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ORIGINAL ARTICLE

Medicine Science International Medical Journal

Medicine Science 2025;14(3):740-4

Three-year outcomes of level II oncoplastic breast-conserving surgery: A comparative analysis

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Received 23 April 2025; Accepted 15 August 2025
Available online 27 August 2025 with doi: 10.5455/medscience.2025.04.100

Abstract

This study aimed to compare the clinical and patient-reported outcomes of level II oncoplastic breast-conserving surgery (BCS) versus conventional BCS in breast cancer treatment, focusing on re-excision rates, early postoperative complications, and quality of life (QoL). This retrospective cohort study included 395 patients who underwent either conventional BCS (n=255) or level II oncoplastic BCS (n=140) at a tertiary academic center between January 2021 and June 2024. Demographic, clinicopathological, surgical, and postoperative data were extracted from the institutional database. Patient-reported outcomes were assessed using BREAST-Q scores in a subset of patients. The mean age did not differ significantly between groups (p=0.13). Reexcision was required in 22% of the conventional BCS group and 5% of the oncoplastic BCS group (p<0.001). Tumor size >20 mm and multifocal disease were independent predictors of re-excision, while oncoplastic BCS was protective (p<0.001). BREAST-Q scores for satisfaction with breasts, psychosocial well-being, and sexual well-being were significantly higher in the oncoplastic group (p<0.001). No significant differences were observed in pathological tumor size (p=0.45), ultrasound/MRI tumor size (p=0.62, p=0.35), seroma formation (p=0.72), or surgical site infection (p=0.23). Level II oncoplastic BCS was associated with significantly lower reexcision rates and improved patient-reported QoL compared to conventional BCS. These findings, supported by predictive modeling and QoL data, suggest that oncoplastic BCS is a preferable approach for balancing oncologic safety, aesthetic outcomes, and patient satisfaction.

Keywords: Breast cancer, oncoplastic surgery, re-excision, breast-conserving surgery, quality of life

Introduction

Breast carcinoma remains the most common neoplasm in women and the second leading cause of cancer-related mortality [1]. This high prevalence underscores the need for optimized diagnostic and therapeutic strategies. Effective breast cancer management requires a multidisciplinary approach, integrating surgical, radiation, and medical oncology, which has reduced mortality rates [2,3]. Surgical interventions are evolving to prioritize both oncologic efficacy and patient quality of life (QoL). Breast-conserving surgery (BCS) aims to achieve survival outcomes equivalent to mastectomy while preserving aesthetics and supporting psychosocial well-being [4]. Oncoplastic BCS integrates reconstructive techniques to enhance cosmetic outcomes, particularly for complex cases requiring significant tissue resection [5].

Studies suggest oncoplastic BCS offers better QoL compared to mastectomy or standard lumpectomy [6]. However, gaps remain in understanding long-term oncologic safety, objective cosmetic outcomes, and health-economic implications. This study compares level II oncoplastic BCS versus conventional BCS, analyzing clinical, oncologic, and patient-reported outcomes to provide comprehensive insights into the benefits of oncoplastic techniques.

CITATION
Akgul N, Turan MI, Sakar B, et al. Three-year outcomes of level II oncoplastic breast-conserving surgery: A comparative analysis. Med Science. 2025;14(3):740-4.

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DOI: 10.5455/medscience.2025.04.100

Material and Methods

Ethical approval was granted by the Clinical Research Ethics Committee of the Antalya Training and Research Hospital (Ethics Committee Number: 2024-232, Date: 08.08.2024). This retrospective cohort study included patients diagnosed with breast cancer who underwent conventional BCS or level II oncoplastic BCS from January 2021 to June 2024. Data on demographics, clinicopathological variables, surgical procedures, and postoperative outcomes were extracted from the institutional database. Variables included age, body mass index (BMI), tumor laterality, menopausal status, neoadjuvant therapy, tumor size, histological subtype, T and N stage, biological markers (ER, PR, HER2, Ki-67, molecular subtypes), lymph node involvement, re-excision, and local recurrence. Post hoc BREAST-Q data were collected from a subset of patients to assess QoL.

Patients with incomplete clinicopathological or follow-up data, multicentric/multifocal carcinoma, inflammatory breast cancer, distant metastases, radiotherapy contraindications, mastectomy due to positive margins, or bilateral breast cancer were excluded (Figure 1).

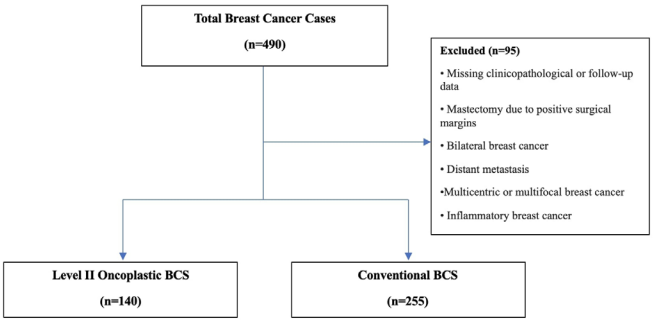

Figure 1. Flowchart of the study

Statistical Analysis

Statistical analyses were performed using IBM SPSS Statistics version 22.0. Categorical variables were reported as frequencies and percentages, continuous variables as means and standard deviations. Normality was assessed using the Kolmogorov-Smirnov test. Chisquare tests compared categorical variables, while independent samples t-tests or MannWhitney U tests compared continuous variables based on distribution. Multivariable logistic regression was used to identify predictors of re-excision. A p-value <0.05 was considered statistically significant.

Results

A total of 395 patients were included, with 255 (64.6%) undergoing conventional BCS and 140 (35.4%) undergoing level II oncoplastic BCS. Baseline characteristics were comparable (Table 1). The mean age was 54.25±12.02 years (conventional) and 56.11±11.28 years (oncoplastic) (p=0.13). Ductal carcinoma in situ (DCIS) or lobular carcinoma in situ (LCIS) was present in 52.9% (conventional) and 54.2% (oncoplastic) (p =0.579).

Table 1. Comparison of patient characteristics between the conventional BCS and oncoplastic BCS groups

Variable	Conventional BCS (n=255)	Oncoplastic BCS (n=140)	p-value
Age, year	54.25±12.02	56.11±11.28	0.13
DCIS-LCIS component			0.579
DCIS	120 (51.4%)	49 (52.2%)	
LCIS	4 (1.5%)	4 (2%)	
None	131 (47.1%)	87 (42.8%)	
Stage			0.45
1A	58 (22.7%)	36 (25.7%)	
2A	105 (41.7%)	57 (40.7%)	
2B	57 (22.4%)	35 (25%)	
3A	35 (13.7%)	12 (8.6%)	
Axillary surgery			0.41
ALND	62 (24.3%)	29 (20.7%)	
SNLD	193 (75.7%)	111 (79.3%)	
Molecular subtype			0.19
Luminal A	92 (36.1%)	49 (35%)	
Luminal B -	99 (38.8%)	53 (37.9%)	
Luminal B +	21 (8.2%)	20 (14.3%)	
Triple N	32 (12.5%)	10 (7.1%)	
Her 2	11 (4.3%)	8 (5.7%)	
T stage			0.71
T1	87 (34.1%)	43 (30.7%)	
T2	163 (63.9%)	95 (67.95%)	
T3	5 (2%)	2 (1.4%)	
N stage			0.13
N0	134 (52.5%)	88 (62.9%)	
N1	90 (35.3%)	40 (28.6%)	
N2	31 (12.2%)	12 (8.6%)	
Neodajuvant treatment			0.3
None	145 (56.9%)	87 (62.1%)	
Present	110 (43.1%)	53 (37.9%)	

Values presented as mean±SD, number (%); *p<0.05 is statistically significant; BCS: breast converting surgery, DCIS: ductal carcinoma in situ, LCIS: lobular carcinoma in situ

Seroma formation (28% vs. 19%, p=0.72) and surgical site infection (4.3% vs. 7.1%, p=0.23) did not differ significantly (Table 2).

DOI: 10.5455/medscience.2025.04.100

Table 2. Comparison of tumor and resected tissue characteristics between the conventional BCS and oncoplastic BCS groups

Variable		Conventional BCS (n=255)	Oncoplastic BCS (n=140)	p-value
Pathological tumor size, mm		17.09±11.6	17.68±12.9	0.45
Ultrasound size, mm		24.93±10.1	25.22±9.1	0.62
MRI size, mm		24.73±9.5	25.58±9.6	0.35
Re-excision	**None**	199 (78%)	133 (95%)	<0.001*
	Present	56 (22%)	7 (5%)	
Seroma	**None**	227 (89%)	123 (87.9%)	0.72
	Present	28 (11%)	17 (12.1%)	
Surgical site infection	**None**	244 (95.7%)	130 (92.9%)	0.23
	Present	11 (4.3%)	10 (7.1%)	

Values presented as mean±SD, number (%); *p<0.05 is statistically significant; BCS: breast converting surgery, MRI: magnetic resonance imaging

Short-term oncologic outcomes (median follow-up: 36 months) showed local recurrence in 5 patients (2.0%) in the conventional group and 2 patients (1.4%) in the oncoplastic group (p=0.65). Three-year disease-free survival (DFS) and overall survival (OS) were 96.1% vs. 97.1% (p=0.68) and 98.0% vs. 98.6% (p=0.71), respectively. Long-term data beyond 36 months were incomplete due to loss to follow-up or referral to external facilities. Objective cosmetic assessments (e.g., Harris scale, BCCT.core) were not performed due to absent protocols. BREAST-Q scores, collected post hoc from 231 patients (138 conventional, 93 oncoplastic), showed significantly higher median scores in the oncoplastic group for satisfaction with breasts (90 [IQR 88–92] vs. 66 [IQR 62–68], p<0.001), psychosocial well-being (88 [IQR 86–90] vs. 65.5 [IQR 60–68], p<0.001), and sexual well-being (82 [IQR 80–88] vs. 62 [IQR 60–66], p<0.001) (Table 3). Cost data were unavailable, precluding economic analysis.

Table 3. Comparison of BREAST-Q score data between the conventional BCS and oncoplastic BCS groups

Variable	Conventional BCS (n=138)	Oncoplastic BCS (n=93)	p-value
Satisfaction with breasts	66 (62–68)	90 (88–92)	<0.001*
Psychosocial well-being	65.5 (60–68)	88 (86–90)	<0.001*
Sexual well-being	62 (60–66)	82 (80–88)	<0.001*

Values presented as median (IQR); Mann-Whitney U test was used; *p<0.05 is statistically significant; BCS: breast-conserving surgery

Re-excision was required in 56 patients (22%) in the conventional BCS group and 7 patients (5%) in the oncoplastic BCS group (p<0.001). A multivariable logistic regression analysis (n=350 with complete data) identified tumor size >20 mm (odds ratio [OR] 2.8, 95% confidence interval [CI] 1.4–5.6, p=0.004) and multifocal disease (OR 3.5, 95% CI 1.6–7.8, p=0.002) as independent predictors of re-excision, while oncoplastic BCS was protective (OR 0.21, 95% CI 0.09–0.49, p<0.001) (Table 4).

Table 4. Multivariable logistic regression analysis of predictors of re-excision

Variable	Odds ratio	95% confidence interval	p-value
Tumor size (>20 mm vs. multifocal disease (yes vs. no) ≤20 mm)	2.8 3.5	1.4–5.6 1.6–7.8	0.004 0.002
Surgical approach (oncoplastic vs. conventional)	0.21	0.09–0.49	<0.001
Age (histological subtype (DCIS vs. invasive) ≥50 vs. <50 years)	1.2 1.4	0.6–2.4 0.7–2.9	0.61 0.33

Discussion

This study confirms that level II oncoplastic BCS is associated with a significantly lower re-excision rate (5% vs. 22%, p<0.001) compared to conventional BCS. The integration of BREAST-Q data and predictors of re-excision enhances the clinical and patient-centered relevance of these findings. Tumor size >20 mm and multifocal disease were identified as independent risk factors for reexcision, while oncoplastic BCS was protective. These

DOI: 10.5455/medscience.2025.04.100

results highlight the technical advantages of oncoplastic BCS in achieving oncologic safety with fewer surgeries, reducing patient distress and healthcare utilization.

BCS is a cornerstone of breast-conserving therapy, involving tumor resection with sufficient margins while preserving breast tissue, typically followed by adjuvant radiotherapy. The main objectives of BCS are to achieve survival outcomes equivalent to those of mastectomy, ensure satisfactory cosmetic results, and maintain a low incidence of local recurrence within the treated breast. By preserving the breast's natural appearance, BCS supports patients' body image and self-esteem, which are critical for psychological recovery. BCS enables patients to retain their breast while ensuring oncologically sound outcomes. Effective BCS requires complete tumor removal with negative margins. Therefore, meticulous surgical planning and intraoperative precision are essential components of this approach. These technical demands highlight the importance of surgical expertise and advanced imaging technologies in achieving optimal results. Although conventional breast-conserving surgery is frequently applied within breast-conserving therapies, level II oncoplastic breast-conserving surgery is also an alternative technique in selected cases. These techniques aim to secure clear surgical margins while maintaining the breast's structural and aesthetic integrity. The primary determinant in choosing a surgical technique is ensuring a safe oncologic resection. This also includes considerations such as the patient's quality of life, cosmetic expectations, and cost analysis.

The significantly lower re-excision rate observed in the level II oncoplastic BCS group (5% vs. 22%, $p < 0.001$) aligns with prior studies demonstrating the oncologic advantages of oncoplastic techniques. For instance, Tian et al.'s meta-analysis of 34,244 patients reported reduced re-excision rates with oncoplastic BCS, attributed to the ability to perform wider excisions while maintaining aesthetic outcomes [7]. Similarly, Losken et al. found lower positive margin rates in oncoplastic BCS, likely due to enhanced surgical planning and tissue mobilization [8]. In our study, multivariable logistic regression identified tumor size >20 mm and multifocal disease as independent predictors of re-excision, while oncoplastic BCS was protective (OR 0.21, 95% CI 0.09–0.49, $p<0.001$). These findings suggest that oncoplastic techniques facilitate more effective tumor resection, reducing the need for additional surgeries. This reduction not only minimizes patient distress but also streamlines healthcare resource utilization, as fewer re-excisions decrease procedural risks and hospital stays [9,10]. The consistency of our results with existing literature underscores the oncologic reliability of level II oncoplastic BCS, particularly for complex cases requiring extensive resection [11,12].

Level II oncoplastic BCS significantly improved patient-reported QoL outcomes, as evidenced by higher BREAST-Q scores in satisfaction with breasts (90 vs. 66, $p<0.001$), psychosocial well-being (88 vs. 65.5, $p<0.001$), and sexual well-being (82 vs. 62, $p<0.001$). These findings corroborate prior research, such as Kaviani et al., which highlighted superior QoL outcomes with oncoplastic BCS compared to conventional approaches [6]. The integration of reconstructive techniques in oncoplastic BCS allows for better preservation of breast contour and symmetry, which directly contributes to improved body image and self-esteem [4]. While objective cosmetic assessments (e.g., Harris scale, BCCT.core) were not feasible in this study due to the absence of standardized protocols, the patient-reported outcomes provide robust evidence of the aesthetic benefits of oncoplastic techniques. These results emphasize the importance of incorporating patient-centered metrics in evaluating surgical outcomes, as cosmetic satisfaction plays a critical role in psychological recovery and long-term well-being [13]. Future studies should aim to combine subjective QoL data with objective aesthetic evaluations to provide a more comprehensive assessment of oncoplastic BCS benefits [14].

This study has several limitations that warrant consideration. The retrospective design introduces potential selection bias, as patients were not randomized to treatment groups. Although propensity score matching was considered, it was deemed unfeasible due to incomplete data on confounding factors such as comorbidities, surgeon expertise, and patient preferences. This limitation may impact the generalizability of our findings, as unmeasured variables could influence outcomes. Additionally, the absence of long-term oncologic data, such as local recurrence and survival metrics beyond 36 months, restricts conclusions about the comparative oncologic safety of oncoplastic versus conventional BCS. This gap resulted from incomplete follow-up records and patient referrals to external facilities. Furthermore, the lack of cost data prevented a health-economic analysis, which is critical for evaluating the broader implications of adopting oncoplastic techniques. The inability to collect comprehensive data on predictors of re-excision, such as detailed margin status or intraoperative factors, further limits the study's clinical applicability. To address these gaps, future research should employ prospective designs with longer follow-up periods, incorporate standardized aesthetic scoring systems, and include cost-effectiveness analyses. Such studies would provide a more robust understanding of the benefits and challenges of level II oncoplastic BCS, facilitating its integration into clinical practice [6,7,9].

Conclusion

Consistent with existing literature, this study found that the re-excision rate in patients undergoing level II oncoplastic BCS for breast cancer was significantly lower than in those undergoing conventional BCS. Given the enhanced patient satisfaction with cosmetic outcomes, level II oncoplastic BCS appears to be a preferable approach in breast cancer management.

DOI: 10.5455/medscience.2025.04.100

Conflict of Interests
The authors declare that there is no conflict of interest in the study.

Financial Disclosure
The authors declare that they have received no financial support for the study.

Ethical Approval
Ethical approval for this single-center study was obtained from the Clinical Research Ethics Committee of the Antalya Training and Research Hospital (Ethics Committee Number: 2024-232, Date: 08.08.2024).

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