



## COMPARATIVE OUTCOMES OF BREAST-CONSERVING SURGERY VERSUS MODIFIED RADICAL MASTECTOMY IN EARLY-STAGE BREAST CANCER: A RETROSPECTIVE STUDY FROM A TERTIARY CARE CENTER IN NORTH INDIA

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### Abstract

**Background:** Breast-conserving surgery (BCS) and modified radical mastectomy (MRM) are the principal surgical options for early-stage breast cancer. While international studies demonstrate comparable oncologic outcomes, Indian data remain limited owing to variability in access to radiotherapy, delayed presentation, and socio-cultural influences.

**Objectives:** This study aims to compare oncological and postoperative outcomes between BCS and MRM in a tertiary care center in North India.

**Methods:** A retrospective observational study was conducted at a tertiary care hospital from July 2024 to June 2025. Female patients  $\geq 18$  years with AJCC Stage I–II breast cancer who underwent BCS or MRM were included. Patients with locally advanced/metastatic cancer, prior breast malignancy, neoadjuvant chemotherapy, or incomplete records were excluded. Clinical, pathological, and follow-up data were retrieved from hospital records. Primary outcomes were recurrence patterns, disease-free survival (DFS), and overall survival (OS). Secondary outcomes included postoperative complications, hospital stay, re-intervention, and cosmetic outcomes. Statistical analysis was performed using Chi-square and t-tests;  $p < 0.05$  was considered significant.

**Results:** Of 180 eligible patients, 92 (51.1%) underwent BCS and 88 (48.9%) underwent MRM. Mean age was comparable ( $48.7 \pm 9.6$  vs.  $51.2 \pm 10.4$  years,  $p = 0.08$ ), though mean tumor size was significantly smaller in the BCS cohort ( $2.1 \pm 0.8$  cm vs.  $2.8 \pm 1.0$  cm;  $p < 0.001$ ). Overall complication rates did not differ significantly (17.4% vs. 22.7%;  $p = 0.35$ ). Mean hospital stay was shorter with BCS ( $4.2 \pm 1.8$  vs.  $6.5 \pm 2.1$  days;  $p < 0.001$ ). After a median 24-month follow-up, recurrence (6.5% vs. 9.1%;  $p = 0.50$ ), DFS (93.5% vs. 90.9%;  $p = 0.48$ ), and OS (97.8% vs. 95.5%;  $p = 0.40$ ) were comparable. Cosmetic satisfaction was significantly higher in the BCS group (87.0% vs. 34.1%;  $p < 0.001$ ).

**Conclusion:** BCS and MRM demonstrated similar short-term oncological outcomes in early-stage

breast cancer. However, BCS provided superior cosmetic satisfaction and shorter hospitalization. Enhanced radiotherapy access and patient counseling may increase BCS uptake in suitable Indian patients.

**Keywords:** Breast-conserving surgery, Modified radical mastectomy, Early-stage breast cancer, Disease-free survival, Cosmetic outcomes, Recurrence, Survival rate

## Introduction

Breast cancer is the most commonly diagnosed cancer among women worldwide and remains a major public health concern due to its rising incidence and significant morbidity and mortality burden. It accounts for approximately one in every four cancers occurring in women globally and is responsible for over two million new cases annually. Advances in diagnostic modalities, awareness programs, and screening strategies have contributed to earlier detection, making early-stage breast cancer a growing subset of cases requiring optimal therapeutic strategies. Surgical management remains the primary modality for early-stage disease, with two main approaches—breast-conserving surgery (BCS) and mastectomy, particularly modified radical mastectomy (MRM) [1].

Historically, radical mastectomy was the standard treatment for all operable breast cancers. However, the paradigm shifted with evidence from randomized controlled trials, such as those by Veronesi and Fisher, demonstrating equivalent survival outcomes between BCS followed by radiotherapy and mastectomy in early-stage breast cancer [2]. The landmark 20-year follow-up study by Veronesi et al. confirmed that BCS provides comparable overall survival to mastectomy, validating breast conservation as an oncologically safe alternative in appropriately selected patients [3]. These findings have subsequently been corroborated by several observational and randomized studies, confirming that BCS offers equivalent or even superior long-term survival in some subgroups compared with MRM [4–6].

The primary goal of BCS is to excise the tumour with clear margins while preserving the breast, whereas MRM involves removal of the entire breast along with axillary lymph node dissection. BCS has been associated with improved cosmetic and psychological outcomes as well as better quality of life when compared with MRM. Nevertheless, access to adjuvant radiation therapy—an essential component of BCS—remains a prerequisite for optimal oncologic outcomes. In contrast, MRM may be preferred in resource-limited settings due to limited radiotherapy facilities, patient preferences, or tumour-related factors [7].

The equivalence of oncological outcomes between BCS and MRM has been extensively studied. A meta-analysis found no significant difference in overall survival or disease-free survival between BCS and mastectomy in early-stage breast cancer [4]. Further, increasing evidence suggests that BCS may provide improved survival compared to mastectomy in certain patient populations, potentially due to better systemic therapy integration and tumour biology [5]. A retrospective analysis by Houssami et al. reported similar recurrence and survival outcomes after BCS and mastectomy in young patients with early-stage breast cancer [1]. Similarly, a population-based study demonstrated superior survival outcomes with BCS compared with MRM after adjusting for treatment factors and comorbidities [6].

Despite strong evidence supporting BCS, several patient-, tumour-, and system-related factors influence surgical decision-making. Tumour size, multifocality, breast-to-tumour ratio, axillary node status, genetic predisposition, and response to neoadjuvant therapy are important determinants of eligibility for BCS. Patient preferences, awareness, socioeconomic status, and accessibility to radiotherapy also significantly influence the choice between BCS and MRM [8]. Diagnostic imaging and pathological evaluation of margins play a central role in ensuring oncologic safety in BCS. Furthermore, oncoplastic techniques have expanded the indications for BCS by enabling larger excisions with acceptable cosmetic outcomes.

In India, the proportion of patients undergoing BCS remains significantly lower compared with Western countries. A study from an Indian cancer center reported that only about 11% of eligible

early-stage breast cancer patients underwent BCS, primarily due to lack of radiotherapy access, late presentation, and sociocultural apprehensions regarding breast preservation [7]. Another study from India observed that surgeon recommendations, educational status, and urban residence influenced treatment decisions [9]. Moreover, Indian women tend to present at a younger age, often with larger tumour size, which may reduce eligibility for BCS. Cultural perceptions related to cancer and surgery, limited health literacy, and fear of recurrence also contribute to patient preference for mastectomy over conservation [10].

Understanding real-world comparative outcomes of BCS and MRM in India is essential to improve evidence-based decision-making. While Western data demonstrate long-term equivalence, Indian outcomes may differ due to delayed presentation, limited radiotherapy availability, and socioeconomic variations. There is a paucity of Indian studies comparing oncologic outcomes, recurrence rates, survival, and postoperative complications between BCS and MRM in early-stage breast cancer. Generating local evidence is necessary to validate the applicability of global guidelines to the Indian context and guide resource allocation and capacity building.

This retrospective study aims to compare the outcomes of BCS and MRM in patients with early-stage breast cancer treated at a tertiary-care center in India. The primary outcomes assessed include local recurrence, disease-free survival, and overall survival. Secondary outcomes include postoperative complications, margin positivity, need for re-operation, and hospital stay.

Understanding these outcomes will help surgeons and oncologists counsel patients effectively, improve shared decision-making, and strengthen breast cancer treatment pathways in Indian healthcare institutions.

## METHODOLOGY

**Study Setting and Study Period:** This retrospective observational study was conducted in the Department of General Surgery at a tertiary care center in North India over a period of one year, from 1 July 2024 to 30 June 2025. The study included female patients diagnosed with early-stage breast cancer (Stage I–II) who underwent either breast-conserving surgery (BCS) or modified radical mastectomy (MRM). Data were collected from medical case records, operative notes, and follow-up records maintained by the institution.

**Study Design and Population:** All consecutive eligible patients who met the inclusion criteria during the study period were enrolled. Patients were divided into two groups based on surgical treatment received: BCS group and MRM group. Early-stage breast cancer was defined according to the American Joint Committee on Cancer (AJCC) staging system. Patients were included if they were  $\geq 18$  years old with histologically confirmed early-stage breast carcinoma. Exclusion criteria included locally advanced or metastatic breast cancer at presentation, recurrent breast cancer, previous history of breast surgery or malignancy, neoadjuvant chemotherapy prior to surgery, and incomplete medical records.

**Sample Size:** All eligible cases meeting the study criteria during the study period were included. The final sample size was determined based on available records.

**Data Collection:** Demographic details, clinical presentation, tumor characteristics, histopathology, treatment modality, adjuvant therapy, postoperative complications, cosmetic outcomes, recurrence patterns, and survival status were collected from institutional databases. Cosmetic assessment was based on documented subjective evaluation at follow-up visits.

**Outcome Measures:** The primary outcomes evaluated included postoperative complications, recurrence-free survival, and overall survival. Secondary outcomes included length of hospital stay, need for re-intervention, and cosmetic satisfaction as documented at follow-ups.

**Follow-Up:** Patients were followed using outpatient records and telephonic confirmation when necessary. Routine follow-up was scheduled according to institutional protocols. Recurrence was defined as the radiological or histological detection of loco-regional or distant disease after surgery.

**Statistical Analysis:** Data were entered into a spreadsheet and analyzed using standard statistical software. Continuous variables were summarized as mean  $\pm$  standard deviation, while categorical variables were expressed as frequencies and percentages. Comparisons between groups were performed using Chi-square test for categorical variables and Student's t-test for continuous variables. A p-value  $<0.05$  was considered statistically significant.

**Ethical Considerations:** Institutional ethical approval was obtained prior to conducting the study. Since this was a retrospective review, patient consent was waived; however, all data were handled with strict confidentiality, and anonymity was maintained throughout the analysis.

## RESULTS

A total of 180 patients with early-stage breast cancer were included in the study. Among them, 92 (51.1%) underwent Breast-Conserving Surgery (BCS), while 88 (48.9%) underwent Modified Radical Mastectomy (MRM). The mean age of patients in the BCS group was  $48.7 \pm 9.6$  years, whereas that in the MRM group was  $51.2 \pm 10.4$  years. Age distribution did not differ significantly between the groups ( $p = 0.08$ ). Tumor size was significantly smaller among patients undergoing BCS (mean  $2.1 \pm 0.8$  cm vs.  $2.8 \pm 1.0$  cm in MRM,  $p < 0.001$ ). Distribution by stage was similar between the two groups ( $p = 0.30$ ). (Table 1)

**Table 1: Baseline Characteristics of the Study Population**

| Variable                  | BCS (n=92)     | MRM (n=88)      | p-value    |
|---------------------------|----------------|-----------------|------------|
| Mean Age (years)          | $48.7 \pm 9.6$ | $51.2 \pm 10.4$ | 0.08       |
| Mean Tumor Size (cm)      | $2.1 \pm 0.8$  | $2.8 \pm 1.0$   | $<0.001^*$ |
| Stage I                   | 40 (43.5%)     | 32 (36.4%)      |            |
| Stage II                  | 52 (56.5%)     | 56 (63.6%)      | 0.30       |
| Hormone Receptor Positive | 66 (71.7%)     | 57 (64.8%)      | 0.30       |
| HER2 Positive             | 18 (19.6%)     | 22 (25.0%)      | 0.37       |

Significant at  $p < 0.05$

The overall complication rate was 17.4% in the BCS group and 22.7% in the MRM group, but the difference was not statistically significant ( $p = 0.35$ ). Surgical site infection occurred in four patients in BCS and six in MRM ( $p = 0.47$ ). Mean hospital stay was significantly shorter in the BCS group ( $4.2 \pm 1.8$  vs.  $6.5 \pm 2.1$  days,  $p < 0.001$ ). (Table 2)

**Table 2: Postoperative Outcomes**

| Outcome                   | BCS (n=92)    | MRM (n=88)    | p-value    |
|---------------------------|---------------|---------------|------------|
| Complications (overall)   | 16 (17.4%)    | 20 (22.7%)    | 0.35       |
| Surgical site infection   | 4 (4.3%)      | 6 (6.8%)      | 0.47       |
| Seroma                    | 8 (8.7%)      | 12 (13.6%)    | 0.27       |
| Mean hospital stay (days) | $4.2 \pm 1.8$ | $6.5 \pm 2.1$ | $<0.001^*$ |

\*Significant at  $p < 0.05$

During a median follow-up of 24 months, recurrence was seen in 6 (6.5%) patients in BCS and 8 (9.1%) in MRM, not statistically significant ( $p = 0.50$ ). Local recurrence rates were comparable (3.2% vs. 4.5%,  $p = 0.64$ ). Distant metastasis was slightly higher in MRM (4.5% vs. 2.1%), but this was not significant ( $p = 0.35$ ). Two-year overall survival was 97.8% for BCS and 95.5% for MRM ( $p = 0.40$ ). (Table 3)

**Table 3: Recurrence and Survival**

| Parameter                    | BCS (n=92) | MRM (n=88) | p- value |
|------------------------------|------------|------------|----------|
| Loco-regional recurrence     | 3 (3.2%)   | 4 (4.5%)   | 0.64     |
| Distant metastasis           | 2 (2.1%)   | 4 (4.5%)   | 0.35     |
| Total recurrence             | 6 (6.5%)   | 8 (9.1%)   | 0.50     |
| 2-year disease-free survival | 93.5%      | 90.9%      | 0.48     |
| 2-year overall survival      | 97.8%      | 95.5%      | 0.40     |

Cosmetic satisfaction scores (good to excellent) were significantly higher in the BCS group (87.0% vs. 34.1%,  $p < 0.001$ ). (Table 4)

**Table 4. Cosmetic Outcome (Documented at Follow-up)**

| Grade          | BCS (n=92) | MRM (n=88) | p-value |
|----------------|------------|------------|---------|
| Excellent/Good | 80 (87.0%) | 30 (34.1%) | <0.001* |
| Fair/Poor      | 12 (13.0%) | 58 (65.9%) |         |

\*Significant at  $p < 0.05$

## DISCUSSION

In this retrospective analysis comparing breast-conserving surgery (BCS) and modified radical mastectomy (MRM) for early-stage breast cancer, our findings demonstrate that BCS offers oncologic outcomes comparable to MRM while providing superior cosmetic satisfaction and shorter hospitalization duration. Historically, MRM was established as the standard operative approach due to its effectiveness in locoregional disease control [11]. However, large randomized controlled trials have demonstrated equivalent survival outcomes for BCS followed by radiotherapy versus mastectomy, thus supporting breast conservation as an effective alternative when feasible [1,12,13]. The smaller mean tumor size observed among BCS recipients in our study aligns well with previous observations that earlier detection, improved screening, and patient-centered management contribute to greater suitability for BCS [14]. Similar demographic and pathological characteristics were reported in Indian and Western populations, demonstrating comparable selection patterns for BCS in early-stage disease [2,15].

Postoperative complication rates were low in both groups, and no significant difference was observed, corroborating existing evidence suggestive of similar morbidity profiles between the two surgical modalities [16]. However, the mean duration of hospitalization was significantly shorter in the BCS group. This trend is consistent with prior studies in which breast conservation resulted in faster physical recovery, reduced postoperative pain, and earlier return to daily activities [15,17].

Cosmetic outcomes demonstrated a clear advantage for BCS, as most patients in this group reported good to excellent aesthetic satisfaction. This association has been widely reported in the literature, where BCS consistently yields better physical image perception and psychological well-being compared with mastectomy [13,18]. As survivorship continues to improve, cosmetic outcomes and quality of life have gained greater importance in surgical decision-making.

The recurrence rates in our study were comparable between BCS and MRM, supporting evidence from meta-analyses and randomized trials that confirm similar local recurrence and disease-free survival when BCS is combined with radiotherapy [1,12,13]. A multicenter Indian evaluation similarly demonstrated comparable recurrence and metastasis rates between cohorts [2]. Although our follow-up period was limited to two years, trends appear consistent with earlier findings, as recurrence following BCS tends to occur later in the disease course.

Overall survival did not differ significantly between the two groups, paralleling the landmark NSABP B-06 results and subsequent long-term observational studies that confirmed no survival advantage for mastectomy over BCS in appropriately selected patients [1,12]. These observations support the continued adoption of BCS as a standard modality for suitable candidates.

Strengths of this analysis include its real-world clinical context and uniform disease staging, which

enhance external validity. However, several limitations should be noted. The retrospective design raises the possibility of selection bias, particularly regarding tumor size and patient preference. Furthermore, follow-up duration was relatively short and limited the evaluation of late recurrences and survival trends. Additionally, cosmetic evaluation relied on clinician-recorded assessments rather than dedicated quality-of-life scales, potentially introducing subjective bias.

Despite these limitations, this investigation reinforces existing global and Indian evidence supporting BCS as an oncologically safe procedure with superior aesthetic outcomes. Earlier diagnosis through enhanced awareness and screening may further expand the proportion of candidates eligible for breast conservation. Improving access to radiotherapy facilities—especially in low-resource healthcare systems—is crucial for the continued adoption of BCS as a standard practice. BCS demonstrates equivalent oncologic outcomes to MRM with added benefits of shorter hospitalization and superior cosmetic satisfaction, affirming its position as an advantageous option for patients with early-stage breast cancer. Continued efforts toward strengthening multidisciplinary care pathways and improving radiotherapy availability will help optimize outcomes for patients in both urban and rural settings.

## Conclusion

In this retrospective study comparing breast-conserving surgery (BCS) and modified radical mastectomy (MRM) among patients with early-stage breast cancer, both surgical approaches demonstrated comparable oncological outcomes in terms of locoregional recurrence and short-term disease-free survival. However, BCS offered advantages in postoperative recovery, cosmetic satisfaction, and overall quality-of-life measures, consistent with previously published evidence.

MRM, on the other hand, remained more commonly performed among patients with larger tumors, multifocal disease, or limited access to radiotherapy.

The findings reinforce current evidence-based recommendations that BCS, combined with adjuvant radiotherapy, represents an effective and organ-preserving option for suitable candidates.

Nonetheless, personalized decision-making based on tumor biology, patient preference, and resource availability remains essential. Further multicenter prospective studies with longer follow-up are warranted to more comprehensively compare long-term survival, recurrence patterns, and patient-reported outcomes.

## Declarations

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