

Breast Conserving Therapy: A surgical Technique where Little can Mean More

Cancer is a leading cause of death around the world. The World Health Organization (WHO) estimates about 84 million people will die of cancer between 2005 and 2015 without intervention.^[1] At present, in the United States, one in four deaths is due to cancer.^[2] The most prevalent cancer in the world is breast cancer and nearly one in four women with cancer in the world have breast cancer. Half of these are in developing countries.^[3] As stated by Ferlay *et al.*, cancer is neither rare anywhere in the world nor mainly confined to the high-resource countries.^[4]

TREATMENT OF BREAST CANCER

For a complete and optimal therapy for breast cancer, it should be a multidisciplinary approach with input from the patient, the surgeon, the diagnostic radiologist, the pathologist, the general practitioner, the radiation oncologist, the medical oncologist, nurses, and other health professionals. The outcome of patients with breast and other cancers is better if they are treated by a clinician who has access to a full range of treatment options in a multidisciplinary setting.

The primary goal in the treatment of breast cancer is to control the disease with the aim of achieving cure. The other desirable outcomes of treatment include: to improve survival, minimize the risk of distant metastases and / or local recurrence, cosmesis, relief of symptoms, and the return to a quality life as close as possible to the life before diagnosis.

The different modalities of treatment include surgery, radiotherapy, systemic therapy (cytotoxic drugs and hormonal manipulation) and treatment targeted at HER2. Surgery remains an important modality of treatment, to eradicate the primary tumor and achieve total disease control.

HISTORY OF SURGICAL MANAGEMENT

The initial surgical treatment of breast cancer was typically wide excision, but was associated with a high rate of local recurrence and poor survival. William Halsted popularized radical mastectomy in 1894.^[5] Radical mastectomy (RM) resulted in a significant drop

in the local recurrence rate, but the curative potential remained limited.

Attempt with extended radical mastectomy, which included internal mammary node dissection, failed to improve survival.^[6,7]

At different times, Modified Radical Mastectomy (MRM), Total (Simple) Mastectomy, and more recently, Skin sparing mastectomy (SSM) and Nipple sparing mastectomy (NSM) were introduced.

Although MRM is a less morbid procedure compared to RM, the patient will still require a loss of the breast. The attempt to preserve the breast without compromising survival brought up the use of Breast Conserving Therapy (BCT). This includes breast conserving surgery and breast radiotherapy. Although BCT and breast conserving surgery (BCS) are used interchangeably, strictly speaking BCT includes both BCS and breast radiotherapy.

BCS is an important part of the breast-conserving therapy, which may be defined as a combination of conservative surgery for resection of the primary tumor with or without surgical staging of the axilla, followed by radiotherapy for the eradication of the residual microscopic disease of the breast, with or without adjuvant systemic therapy.

The aim of this communication is to highlight the indications, contraindications, surgical techniques, and complications of BCT.

BREAST CONSERVING THERAPY

The National Surgical Adjuvant Breast and Bowel Project (NSABP) B 06 compared TM to lumpectomy, with or without radiation therapy, in the treatment of stages I and II breast cancer. After five- and eight-year follow-up periods, the disease-free, distant disease-free, and overall survival rates for lumpectomy, with or without radiation therapy, were similar to those observed after TM. However, the incidence of ipsilateral breast cancer recurrence (in-breast recurrence) was higher in the lumpectomy group that did not receive radiation therapy.^[8-11]

PATIENT'S SELECTION FOR BCT

The four critical elements in selecting patients for breast conserving therapy are: A history and physical examination, breast imaging, histological assessment of the resected breast, and assessment of the patient's needs and expectations.^[12]

CONTRAINDICATION

If an attempt to preserve the breast is associated with high rates of in-breast recurrence, then BCT is absolutely contraindicated. These situations are: Multicentric disease, diffuse malignant-appearing mammographic microcalcifications (suggesting multicentricity), persistent positive resection margin, prior radiotherapy to the breast or chest wall, and pregnancy. The main reason for contraindication in pregnancy is the need for radiotherapy, which will be contraindicated in pregnancy. BCT can therefore be performed in the third trimester, deferring breast radiotherapy until after delivery.

Relative contraindications are connective tissue disease, especially scleroderma and active systemic lupus erythematosus (SLE)^[12,13] and a large tumor in a small breast.

Factors thought to be associated with risk of breast cancer recurrence after BCT are now known to be unfounded as long as there is a negative margin on excision. Some of these are: age, positive family history of breast cancer, skin or nipple retraction (not necessarily sign of locally advanced disease), tumor location, clinical or pathological axillary nodal metastases, histological subtypes,^[14] and the presence of an extensive intraductal component.

SURGICAL TECHNIQUE

The essence of BCT is not only to preserve the breast, but also to have an esthetically acceptable result. The cosmetic appearance after BCT is determined by surgical factors like: size and placement of incision, management of the lumpectomy cavity, and extent of axillary dissection, if necessary. The surgical technique can therefore make a difference.^[15] The goal at the end is to have a cosmetically acceptable outcome without compromising local tumor control.

In planning the incision, the surgeon had to take into consideration the location of the lump, type of incision,

depth of mass from the skin, and the incision had to be close to the lump to avoid tunneling.

In order to reduce local failure and improve the outcome in breast cancer, there is need to emphasize the surgeon's role in improving patient selection and optimizing the procedure.

The incision should be sited in such a way that if mastectomy is eventually required, it can be included in the mastectomy specimen. In the upper part of the breast, incisions should be curvilinear or transverse, while in the lower part, they should be either curvilinear or radial.

An improved adequate surgical margin is crucial and can be achieved without an excessive re-excision rate, with detailed planning, consideration for oncoplastic resection, and intraoperative margin analysis.^[16]

What constitutes an adequate margin of a grossly normal breast tissue around the tumor in BCT is uncertain. In one series, resection of 0.5 to 1.0 cm of grossly normal tissue resulted in a histologically negative margin in 95% of 239 patients.^[17]

The surgical technique must ensure adequate excision. Obtaining a tumor-free surgical margin decreases the incidence of a local recurrence (LR) of the primary tumor.^[18]

There are various risk factors associated with a positive margin, among them are: The extent of excision, age, large tumor size, multifocality, lobular histological type, and the number of positive lymph nodes.^[19]

In 30 of 34 reviewed studies, persistent microscopic inadequate (R1) or macroscopic inadequate (R2) surgical margins were highly significant for LR compared to the negative margin ($p = 0.0001$).^[20] Microscopic disease resulting from a positive margin is more problematic because theoretically, cancer in the relatively hypoxic environment of the lumpectomy scar bed will be resistant to radiation therapy.^[21] Furthermore, the inability to achieve negative margins may be a marker of an excessive tumor burden in the treated breast.

Although Gould and Robinson summarized that variation between pathologists in the processing, interpretation, and reporting of the margin may influence the result,^[22] it is important to establish a

direct communication between the surgeon and the pathologist in optimizing margin control.

In order to ascertain a negative margin, intraoperative margin assessment (IOMA) has been found to be useful. These include: gross inspection in the operating room, with or without frozen section analysis, cytologic touch prep (CTP) analysis, shaved margin (SM), and intraoperative ultrasound (IOUS). Although these assessments are useful, they do not guarantee an absence of microscopic tumor on permanent section.

As most of the current techniques still result in a relatively high rate of positive margins with impact on the LR rate and cosmetic results, new innovative surgical approaches and methods for IOMA are needed.^[23,24] The following are suggested: Positron Emission Tomography (PET) imaging, Radio-guided Occult Lesion Localization (ROLL) and Infrared Fluorescence (NIRF) Optical Imaging.^[25]

At the completion of the excision, the surgeon should ensure adequate hemostasis. Drainage of the lumpectomy cavity should be avoided and it should be allowed to fill with serum and fibrin. This will give the best cosmetic result. As suggested by Morrow *et al.*, reapproximation is best avoided, as it can result in distortion of the breast contour, which may not be apparent with the patient supine on the operating table.^[12] In a situation where the lumpectomy cavity is large, latissimus dorsi reconstruction of the defect may be appropriate

The incision should be closed with a subcuticular suture.

COSMETIC EVALUATION

As cosmesis is a major consideration in BCT, various scores have been designed to evaluate the cosmetic outcome.^[26]

COMPLICATIONS

Seroma formation, arm morbidity (arm swelling, arm pain, arm numbness, arm stiffness, shoulder stiffness, shoulder pain, and nerve injury), phantom breast syndrome, delayed cellulitis and pain syndromes of the chest wall, axilla, and upper extremity are known complications after breast cancer treatment. Some of these complications especially arm morbidity is less common in BCT as compared to mastectomy, and less

frequent with sentinel lymph node biopsy than after axillary lymph node dissection.

CONCLUSION

Although getting a microscopic negative margin is still challenging, BCT as a surgical technique has revolutionized the surgical treatment of early breast cancer. BCT has not only provided an acceptable oncological outcome, but has diminished the psychological burden, offered better cosmetic results, and reduced postoperative complications.

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