Surgical techniques in breast cancer: an overview

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Abstract

Breast cancer is the most common female cancer and its incidence continues to increase. Ongoing advances in adjuvant treatments have resulted in declining mortality rates with increasing numbers of women surviving their breast cancer diagnosis. Whilst the primary outcome of surgery remains oncological efficacy, the contemporary breast surgeon must consider the long-term aesthetic outcome of the procedure and the inevitable impact on body image and self-esteem.

There has been a paradigm shift in breast surgery in the UK over the last 20 years with oncoplastic breast surgery (OPBS) techniques now representing the standard of care. As the role of breast conserving surgery (BCS) has been extended by therapeutic mammoplasty and the use of neoadjuvant treatments, mastectomy rates continue to decline. The introduction of sentinel node biopsy (SNB) has fostered an increasingly conservative approach to axillary surgery. Nationally, rates of immediate breast reconstruction (IBR) following skin-sparing Mastectomy (SSM) continue to rise. Yet the National Mastectomy and Breast Reconstruction Audit (NMBRA) highlighted the disparities in care and wide variation in practice that still exists in the UK. Whilst breast reconstruction is widely practised, the adoption of the Oncoplastic Breast Surgery Best Practice Guidelines and engagement with long-term follow-up studies focusing on patient reported outcome measures (PROMs) will hopefully result in a consistently high standard of care.

Keywords breast; implant; lipomodelling; mammoplasty; neoadjuvant; oncoplastic; reconstruction; surgery; techniques

Introduction

Breast cancer is the most common female cancer world wide and in the UK. Though over the last 30 years there have been successive improvements in adjuvant treatment, surgery remains the single most important modality in effecting its cure. With the 5 year overall survival rate for breast cancer exceeding 85% and the 10 year survival rate approaching 80% in the UK (http://www.cancerresearchuk.org/health-professional/cancer-statistics/statistics-by-cancer-type/breast-cancer/survival), the modern breast surgeon has to consider the long-term aesthetic outcome of breast surgery as well as the oncological effectiveness of the operation. In this chapter we will explore the advances in breast conservation surgery and the role of reconstructive surgery.

Breast conservation surgery

Historically and up to the mid-1970s the surgical treatment of breast cancer was largely limited to mastectomy. From the mid-1970s a number of large randomized controlled trials, comparing breast conservation surgery (BCS) with mastectomy demonstrated that, with the addition of whole breast radiotherapy, where a tumour had been completely excised from the breast with adequate margins, survival was equivalent.[1–3] These successive trials which eventually included tumours up to 5 cm in size, all showed that there was an increased rate of local recurrence following BCS, 1% per annum compared to 0.5% per annum, but this was not translated to an inferior overall survival.

Since the establishment of BCS its application within the management of breast cancer has been expanded by the adoption of oncoplastic techniques. Rather than the recommendation of mastectomy being made on absolute tumour size alone, it is now more appropriate to consider the ratio of the volume of the required excision to the total breast volume. In selected cases using some of the more complex oncoplastic approaches tumour excision volume up to 50% of total breast volume can be managed with BCS. The randomized trial evidence of the oncological safety of BCS for tumours exceeding 5 cm is lacking but there is evolving evidence in some case series that this approach is acceptable. In his paper on the classification of oncoplastic breast surgery,[4] Clough describes two levels of oncoplastic procedures, level 1 procedures for tumour to breast ratios <20% requiring local glandular rearrangement and level 2 procedures for lesions between 20 and 50% where a therapeutic breast reduction (mammoplasty) may be required.

Oncoplastic breast surgery techniques, once the preserve of the specialized breast surgeon, should now be considered the standard approach to all breast conservation surgery. These basic principles are; incision placement and access to the tumour, glandular rearrangement to avoid local defect in breast contour, and steps to negate nipple displacement.

There are few situations where a tumour excision requires an incision placed on the cosmetically sensitive breast mound. The majority of breast cancers can be accessed via a circumareolar incision or an incision off the breast mound in the infra-mammary fold or the lateral breast fold (Figure 1). The key to the success of these approaches is to use an incision of adequate length for the IMF or lateral incisions (a long sympathetically placed incision is far superior to a short poorly placed one) and adequate elevation of the skin off the breast tissue in the mastectomy plane. This extensive superficial de-gloving of the breast allows not only excellent access for tumour excision but also the mobilization of the surrounding breast tissue to re-shape the breast.

Once adequate exposure is achieved the tumour should be excised in most cases as a full-thickness block extending from the mastectomy plane below the skin to the pre-pectoral fascia. In cases when the full thickness of the breast depth has not been excised this should be noted at the time of the operation as it may

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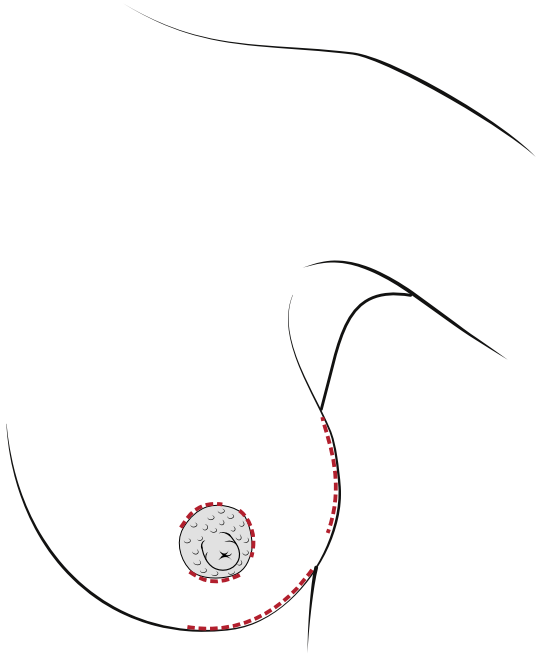

Figure 1 Breast incisions.

have to be considered when the post-operative pathology is discussed at the multi-disciplinary meeting. All breast conservation specimens should be orientated as agreed by local protocol to allow pathological assessment of radial margins. The excision cavity should be marked with titanium clips as in some cases the tumour bed may be targeted with a boost of radiotherapy and the clips facilitate CT planning of radiotherapy fields.

In cases where the tumour excision volume is less than 20% (level 1 procedures) the breast glandular tissue can then be rearranged to obliterate the excision cavity. This may well require some mobilization of the glandular tissue off the pectoral fascia to allow a tension free closure of the cavity. This is usually not problematic but should be used cautiously in the sub-optimal patient (i.e. diabetics or smokers) or patients with excessively fatty breast tissue to minimize the risk of fat necrosis. The diligent obliteration of the resection cavity is essential to reduce the incidence of local volume defects following adjuvant radiotherapy.

In some cases, especially the smaller breasted patients, careless resection of tumour much smaller that 20% breast volume can lead to poor long-term aesthetic outcomes. Special consideration should be taken with tumours located in the upper inner quadrant of the breast where any defect in this cosmetically sensitive area is distressing to the patient and to tumours of the lower pole where glandular excision can lead to a pronounced 'bird beak' deformity of the breast. In these cases a small therapeutic mammoplasty or mastopexy should be considered.

When the excision volume exceeds 20% of the breast, it is likely that in addition to the glandular resection, there will have to be an element of skin envelope reduction and relocation of the nipple areolar complex. To achieve this it is necessary to use a therapeutic mammoplasty. There are a multitude of techniques to perform a breast reduction, these were developed predominately as cosmetic plastic surgical operations but have been utilised to resect tumours form all locations within the breast. It is essential that the modern breast surgeon is familiar with a number of these operations to provide them with the tools to safely approach tumours of various sizes in all the breast quadrants.

Essentially a therapeutic mammoplasty consists of an incision pattern to incorporate a skin envelope reduction, a glandular resection of the desired region of the breast and a dermo-glandular pedicle to maintain the nipple areolar complex in its new position. The choice of method is dependent on the tumour location, the volume of resection required, the skin envelope reduction required and the desired new nipple areolar complex position.

Incision patterns include wise pattern, vertical scar, round block (Benelli), bat wing, melon slice to name but a few. The nipple areolar complex may be maintained on a superior, superior medial, superior lateral, inferior or central mound pedicle. An extended or secondary pedicle may be required to fill a defect not included in the traditional mammoplasty pattern.

The obvious advantage of the therapeutic mammoplasty is the ability to excise relatively large tumours whilst minimizing the cosmetic defect. It is also suggested that there is reduced morbidity associated with whole breast radiotherapy given to the excessively large breast. It is therefore not unreasonable to consider a therapeutic mammoplasty for larger breasted women with relatively small tumours for this reason. This surgery carries higher complication rates than simple level 1 techniques predominantly in relation to wound healing, but there is no evidence that this causes a significant delay to a patient's adjuvant treatment.

When a therapeutic mammoplasty is performed contralateral symmetrising surgery should be considered. With relatively small reductions it may be advisable to delay the symmetrizing surgery until after the adjuvant radiotherapy as there is a degree of unpredictability of the response to the treated breast to the radiotherapy and the asymmetry may not be excessive or troublesome for the patient. In the cases of larger volume reductions it is not unreasonable to perform the symmetrising surgery simultaneously (Figure 2).

There may be cases when the tumour breast ratio while not necessitating a mastectomy exceeds the glandular volume available to fill the defect. These patients may be considered for breast volume replacement in the form of a local flap. These flaps are most commonly based upon the lateral chest wall vessels (LICAP/TDAP flaps) or the vessels of the upper abdominal wall (Figure 3). These operations may be carried out in a single procedure or staged to ensure complete tumour excision before the volume replacement flap is performed.

One third of breast malignancies in the UK are diagnosed as a result of the NHS Breast Screening Program. To facilitate BCS the majority of these tumours require localization pre-operatively as they are impalpable. This is traditionally facilitated by the placement of a fine guide wire under image control on the day of surgery. Advances on the guide wire technique include the use of Technetium 99 colloid injection into the location of the tumour up to 12 hours prior to surgery. This region can then be identified using the gamma probe as for the sentinel node biopsy (ROLL or radioisotope occult lesion localisation). Another novel approach involves the placement of a 4.5-mm long iodine 125 seed into the

