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Original Article

Impact of SSO-ASTRO Margin Guidelines on Re-excision Rate in Breast-conserving Surgery: A Single-center Experience

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Abstract

Introduction: Breast-conserving surgery (BCS) has been historically linked with a high rate of re-excision. To address this issue, the Society of Surgical Oncology (SSO) and the American Society for Radiation Oncology (ASTRO) developed consensus guidelines in 2014 to standardize practices and improve clinical outcomes for BCS patients. In our tertiary cancer care hospital, we assessed the impact of these guidelines on the re-excision rate following BCS. **Materials and Methods:** We conducted a retrospective study on breast cancer patients who underwent BCS at the Shaukat Khanum Memorial Cancer Hospital and Research Centre in Lahore, Pakistan. The study compared the re-excision rate before the implementation of the SSO-ASTRO consensus guidelines (November 2015–July 2017) and after the implementation (January 2018–August 2019). Margins were considered positive if "ink on tumor" was present and negative if "no ink on tumor" was present. Fisher's exact test or Chi-square test was used to compare the re-excision rates between the pre- and post-guideline periods. **Results:** A total of 919 patients were identified, with 533 from the pre-guideline period and 386 from the post-guideline period. Of the 919 patients, 31 with ductal carcinoma *in situ* (DCIS) were excluded from the re-excision analysis because the guidelines were not implemented on the DCIS. Furthermore, the overall rate of re-excision in our data was 4.3%. The re-excision rate decreased from 71.1% to 28.9% ($P \leq 0.05$) following the adoption of the guidelines. We observed a statistically significant decrease in the re-excision rate after implementing the SSO-ASTRO guidelines. **Conclusion:** Implementation of the SSO-ASTRO margin guidelines led to a notable decrease in the overall re-excision rate in our data set. These findings suggest that continued adherence to the guidelines may lead to a further reduction in the re-excision rate in the future.

Key words: Breast cancer, breast-conserving surgery, re-excision, SSO-ASTRO

Introduction

Breast cancer is the most common cancer among women globally.[1] Despite advances in treatment, it remains a significant public health issue and a leading cause of death among women worldwide.[1] In Pakistan, breast cancer is the most commonly diagnosed cancer, with a higher incidence rate than other cancers.[2,3] Every year, approximately 178,388 new cancer cases are reported in the country, with almost 25,928 new cases of breast cancer.[2] Shaukat Khanum Memorial Cancer Hospital and Research Center (SKMCH&RC) is a unique healthcare institution in Pakistan that focuses exclusively on cancer treatment and care.[4] At SKMCH&RC, breast cancer is the most commonly diagnosed type of cancer.[3]

Breast cancer management is a comprehensive strategy for treating the disease that may involve a combination of different treatments.[5,6] This may involve surgical removal of the cancerous tissue, radiation, hormonal and chemotherapy, or immunotherapy.[5,6] Treatment for breast cancer varies based on stage, type, the patient's age, and overall health.[7] The surgical intervention aims to excise the tumor and reduce the possibility of recurrence, leading to a better prognosis and outcome for the patient.[8] Fisher *et al*. reported the results of a 20-year follow-up study of a randomized trial comparing total mastectomy, lumpectomy (breast-conserving surgery [BCS]), and lumpectomy plus radiotherapy as treatments for invasive breast cancer.[9] They found no significant difference in survival outcomes between the three treatment groups.[9] However, another study demonstrated that certain factors, such as tumor size and close resection margins, were associated with a higher likelihood of re-excision being required.[10] Furthermore, they highlighted the significance of clear pathological resection margins for effective BCS.[10] Inadequate margin widths are associated with higher risks of distant recurrence, increased local recurrence, and increased breast cancer mortality.[11] The incidence of re-excision after BCS has exhibited significant variability in the literature.[12-15] This variability could be due to multiple factors, including differences in patient and tumor features, surgical technique, and pathological evaluation.[12-15] The consequences of re-excision include significant delays in adjuvant therapy, cosmetic disfigurement, emotional stress, and financial burden.[16] Repeated surgical interventions can lead to scarring, affecting appearance and causing psychological distress, while the cost of repeated treatment can put a financial strain on the patient and their family.[17]

The Society of Surgical Oncology (SSO) and the American Society for Radiation Oncology (ASTRO) assembled a multidisciplinary expert panel to provide evidence-based consensus guidelines to address the variation in the re-excision rate.[18] The guidelines were intended to provide a promising approach to improve outcomes for patients with breast cancer undergoing BCS.[18] The current guidelines specify that the appropriate margin width for patients with stages I and II breast cancer undergoing BCS with whole-breast radiation should be "no ink on tumor", and that may help to improve patient outcomes.[19] Positive margins result in a two-fold increase in ipsilateral recurrence that is not mitigated by additional radiation or systemic therapies.[19]

In June 2017, the breast surgery service at SKMCH&RC implemented the SSO-ASTRO margin guidelines. Before adopting these guidelines, our institution considered margins ≥1 mm as adequate "negative margins." This study evaluated the re-excision rates before and after implementing the SSO-ASTRO margin guidelines.

Materials and Methods

Study design and participants

The retrospective cohort study was conducted at SKMCH&RC Lahore, Pakistan, and received approval from the institution's review board (IRB) under the approval number EX-02-09-21-04. In accordance with the Declaration of Helsinki, the IRB waived the requirement for written informed consent from participants. The study cohort

consisted of patients who underwent BCS for breast cancer between November 2015 and August 2019. The institution adopted guidelines in July 2017, and the cohort was divided into two groups: pre-guideline (November 2015–July, 2017) and post-guideline (January 2018–August 2019), with 6 months after guideline adoption excluded to allow for implementation. Eligible patients were those aged 18 or older with confirmed breast cancer through pathology who underwent BCS. In contrast, those with bilateral breast cancer, previous breast or other malignancies, multifocal or multicentric disease, or those who had undergone surgery at another institution were excluded.

Clinicopathological features

Data were retrieved through the electronic record system of SKMCH&RC (Hospital information system). The following patient information was gathered: Patient age, body mass index (BMI), laterality, site, examination size, and radiographic characteristics, including breast density, microcalcifications, and architectural distortion of the lesion were identified. Lymph node (LN) involvement was confirmed either through fine needle aspiration cytology or sentinel LN biopsy (SLNB) along with a frozen section. Histopathological characteristics, including tumor size, histology, nuclear grade, receptor subtype, estrogen receptor (ER), progesterone receptor (PR), and human epidermal growth factor receptor (HER2/neu). Furthermore, pathological tumor type, size, nodes, and LN metastases (0, 1–3, 4–9, ≥10), extranodal extension, lymph vascular invasion, dermal lymphatic invasion were also documented. The receipt of neoadjuvant chemotherapy, adjuvant chemotherapy, endocrine, anti-HER2, and whole breast irradiation was recorded. Throughout the study period, the lumpectomy specimen at our institution was routinely inked for orientation, and wire localization techniques were commonly used for non-palpable lesions by all participating surgeons. Margins were defined as positive if "ink on tumor" was present and negative if "no ink on tumor". Details of the specific margin involved and the number of margins affected were also recorded. The patient's recurrence and current status were also identified.

Statistical analysis

Statistical analysis was performed using SPSS software (version 20.0; SPSS, Chicago, IL, USA). Percentages (proportions) were used for categorical variables, while the mean and standard deviation were used for continuous variables. Bivariate analysis was done using chi-square or Fisher's exact test (when necessary). For continuous explanatory variables such as age, an independent *t*-test was performed to check the mean difference. Statistical significance was defined as a two-tailed *P*-value of 0.05.

Results

The study categorzsed 919 patients into two periods: Pre-guideline (n = 533) and post-guideline (n = 386). The demographic and clinical details and treatment approaches were divided according to these two-time frames. Table 1 provides a comprehensive overview of the significant and non-significant values corresponding to the divided pre- and post-guideline periods for all demographic and clinical information and treatment modalities. The study observed a mean age of 52.0 ± 11.41 years among patients, revealing a significant difference between participants in the pre-guideline and post-guideline periods (P = 0.001). This was followed by a noteworthy disparity in radiological tumor size between the two periods (P = 0.006), emphasizing the potential influence of the introduced guidelines on disease presentation. Among the categorized radiological tumor sizes, T2 demonstrated the highest prevalence, with 688 cases (74.9%) overall, comprising 403 cases (75.6%) before the guidelines and 285 cases (73.8%) after the guidelines were implemented. Notably, the analysis of core biopsy results highlighted the prominence of invasive ductal carcinoma (IDCA), accounting for 85.3% of cases in total. Notably, there was a distinctive distribution variation between the pre-guideline (61.4%) and post-guideline (38.6%) periods,

Table 1: Summary of demographic, clinical features, and treatment modalities in the pre- and post-guideline period

Variable	Overall *n*=919 (100%)	Pre-guideline period *n*=533 (58.0%)	Post-guideline period *n*=386 (42.0%)	*P*-value
Age (years)				0.001
Mean±standard deviation (SD)	52.0±11.41	53.9±10.9	49.3±11.5	
Body mass index				0.7
Mean±SD	23.2±10.3	23.3±9.6	23.1±11.1	
Family history				0.33
No	733 (79.8)	431 (58.8)	302 (41.2)	
Yes	186 (20.2)	102 (54.8)	84 (45.2)	
Side				0.64
Bilateral	1 (0.1)	-	1 (100.0)	
Left	480 (52.2)	278 (57.9)	202 (42.1)	
Right	438 (47.7)	255 (58.2)	183 (41.8)	
Quadrant				0.15
UOQ	537 (58.4)	298 (55.5)	239 (44.5)	
UIQ	230 (25.0)	145 (63.0)	85 (37.0)	
LIQ	84 (9.1)	51 (60.7)	33 (39.3)	
LOQ	47 (5.1)	30 (63.8)	17 (36.2)	
RA	21 (2.3)	9 (42.9)	12 (57.1)	
Density mammography				0.12
A	121 (13.2)	65 (53.7)	56 (46.3)	
B	427 (46.5)	251 (58.8)	176 (41.2)	
C	162 (17.6)	83 (51.2)	79 (48.8)	
D	78 (8.5)	51 (65.4)	27 (34.6)	
Unknown	131 (14.3)	83 (63.4)	48 (36.6)	
Radiological tumour size				0.006
T0	5 (0.5)	-	5 (1.3)	
T1	219 (23.8)	123 (23.1)	96 (24.9)	
T2	688 (74.9)	403 (75.6)	285 (73.8)	
T3	7 (0.9)	7 (1.3)	-	
Core biopsy (tumour)				0.001
DCIS	12 (1.3)	3 (25.0)	9 (75.0)	
IDCA	784 (85.3)	481 (61.4)	303 (38.6)	
ILCA	34 (3.7)	15 (44.1)	19 (55.9)	
Invasive mammary	9 (1.0)	3 (33.3)	6 (66.7)	
Metaplastic	1 (0.1)	1 (100.0)	-	
Mix	79 (8.6)	30 (38.0)	49 (62.0)	

(*Contd...*)

Table 1: (*Continued*)

Variable	Overall *n*=919 (100%)	Pre-guideline period *n*=533 (58.0%)	Post-guideline period *n*=386 (42.0%)	*P*-value
Grade				0.92
I	16 (1.7)	10 (62.5)	6 (37.5)	
II	494 (53.8)	285 (57.7)	209 (42.3)	
III	409 (44.5)	238 (58.2)	171 (41.8)	
Estrogen receptor				0.25
Negative	195 (21.2)	106 (54.4)	89 (45.6)	
Positive	724 (78.8)	427 (59.0)	297 (41.0)	
Progesterone receptor				0.98
Negative	398 (43.3)	231 (58.0)	167 (42.0)	
Positive	521 (56.7)	302 (58.0)	219 (42.0)	
HER 2 receptor				0.80
Negative	681 (74.1)	389 (57.1)	292 (42.9)	
Positive	202 (22.0)	123 (60.9)	79 (39.1)	
HER 2 equivocal	11 (1.2)	7 (63.6)	4 (36.4)	
Unknown	25 (2.7)	14 (56.0)	11 (44.0)	
Ki67, proliferation index				0.03
Mean±SD	39.8±26.1	38.1±25.6	42.4±26.7	
Neo-adjuvant chemotherapy				0.01
No	322 (35.0)	189 (58.7)	133 (41.3)	
Yes	581 (63.2)	329 (56.6)	252 (43.4)	
Hormonal	16 (1.7)	15 (93.8)	1 (6.3)	
Adjuvant chemotherapy				0.11
No	625 (68.0)	377 (60.3)	248 (39.7)	
Yes	281 (30.6)	149 (53.0)	132 (47.0)	
Hormonal	1 (0.1)	1 (100.0)	-	
Unknown	12 (1.3)	6 (50.0)	6 (50.0)	
Radiotherapy				0.46
No	11 (1.2)	5 (45.5)	6 (54.5)	
Yes	891 (97.0)	520 (58.4)	371 (41.6)	
Unknown	17 (1.8)	8 (47.1)	9 (52.9)	
Herceptin				0.26
No	812 (88.4)	474 (58.4)	338 (41.6)	
Yes	85 (9.2)	50 (58.8)	35 (41.2)	
Unknown	22 (2.4)	9 (40.9)	13 (59.1)	

(*Contd...*)

Table 1: (*Continued*)

Variable	Overall *n*=919 (100%)	Pre-guideline period *n*=533 (58.0%)	Post-guideline period *n*=386 (42.0%)	*P*-value
Hormonal therapy				0.001
No	164 (17.8)	90 (54.9)	74 (45.1)	
Triple-negative	126 (76.8)	73 (57.9)	53 (42.1)	
HER2 enriched	38 (23.2)	17 (44.7)	21 (55.3)	
Yes	734 (79.9)	434 (59.1)	300 (40.9)	
Anastrozole	240 (32.7)	172 (71.7)	68 (28.3)	
Exemestane	8 (0.1)	7 (87.5)	1 (12.5)	
Tamoxifen	486 (66.2)	255 (52.5)	231 (47.5)	
Unknown	21 (2.3)	9 (42.9)	12 (57.1)	

UOQ: Upper outer quadrant, UIQ: Upper inner quadrant, LIQ: Lower inner quadrant, LOQ: Lower outer quadrant, DCIS: Ductal carcinoma *in situ*, IDCA: Invasive ductal carcinoma, ILCA: Invasive lobular carcinoma, RA: Areola

indicating potential shifts in IDCA prevalence over time. Furthermore, the Ki67 proliferation index exhibited a notable disparity between the pre and post-guideline periods. In the pre-guideline phase, the average Ki67 index was 38.1 ± 25.6, while experiencing a modest rise to 42.4 ± 26.7 during the post-guideline phase. This observed fluctuation, substantiated by a p-value of 0.03, underscores the possible influence of the guidelines on the dynamics of cellular proliferation. Moreover, the utilization of neoadjuvant chemotherapy exhibited a statistically significant difference (P = 0.01) between the two periods, with 63.2% of cases before the guidelines and 43.4% after their implementation. In addition, hormonal therapy utilization was notable, encompassing 79.9% of cases overall, with preferences for specific agents like Anastrozole, Exemestane, and Tamoxifen. A significant disparity in hormonal therapy usage was evident (P = 0.001) between the pre-guideline and post-guideline periods, signifying the potential impact of the guidelines on therapeutic decisions. These comprehensive findings underscore the profound influence of the introduced guidelines across a diverse range of clinical variables. In addition to these significant factors, the study also reveals certain variables that do not exhibit statistically significant differences beyond the 0.05 threshold. Notably, variables including BMI, family history, side of occurrence, quadrant, density mammography, grade, ER status, PR status, HER2 receptor status, radiotherapy, adjuvant chemotherapy, and herceptin usage are among those presenting non-significant differences as shown in Table 1.

In addition, various surgical outcomes such as pathological tumor size, pathological nodal size, patient recurrence status, patient's overall status, and the SLNB results were analyzed and compared between the pre and post-guideline periods, as depicted in Table 2. Moreover, Table 3 presents the post-surgical margin status, where it was found that 41 (4.5%) of the 919 cases had positive margins. In addition, the cases of single-margin extractions were analyzed and found to be 33 (80.5%), while those of double-margin extractions were 8 (19.5%). As demonstrated in Table 3, these cases were further divided into the pre- and post-guideline periods.

The re-excision status of the patients with invasive tumors is depicted in Table 4. Of the total 919 patients, 31 diagnosed with DCIS were excluded from the re-excision analysis because the guidelines do not apply to DCIS. Among the invasive tumor patients (n = 888), only

Table 2: Surgical outcome of participants in pre and post guideline period

Variable	Overall *n*=919 (100%)	Pre-guideline period *n*=533 (58.0%)	Post-guideline period *n*=386 (42.0%)	*P*-value
Pathological tumor size (pT)				0.53
T0	167 (18.2)	104 (62.3)	63 (37.7)	
T1	399 (43.4)	233 (58.4)	166 (41.6)	
T2	342 (37.2)	190 (55.6)	152 (44.4)	
T3	11 (1.2)	6 (54.5)	5 (45.5)	
Pathological nodal size (pN)				0.003
N0	570 (62.0)	346 (60.7)	224 (39.3)	
N1	254 (27.6)	147 (57.9)	107 (42.1)	
N2	68 (7.4)	30 (44.1)	38 (55.9)	
N3	25 (2.7)	8 (32.0)	17 (68.0)	
No SLNB	2 (0.2)	2 (100.0)	-	
Recurrence status				0.10
No	718 (78.1)	422 (58.8)	296 (41.2)	
Local	50 (5.4)	25 (50.0)	25 (50.0)	
Distant	120 (13.1)	74 (61.7)	46 (38.3)	
Local+distant	5 (0.5)	1 (20.0)	4 (80.0)	
Unknown	26 (2.8)	11 (42.3)	15 (57.7)	
Patient's status				0.15
Alive	791 (86.1)	456 (57.6)	335 (42.4)	
Death	78 (8.5)	52 (66.7)	26 (33.3)	
Unknown	50 (5.4)	25 (50.0)	25 (50.0)	
Sentinel lymph node biopsy				0.53
Not performed	350 (38.1)	199 (56.9)	151 (43.1)	
Not performed (old age)	2 (0.2)	2 (100.0)	-	
Performed	567 (61.7)	332 (58.6)	235 (41.4)	
Frozen section				0.01
Not performed	586 (63.8)	358 (61.1)	228	
Not performed (old age)	2 (0.2)	2 (100.0)	-	
Performed	422 (45.9)	173 (52.3)	158 (47.7)	
Axillary lymph node dissection				0.59
Not performed	495 (53.9)	284 (57.4)	211 (42.6)	
Not performed (old age)	2 (0.2)	2 (100.0)	-	
Performed	422 (45.9)	247 (58.5)	175 (41.5)	
Histopathology (tumor types)				0.001
No residual tumor	162 (17.6)	101 (62.3)	61 (37.7)	
IDCA	479 (52.1)	287 (59.9)	192 (40.1)	
ILCA	24 (2.6)	11 (45.8)	13 (54.2)	

(*Contd...*)

Table 2: (*Continued*)

Variable	Overall *n*=919 (100%)	Pre-guideline period *n*=533 (58.0%)	Post-guideline period *n*=386 (42.0%)	*P*-value
DCIS	31 (31)	6 (19.4)	25 (80.6)	
Mix tumours	211 (23.0)	118 (55.9)	93 (44.1)	
IDCA+LCIS	1 (0.5)	-	1 (100.0)	
IDCA+ILCA	3 (1.4)	1 (33.3)	2 (66.7)	
ILCA+LCIS	8 (3.8)	1 (12.5)	7 (87.5)	
IDCA+DCIS	199 (94.3)	116 (58.3)	83 (41.7)	
Others tumors	12 (1.3)	10 (83.3)	2 (16.7)	
Neuroendocrine	1 (8.3)	1 (100.0)	-	
Papillary	1 (8.3)	1 (100.0)	-	
Metaplastic	4 (33.4)	2 (50.0)	2 (50.0)	
Mucinous	6 (50.0)	6 (100.0)	-	

SLNB: Sentinel lymph node biopsy, DCIS: Ductal carcinoma *in situ*, IDC: Invasive ductal carcinoma, ILC: Invasive lobular carcinoma, LCIS: Lobular carcinoma *in situ*

Table 3: Margin status of participants in the pre- and post-guidelines period

Variable	Overall *n*=919 (100%)	Pre-guideline period *n*=533 (58.0%)	Post- guideline period *n*=386 (42.0%)	*P*-value
Margin status				0.33
Negative	878 (95.5)	506 (57.6)	372 (42.4)	
Positive	41 (4.5)	27 (65.9)	14 (34.1)	
Invasive tumor	38 (92.7)	27 (71.1)	11 (28.9)	
DCIS	3 (7.3)	-	3 (100.0)	
Single	33 (80.5)	20 (60.6)	13 (39.4)	0.07
Anterior	5 (15.2)	4 (80.0)	1 (20.0)	
Deep	8 (24.2)	5 (62.5)	3 (37.5)	
Inferior	5 (15.2)	3 (60.0)	2 (40.0)	
Lateral	3 (9.1)	2 (66.7)	1 (33.3)	
Medial	6 (18.2)	5 (83.3)	1 (16.7)	
Superior	6 (18.2)	1 (16.7)	5 (83.3)	
Double	8 (19.5)	7 (87.5)	1 (12.5)	0.07
Inferior+deep	2 (25.0)	2 (100.0)	-	
Inferior+lateral	2 (25.0)	1 (50.0)	1 (50.0)	
Lateral+superior	1 (12.5)	1 (100.0)	-	
Medial+anterior	1 (12.5)	1 (100.0)	-	
Medial+inferior	1 (12.5)	1 (100.0)	-	
Superior+deep	1 (12.5)	1 (100.0)	-	

DCIS: Ductal carcinoma *in situ*

38 (4.3%) underwent re-excision. Moreover, out of 527 patients, 27 (5.1%) re-excisions were done in the pre-guideline adoption period, and out of 361 patients, 11 (2.8%) re-excisions were

Table 4: Re-excision rate of participants in the pre- and post-guideline period

Variable	Overall *n*=888 (100%)	Pre-guideline period *n*=527 (59.3%)	Post-guideline period *n*=361 (40.7%)	*P*-value
Invasive (margin)				≤0.05[c]
Negative	850 (95.7)	500 (58.8)	350 (41.2)	
Positive (re-excision rate)	38 (4.3)	27 (71.1)	11 (28.9)	

performed in the post-guideline adoption period. Therefore, a statistically significant ($P \leq 0.05$) reduction (2.3%) was seen in the pre and post-guideline adoption period. Of the 38 re-excisions performed, 27 (71.1%) were carried out in the pre-guideline adoption period, and 11 (28.9%) were conducted in the post-guideline adoption period. This resulted in a decline in the re-excision rate from 71.1% to 28.9% ($P \leq 0.05$) after adopting the ASSO-ASTRO guidelines, leading to a statistically significant reduction of 42.2%.

Discussion

The SSO-ASTRO margin guidelines were proposed to address the lack of uniformity in defining a negative margin and the significant variability in the re-excision rate among surgeons.[17,18] SSO-ASTRO margin guidelines aimed to provide clear and evidence-based recommendations for margin widths to ensure promising BCS and reduce the need for re-excision.[17,18] The guidelines were developed through a rigorous process of previous experiences and expert consensus, taking into account the latest available evidence and expert opinion. By providing clear guidance on margin widths, the SSO-ASTRO margin guidelines aim to improve the outcomes of BCS for patients with Stages I and II of invasive breast cancer.[17,18] The present study assessed the impact of adopting SSO-ASTRO margin guidelines on the re-excision rates. The finding revealed a noteworthy decrease in re-excision rates, dropping from 71.1% to 28.9% after adopting these guidelines. This finding is consistent with previous studies that reported a reduction in the overall re-excision rate after implementing similar guidelines.[17,19-22] The SSO-ASTRO margin guidelines clarify margin definitions, reduce surgeries, and improve outcomes for breast cancer patients undergoing BCS.

Margin re-excisions can have significant implications for both patients and the health-care system.[20] For patients, these additional surgeries can result in increased pain, scarring, and a more extended recovery period, as well as decreased quality of life and a heightened risk of complications. On the other hand, re-excisions also place a burden on the health-care system, increasing costs and resource utilization.[23,24] In addition, multiple surgeries can reduce the overall efficacy of the treatment, leading to a lower chance of successful outcomes for patients. Furthermore, significant delays in adjuvant therapy can occur due to the re-excision procedure. Delays in adjuvant therapy can lead to decreased treatment efficacy and potentially compromise the overall success of the therapy.[16] In addition, re-excision can result in cosmetic disfigurement due to the scarring that occurs from repeated surgical procedures. This can have a significant emotional impact on the patient, leading to decreased self-esteem, anxiety, and depression.[25] The physical and emotional stress of undergoing repeated surgeries can also take a financial toll on the patient, as they may incur additional medical costs and compromised quality of life.[26-28] These consequences highlight the importance of reducing the need for margin re-excisions and maximizing the effectiveness of initial surgical procedures.

Multiple comparative studies have been conducted to compare the outcomes of oncoplastic and non-oncoplastic BCS.[29-32] The results of these studies indicate that there is no significant difference in terms of survival outcomes, recurrence

rates, or quality of life between the two surgical approaches.[30-32] In addition, the studies suggest that oncoplastic surgery may lead to improved cosmetic outcomes, including better symmetry and reduced deformity rates, compared to conventional BCS.[30-32] The SSO-ASTRO margin guidelines are relevant to oncoplastic surgery because they guide how much tissue needs to be removed to reduce the risk of recurrence. The use of oncoplastic techniques may allow for wider excision margins while still maintaining the cosmetic outcome, which is important in ensuring good oncologic outcomes while preserving the breast appearance.

In addition, the results demonstrated that while radio-guided localization was quicker, wire-guided localization displayed a slightly higher level of accuracy.[33,34] Wire localization procedures for non-palpable lesions are routinely performed at our institution. Both radio-guided and wire-guided localization techniques are deemed safe and effective for localizing non-palpable breast lesions.[33,34] The COVID-19 pandemic has resulted in substantial disruptions to the provision of breast cancer care, emphasizing the importance of guaranteeing timely and appropriate treatments for patients to mitigate the potential risks associated with delays.[35,36] Adopting the SSO-ASTRO margin guidelines may have a significant impact on providing breast cancer care to patients in future public health emergencies.

The study presents a clear and positive impact of implementing the SSO-ASTRO margin guidelines on re-excision rates. The statistically significant reduction in re-excision rates provides compelling evidence for the practical effectiveness of these guidelines within clinical practice. The comprehensive analysis involving a substantial cohort of 919 patients, covering both pre- and post-guideline periods, enables robust comparisons and yields meaningful insights into the influence of the guidelines on re-excision rates. The clinical relevance of the reduction in re-excision rates underscores the study's contribution to enhancing patient outcomes and treatment success, offering practical insights for health-care professionals. However, the current study also carries some limitations, including the study's retrospective design, which limits data control and may introduce selection bias. Its focus on one institution may hinder generalizability to diverse healthcare settings. Despite highlighting guideline benefits, ongoing prospective multi-center research and longer follow-up are needed to comprehend their role in enhancing breast cancer surgery outcomes.

The rate of margin re-excisions may have a significant impact on the quality of life of breast cancer patients. Although re-excisions are sometimes inevitable, implementing the SSO-ASTRO margin guidelines can reduce the variation in re-excision rates. At our hospital, adopting these guidelines resulted in a significant decrease in the re-excision rate. Continued adherence to these guidelines is expected to result in further reduction. Based on the observed benefits, it is suggested to maintain adherence to these guidelines in the future. Further research is necessary to determine the impact of these guidelines on overall survival and disease-free outcomes in a larger patient population.

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Author Contributions

Conceived and designed the analysis: NM, KA, ZC, AP, and AK; Collected the data: NM, MA, AAM, BR, BS, and NF; Contributed data or analysis tools: MA, ZC, AP, and AK; Performed the analysis: KA, MH, AAM, BR, BS, and NF; Wrote the paper: NM, KA, MH, ZC, AP, and AK.