literature there are key points to be highlighted.

All decisions related to oncoplastic techniques in breast cancer patients must go through an MDT meeting that will inform the patient about different treatments available.

Mastectomy is an option for women who desire it after a complete informed discussion.

OBS is a safe oncological option and it maintains the shape of the breast without the secondary effects of foreign bodies, re-do surgery and its complications.

OBS involves appropriate oncologic surgery, immediate homolateral reconstruction using plastic surgery techniques and correction of the contralateral breast, whenever a symmetry procedure is required.

Training in oncoplastic surgery must be facilitated to all breast surgeons.

Limitations of the study come mainly from the absence of prospective randomised trials comparing conservative surgery directly with oncoplastic breast surgery in similar populations and studying overall survival and recurrence in similar populations. However, those studies seem to be difficult to perform.

Future research should concentrate in the long term oncoplastic surgery data related to survival, local recurrence and quality of life of patients.

Oncoplastic breast surgery techniques have become the best new surgical options to treat breast cancer. Specific training is needed for breast surgeons to learn and apply all surgical options that oncoplastic surgery offers to treat

breast cancer.

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