THE AMERICAN SOCIETY OF Breast Surgeons

Resource Guide

Breast Conserving Surgery

Purpose

This resource guide aims to provide a summary of the current evidence and best practices for breast conservation surgery (BCS). It will include an overview of the current literature on BCS, a review of standard and extended indications, and a practical outline of operative techniques and technical considerations.

Methods

This resource guide is based on a focused literature review and expert-informed synthesis of the current evidence on breast conservation surgery (BCS). We prioritized seminal studies and compelling emerging literature with direct relevance to clinical practice. Articles were selected based on their contributions to understanding indications for BCS and oncoplastic techniques, patient selection criteria, updates in operative approaches, and long-term clinical outcomes such as recurrence and survival. The goal was to distill high-impact findings into actionable insights for surgical decision-making. This resource guide is not intended to serve as a comprehensive surgical manual but rather to outline principles of good clinical practice.

Summary of Data Reviewed

Background

Multiple evidence-based clinical guidelines from leading oncology organizations recognize breast conservation surgery (BCS) as an appropriate surgical option for the management of early-stage breast cancer.[1,2] Specifically, the landmark 1990 National Institutes of Health (NIH) Consensus Development Conference established BCS as the recommended primary surgical modality for most women with stage I and II breast cancer.[1] Subsequent decades of clinical research have consistently demonstrated that breast-conserving therapy (BCT), defined as breast conservation surgery followed by radiation, offers oncologic outcomes equivalent to those achieved with mastectomy.[3-5]

Advances in surgical techniques, notably oncoplastic surgery, and the availability of improved localization technologies have further reinforced the oncologic safety and durability of BCS, while significantly enhancing cosmetic outcomes. As a result, BCS has become the standard of care for managing early-stage breast cancer.

This resource guide synthesizes contemporary evidence confirming the oncologic equivalence between BCT and mastectomy. Additionally, it outlines current indications for oncoplastic surgical techniques, considerations for performing BCS after neoadjuvant chemotherapy, absolute and relative contraindications for breast conservation, and essential technical considerations to optimize both clinical efficacy and aesthetic results.

Recommendations

Table 1: ASBrS Guidelines for Breast Conservation Surgery	
Indications for BCS	● Biopsy-proven DCIS or invasive carcinoma ● Tumor-to-breast size ratio allows resection with negative margins and acceptable cosmesis ● Unifocal or limited multifocal disease in a single quadrant ● Patient preference for breast preservation
Extended Indications for Oncoplastic Breast Surgery (OBS)	● Large tumor-to-breast volume ratio ● Tumors in cosmetically sensitive regions (e.g., central or inferior breast) ● Multifocal or multicentric disease (e.g., ≥2 foci ≥2 cm apart, as in ACOSOG Z11102) ● Desire to avoid mastectomy with acceptable cosmesis
Absolute Contraindications	● Pregnancy (first trimester) ● Diffuse suspicious or malignant microcalcifications ● Persistently positive margins despite re-excision attempts ● Inflammatory breast cancer (T4d) ● Homozygous ATM mutation (ataxia-telangiectasia syndrome) ● Multicentric disease not amenable to oncoplastic breast surgery
Relative Contraindications	● Collagen vascular diseases (consider on a case-by-case with radiation input) ● History of prior radiation (e.g., whole breast or mantle radiation) ● Germline TP53 mutations/Li-Fraumeni syndrome
Preoperative Planning	● Diagnostic bilateral mammogram ● Supplemental ultrasound and/or MRI as needed ● Clip placement at biopsy for localization ● Multidisciplinary coordination for multifocal/multicentric disease ● Familiarity with localization devices and intraoperative imaging
Technical Considerations	● "No ink on tumor" margin for invasive cancer ● ≥2 mm margin for DCIS (SSO/ASTRO/ASCO guidelines)

	• Use of aesthetic incision placement (periareolar, axillary, inframammary fold) • Consider skin-sparing incision if mastectomy may be required • Excise all known malignant foci identified on imaging • Place cavity radiologically visible markers (e.g., clips) for radiation targeting • Confirm removal with specimen x-ray or intraoperative ultrasound
Additional OBS Considerations	• OBS allows resection of 20–50% of breast volume with reconstruction • Can reduce re-excision and margin positivity rates • May decrease visible scarring and improve cosmetic outcome • Complication rates similar or slightly lower than standard BCS

Definition of Breast Conservation Surgery versus Excisional Biopsy

Breast conserving surgery:

A therapeutic oncologic operation to remove known ductal carcinoma in situ or invasive cancer with the explicit goal of achieving negative margins while preserving the breast.

Excisional biopsy:

A diagnostic procedure in which a palpable or imaged lesion is removed to obtain a histopathologic diagnosis.

Breast-Conserving Therapy and Survival Outcomes

Breast-conserving surgery (BCS) refers to the removal of a breast malignancy with clear histologic margins and is variably termed lumpectomy, wide local excision, segmental mastectomy, partial mastectomy, tylectomy, or quadrantectomy, depending on regional or institutional practice. When followed by adjuvant radiation therapy, the combined modality is termed breast-conserving therapy (BCT). Landmark randomized controlled trials, including NSABP B-06 and the Veronesi et al. Milan study have established that BCT provides equivalent overall and disease-specific survival compared to mastectomy for patients with early-stage breast cancer.[3,4,6,7] Some of these trials also demonstrated that while local recurrence rates are higher with BCT, particularly in the ipsilateral breast, this does not translate into a survival disadvantage for the majority of patients.[3,4] However, pooled analyses, such as the NSABP meta-analysis, confirm that among women who experience a local or regional recurrence after BCT, especially within the first two years post-treatment or in those with estrogen receptor (ER)–negative tumors, the risk of distant metastasis and mortality increases substantially.[8]

More recently, large observational cohort studies have extended these findings and, in some cases, suggest a survival advantage for BCT over mastectomy in real-world populations.[9-12] Using SEER data from over 132,000 women with early-stage invasive ductal carcinoma (T1–T2, N0, M0) Agarwal et al reported that

those undergoing BCT had a 31% improvement in breast cancer–specific survival compared to women undergoing mastectomy alone (HR 1.31; $P < 0.001$).[10] In a contemporary English cohort of over 100,000 women aged ≥50 years, Miller et al. reported that at five years, standardized cumulative incidence of breast cancer death was lower in patients undergoing BCT (3.9%) compared to those treated with mastectomy (5.1%), an absolute difference of 1.2%.[12] Notably, this difference persisted after adjustment for age, co-morbidity, and frailty.[12] Similarly, a large Swedish national cohort study of 48,986 women with T1–2, N0–2 breast cancer found that breast-conserving surgery with radiotherapy was associated with significantly better overall and breast cancer–specific survival compared with mastectomy, even after stepwise adjustment for tumor characteristics, comorbidity, and socioeconomic status. In adjusted analyses, both mastectomy without radiotherapy and mastectomy with radiotherapy were associated with higher breast cancer–specific mortality compared with BCT.[13] Hartmann-Johnsen et al.'s registry-based study of Norwegian women treated between 1998 and 2008 reported that for stage T1N1M0 disease, mastectomy was associated with nearly threefold higher risk of breast cancer–specific death compared to BCT (HR 2.91, 95% CI 1.30–6.48).[11] While these real-world findings are compelling, it is important to recognize that all studies demonstrating a survival benefit for BCT over mastectomy are retrospective observational analyses, which are inherently subject to selection bias, residual confounding, and immortal time bias. Long-term randomized trials remain the highest level of evidence, and these consistently demonstrate survival equivalence, not superiority, between BCT and mastectomy.

Breast Conserving Surgery and Neoadjuvant Systemic Therapy

For patients with biologically aggressive tumors, particularly those with triple-negative or HER2-positive subtypes, and those presenting with large tumor-to-breast volume ratios, multifocal, or multicentric disease, neoadjuvant systemic therapy (NST) offers a critical opportunity to downstage disease and increase eligibility for breast-conserving surgery (BCS).[14] Multiple studies have demonstrated that NST significantly increases BCS rates in patients with operable breast cancer, particularly among those who may not initially appear to be candidates for conservation.[14-16] When planning surgery following NST, several technical considerations are essential. Pre- and post-treatment imaging—typically using a combination of mammography, ultrasound, and MRI—should be obtained to accurately assess tumor response and guide surgical planning. Any biopsy-confirmed malignant foci, whether identified on baseline or post-treatment imaging, should be excised to ensure comprehensive local control. Currently, there is no specific consensus guideline on the optimal margin width in the post-NST setting. Therefore, existing guidelines, which include no tumor on ink for patients with invasive disease and ≥2mm margins for those with DCIS, should be used in this setting.[17,18] (*For a comprehensive discussion on patient selection, response assessment, and surgical strategy after neoadjuvant therapy, refer to the Weiss et al Society of Surgical Oncology (SSO) and American Society of Breast Surgeons (ASBrS) overview on the importance of neoadjuvant systemic therapy in breast cancer*).[19]

Oncoplastic Breast Surgery

Oncoplastic breast surgery (OBS), as defined by the American Society of Breast Surgeons (ASBrS), is "breast conservation surgery incorporating an oncologic partial mastectomy with ipsilateral defect repair using volume displacement or volume replacement techniques".[20] OBS has expanded the indications for breast conservation surgery (BCS) by enabling the resection of larger volumes of breast tissue, typically 20–50%, and in some cases more, while maintaining breast contour and symmetry.[21-23] While basic re-approximation of the breast parenchyma to minimize the lumpectomy defect should be considered for most patients, OBS is particularly indicated in clinical scenarios where standard lumpectomy would be technically feasible but result in poor cosmetic outcomes. These include: A large tumor-to-breast volume ratio, tumors

located in cosmetically sensitive regions, such as the central or inferior breast, and multifocal or multicentric disease. Evidence from trials such as ACOSOG Z11102 supports the safety and efficacy of BCS in patients with two to three discrete tumor foci separated by ≥2 cm within the same breast, particularly.[24] Current evidence suggests that oncoplastic breast surgery (OBS) achieves oncologic outcomes, including survival and recurrence rates, comparable to those of standard breast-conserving surgery and mastectomy, with studies also indicating similar or slightly lower rates of 30-day postoperative complications and lower rates of margin positivity.[25-28]

Patient Reported Outcomes

Multiple studies have shown that patients undergoing breast-conserving surgery (BCS), including oncoplastic approaches, report higher quality-of-life outcomes—particularly with regard to body image, psychosocial well-being, and sexual health—compared to patients who undergo mastectomy with or without reconstruction.[29,30] In a study examining breast specific sensuality and appearance satisfaction, patients who underwent lumpectomy reported higher breast specific sensuality and appearance satisfaction compared with mastectomy with or without reconstruction, although overall sexual function did not differ by surgical approach.[31] Moreover, emerging evidence suggests that patients who undergo oncoplastic breast conserving surgery often report better quality of life, psychosocial well-being, sexual well-being, and satisfaction with their breasts than those who undergo conventional BCS or mastectomy.[32-34] Notably, Pak et al. found that psychosocial well-being scores were lower for oncoplastic breast conserving surgery than for conventional breast conserving surgery at approximately four years.[35] However, this difference was no longer present at five years, and long-term breast satisfaction and sexual well-being were similar between the groups.[35]

Breast Conservation Surgery Indications

Patients with biopsy-proven ductal carcinoma in situ (DCIS) or invasive breast cancer are candidates for breast conservation surgery (BCS). Eligibility for BCS depends on achieving negative margins, typically defined as ≥2 mm for DCIS and "no tumor on ink" for invasive disease, while maintaining an acceptable cosmetic outcome.[17,18] Key considerations include the size of the breast relative to the tumor and the extent of disease (i.e., unifocal, multifocal, or multicentric).

Consider oncoplastic breast surgery in the following patients:

- A large tumor-to-breast volume ratio
- Tumors located in cosmetically sensitive regions (e.g, inferior and central regions)
- Multifocal or multicentric disease.

Breast Conservation Surgery Contraindications

Absolute Contraindications

1. Pregnancy: Radiation is an absolute contraindication during pregnancy because of the risk associated with fetal radiation exposure. Thus, women requiring surgery during their first trimester would not be candidates for BCT as radiation could not be administered in an appropriate timeframe. Women diagnosed in their second or third trimester who will be managed with surgery or neoadjuvant therapy could be considered for BCT and treated with adjuvant radiation after pregnancy. [36,37]
2. Diffuse suspicious or malignant microcalcifications.
3. Persistently positive margins despite multiple re-excision attempts.
4. Inflammatory breast cancer (4d).
5. Homozygous ATM mutation (ataxia-telangiectasia syndrome): This genotype confers marked cellular and clinical radiosensitivity, increasing the risk of severe tissue toxicity and other treatment

related complications with exposure to ionizing radiation.[38]
6. Multicentric disease not amenable to oncoplastic breast surgery.

Relative Contraindications

1. Collagen vascular diseases: Patients with collagen vascular disease tend to tolerate radiotherapy well, but have a higher incidence of late toxicity compared to controls.[39] Advanced radiation techniques, such as IMRT and IGRT, can help minimize acute and late local side effects. BCT in patients with collagen vascular disease should be considered after careful evaluation of the risks and benefits with the patient, along with a discussion with a radiation oncologist.[40]
2. History of prior radiation: Common examples include patients previously treated with mantle radiation for Hodgkin's lymphoma and patients with history of whole breast radiation for breast cancer. These contraindications are evolving as the NRG/RTOG 1014 Phase 2 trial explores 3D conformal partial breast reirradiation in select patients with prior in breast recurrences and prior whole breast radiation.[41]
3. Germline TP53 mutations/Li-Fraumeni syndrome: A highly penetrant mutation that is associated with early breast cancer. These mutations confer an increased sensitivity to ionizing radiation, resulting in an increased frequency of radiation-induced malignancies.[42]

Preoperative Planning

All patients undergoing breast conservation surgery (BCS) must have a histologically confirmed diagnosis of ductal carcinoma in situ (DCIS) or invasive carcinoma. The preoperative evaluation should include a comprehensive medical history, physical examination, appropriate imaging to assess the extent of disease, and a thorough, patient-centered discussion of all surgical options—including the risks, benefits, and expected outcomes of each approach.

Imaging should include a bilateral diagnostic mammogram**.** Breast ultrasound and MRI may be used as adjuncts to better define tumor extent, especially in patients with dense breast tissue, lobular histology, or suspected multifocal/multicentric disease.

All target lesions should be marked preoperatively with a biopsy clip at the time of core needle biopsy to facilitate future localization. Palpable lesions may be excised without the use of a localization device. However, non-palpable lesions require preoperative localization using a localization device (e.g., wire or another suitable device). Alternatively, lesions may be visualized intraoperatively with ultrasound if amenable.

For patients with multifocal or multicentric disease, coordinated preoperative planning between the surgeon and radiologist is essential, particularly in facilities where the radiologist places the localization devices. The goal is to ensure accurate placement relative to the biopsy clip or to delineate the full extent of disease, which may require placement of more than one localization device (i.e. bracketing).

Finally, the surgeon should be familiar with the type of clip and localization device used, as this information is critical for confirming target excision with intraoperative imaging.

Operative Technique

BCS is done under local anesthesia with sedation, regional anesthesia, or general anesthesia, in the supine position, with the patient's arm abducted at 90 degrees and (by surgeon preference) sterilely draped into the

operative field. Prophylactic antibiotics are given before induction.

The skin incision should be carefully planned to optimize cosmesis while ensuring adequate exposure of the tumor. Depending on the tumor's location and extent, aesthetic incisions such as those in the periareolar region, axilla, or inframammary fold, may be preferred over direct incisions placed over the lesion. These approaches can reduce visible scarring and improve postoperative appearance without compromising surgical access.

Incision planning should also consider the potential need for conversion to mastectomy, and placement should facilitate skin-sparing or nipple sparing approaches when possible. Excision of overlying skin is appropriate when the tumor is adherent; however, it should be performed selectively, as unnecessary skin removal can result in visible asymmetry of the breast and distortion of the nipple–areolar complex.

For tumors involving or adherent to the nipple–areola, or patients with multifocal or multicentric disease oncoplastic surgical techniques can be employed to facilitate wider excision while preserving breast contour. (*See ASBrS Consensus Statement on Oncoplastic Surgery for additional guidance.*)

Excision of core needle biopsy tracts is unnecessary. If the excision is carried from the subdermal plane to the pectoralis fascia, it will not require re-excision for a positive anterior or posterior margin. If the dissection does not extend to the subdermal plane and include the pectoralis fascia, this should be documented in the operative note in case of a positive anterior or posterior margin requiring re-excision. All specimens should be oriented by the surgeon using sutures, clips, or ink; labeled appropriately; and submitted fresh for identification of the margins following each institution's protocol. Specimen x-rays or intraoperative ultrasound should confirm removal of the lesion. A radiologically visible marker (e.g., clips) should always be placed in the cavity to mark the margins, and the excision defect closed in layers as cosmetically as possible.

Technical Considerations

A multidisciplinary panel convened by the Society of Surgical Oncology and the American Society for Radiation Oncology recommended using "no ink on tumor" as the standard margin for patients with stages I and II invasive breast cancer treated with BCT followed by whole breast irradiation.[18] For DCIS, a multidisciplinary panel convened by the Society of Surgical Oncology, the American Society for Radiation Oncology, and the American Society of Clinical Oncology recommended a ≥2 mm margin as the standard for patients with DCIS treated with BCS followed by whole-breast irradiation.[17] Removal of non-palpable lesions most commonly requires localization, which is often performed via wire localization. Wire localization is considered the gold standard and is relatively cost-efficient but does have drawbacks. There are logistical difficulties, including the need for a radiologist to place the wire shortly before surgery, patient discomfort, and the risk of wire displacement.[43,44] A new generation of wireless localization devices are now available, widely used, and aiming to overcome these limitations. The international MELODY trial, which involves over 30 countries, will compare wire-guided localization with other techniques (radioactive seed, magnetic, radiofrequency, intraoperative ultrasound, and radar localization) in terms of oncologic safety, including margins, as well as patient-reported outcomes and surgeon and radiology satisfaction outcomes.[45]

Summary

Breast-conserving therapy (BCT) has been well established through randomized trials to provide oncologic

outcomes equivalent to mastectomy in appropriately selected patients with early-stage breast cancer. Multiple clinical guidelines, including the 1990 NIH Consensus Development Conference, endorse BCT as an appropriate and often preferred treatment modality for the majority of patients with stage I and II disease.

Advances in oncoplastic surgical techniques and improved localization technologies have expanded the pool of patients eligible for breast conservation, including those with larger tumors, multifocal disease, or tumors in anatomically challenging locations. In parallel, a growing body of evidence indicates that patients undergoing BCS report higher quality-of-life scores, particularly in domains such as body image, psychosocial well-being, and sexual functioning, compared to those treated with mastectomy.

Ultimately, surgical decision-making should be patient-centered. All individuals should be counseled on the risks, benefits, and expected outcomes of each surgical option, and treatment should align with their values and preferences, without compromising oncologic safety.

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2026 Lead Authors

Samilia Obeng-Gyasi, MD, MPH
Kathie-Ann P. Joseph MD, MPH

Critical Writing Editing and Research Committee: Jessica E. Maxwell, MD; Samilia Obeng-Gyasi, MD, MPH; Zahraa Al-Hilli MD, MBA; Anna C. Beck, MD; Meghan E Garstka, MD; Cathy L. Graham, MD; Kathie-Ann P. Joseph MD, MPH; David W. Lim MDCM, MEd, PhD; Regina Matar-Ujvary, MD; Megan Miller, MD; Rita Adele Mukhtar, MD; Stephanie Serres, MD, PhD; Xuanji Wang, MD

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