Ann Surg Oncol (2019) 26:2444–2451
https://doi.org/10.1245/s10434-019-07251-9

Annals of
SURGICAL ONCOLOGY
OFFICIAL JOURNAL OF THE SOCIETY OF SURGICAL ONCOLOGY

ORIGINAL ARTICLE – BREAST ONCOLOGY

Psychosocial Functioning in Women with Early Breast Cancer Treated with Breast Surgery With or Without Immediate Breast Reconstruction

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ABSTRACT

Purpose. To compare psychosocial function outcomes in early breast cancer patients treated with breast-conserving surgery (BCS), mastectomy alone (MA), and mastectomy with immediate breast reconstruction (IBR) at 1 year after surgery.

Methods. Early-stage (stage 0–2) breast cancer patients treated with BCS, MA, and IBR at the University Health Network, Toronto, Ontario, Canada between May 1 2015 and July 31 2016 were prospectively enrolled. Their changes in psychosocial functioning from baseline to 12 months following surgery were compared by using the BREAST-Q, Hospital Anxiety and Depression Scale, and Impact of Event Scale with ANOVA and linear regression.

Results. There were 303 early-stage breast cancer patients: 155 underwent BCS, 78 MA, and 70 IBR. After multivariable regression accounting for age, baseline score, income, education, receipt of chemoradiation or hormonal therapy, ethnicity, cancer stage, and unilateral versus bilateral surgery, breast satisfaction was highest in BCS (72.1, SD 19.6), followed by IBR (60.0, SD 18.0), and MA (49.9, SD 78.0) at 12 months, $p < 0.001$. Immediate breast reconstruction had similar psychosocial well-being (69.9, SD 20.6) compared with BCS (78.5, SD 20.6), $p = 0.07$. Sexual and chest physical well-being were similar between IBR, BCS, and MA, $p > 0.05$.

Conclusions. Our study found that in a multidisciplinary breast cancer centre where all three breast ablative and reconstruction options are available to early breast cancer patients, either BCS or IBR can be used to provide patients with a higher degree of satisfaction and psychosocial well-being compared with MA in the long-term.

Significant improvements have been made in the management of breast cancer; survivorship for early-stage breast cancer is $> 93\%$ at 5 years.[1] Early-stage breast cancer patients can undergo three different surgical interventions: breast-conserving surgery (BCS), mastectomy alone (MA), and mastectomy with immediate breast reconstruction (IBR).[2,3] Several high-quality studies have compared these and found that oncological outcomes for early-stage breast cancer patients are similar regardless of the type of surgery performed.[4–12]

Despite similar oncological outcomes, each intervention has a different impact on patients' psychosocial functioning.[11,13–16] Previous research has compared psychosocial outcomes in breast cancer patients by type of surgery.[17–22] The majority of research suggests that MA has the greatest impact on quality of life (QoL), leading to the lowest well-being long-term.[17–22] However, there is less consensus on the differences in psychosocial outcomes when comparing BCS and IBR. Studies have differing conclusions with regards to the impact of each surgical procedure on breast satisfaction, as well as physical, psychosocial, and sexual

First Received: 20 July 2018;
Published Online: 6 May 2019

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well-being. Some studies report that BCS leads to higher QoL, whereas others find that IBR provides patients with the highest satisfaction and well-being.[17–19]

With a short timeframe available after a breast cancer diagnosis for patients to select a surgical treatment, it is important to have high-quality evidence on the impact of surgical decision on psychosocial functioning to help patients make informed decisions.[23–26] Furthermore, conducting longitudinal research will improve our understanding of the impact of different surgical procedures on psychosocial functioning of patients over time.[19] The goal of this longitudinal prospective cohort study was to compare psychosocial functioning and breast satisfaction between BCS, MA, and IBR in early-stage breast cancer patients using both a breast-specific as well as generic measurement tools.

METHODS

After receiving approval from the research ethics board, adult female breast cancer patients treated at the University Health Network (Toronto, Canada) between May 1, 2015 and July 31, 2016 were approached for participation in the study. Eligible subjects included women with a new diagnosis of early-stage (stage 0–2) breast cancer. Patients were excluded if they had advanced-stage breast cancer (stage 3 and 4), recurrent breast cancer, or underwent surgery for prophylactic reasons.

Outcome Measures

At baseline, patient characteristics (age, ethnicity, education, income, marital status, and comorbidities) were collected. At baseline (preoperatively), 6 and 12 months, patients completed psychosocial functioning questionnaires, including the BREAST-Q, Hospital Anxiety and Depression Scale (HADS), and Impact of Event Scale (IES). Surgical characteristics (type of breast cancer surgery and unilateral vs. bilateral surgery) were noted at the time of surgery. Chart review was performed to obtain preoperative clinical breast cancer stage (based on the 7th Edition American Joint Committee on Cancer) and determine whether patients received chemotherapy, radiation, and/or hormonal therapy during the study period.

BREAST-Q

BREAST-Q is a validated, procedure-specific, patient-reported outcome instrument used to quantify patient satisfaction and health-related QoL, through different modules.[27,28] The instrument measures the impact of breast surgery using different modules that examine: (1) psychosocial well-being, (2) physical well-being, (3) sexual well-being, and (4) satisfaction with breasts.[29] Each module is scored from 0 to 100; higher scores represent more satisfaction or improved QoL.

Hospital Anxiety and Depression Scale

The HADS is a 14-item, self-report questionnaire that can facilitate the detection of depression and anxiety in medical and surgical patients.[8,29–31] The HADS was first validated in the setting of a hospital outpatient clinic, although it has now been validated in a variety of settings.[30,31] This validated questionnaire provides patients with four choices per item, scored 0–3. The questionnaire generates anxiety and depression score, with a score of 0–7 being normal, 8–10 mild, 11–14 intermediate, and 15–21 severe.[32]

Impact of Event Scale

The IES is a self-reported validated 15-item questionnaire used to measure current subjective distress related to an event.[33] The IES scale is used in oncology to measure cancer-related anxiety.[33–35] Each item is rated on a 5-point scale ranging from 0 (“not at all”) to 5 (“often”). The IES provides three scores: (1) intrusive symptoms (intrusive thoughts, nightmares, intrusive feelings, and imagery), (2) avoidance symptoms (numbing of responsiveness, avoidance of feelings, situations, ideas), and (3) total subjective stress. Higher scores represent greater stress: 0–8 subclinical range, 9–25 mild, 26–43 moderate, and 44+ severe.[33]

Statistical Analysis

Summary statistics were generated for the entire study sample. Categorical factors were assessed using frequencies and percentages. Continuous factors were assessed using mean and standard deviation (SD). Categorical factors were compared using the Chi square test or the Fisher’s exact test, as appropriate. Continuous factors were compared using ANOVA.

Outcomes were compared between surgical procedures: (1) BCS, (2) MA, or (3) IBR. ANOVA was used to evaluate differences between the surgical groups with regards to the mean scores IES, HADS, and the four BREAST-Q domains. Multivariable linear regression was used to evaluate differences in the BREAST-Q, HADS, and IES scores at 12 months, adjusting for patient’s age, income, educational level, ethnicity, cancer stage, surgery laterality, baseline score, and receipt of chemotherapy, radiation, or hormonal therapy. All statistical analyses were performed with the SAS Studio University Edition, version 3.6 (SAS Institute Inc, Cary, NC).

RESULTS

A total of 303 early-stage breast cancer patients (stage 0–2) were prospectively enrolled: 155 underwent BCS, 78 MA, and 70 IBR (Table 1). There were significant differences in the mean ages of patients at baseline ($p < 0.001$). Patients who underwent BCS were older at baseline (59.7 years, SD 12.2) compared with MA (54.5 years, SD 12.8) and IBR (47.5 years, SD 9.2). Radiation was performed more frequently in patients who underwent MA (61.8%) or BCS (91.1%) compared with IBR (20.6%) ($p < 0.001$). In the IBR group, 70% of patient underwent bilateral mastectomy (therapeutic mastectomy of the affected side with contralateral prophylactic mastectomy) and bilateral IBR. The proportion of patients undergoing bilateral breast surgery was significantly greater (70%) in the IBR group compared with BCS (4.5%) or MA (26.9%) ($p < 0.001$). Also, women with IBR more frequently had in situ breast disease (30.9%) compared with BCS (1.3%) and MA (9.2%) ($p < 0.001$).

At baseline, the three groups had similar BREAST-Q breast satisfaction and psychosocial well-being scores (Table 2). The BREAST-Q chest physical well-being score was highest in the BCS group with a mean score of 88.9 (SD 15.3) compared with 74.6 (SD 13.8) in the MA and 78.2 (SD 13.8) in the IBR group ($p < 0.001$). Sexual well-being also was highest in BCS at 61.1 (SD 19.8) compared with 58.1 (SD 18.5) in IBR and 48.0 (SD 25.4) in MA ($p = 0.003$). The mean depression and anxiety scores were similar between groups ($p > 0.05$). The mean IES total score was highest in the MA group at 32.6 (SD 15.1) compared with BCS (29.0, SD 16.5) and IBR (27.8, SD 14.7) as shown in Table 3 ($p = 0.019$).

TABLE 1 Patient and breast cancer characteristics of the cohort

	All $N = 303$	BCS $N = 155$	IBR $N = 70$	MA $N = 78$	p value
Age, mean (SD)	55.6 (12.7)	59.7 (12.2)	47.5 (9.2)	54.5 (12.8)	< 0.001
Comorbidities, *n* (%)					0.88
None	206 (70.1)	107 (71.3)	47 (68.1)	52 (69.3)	
One or more	88 (29.9)	43 (28.7)	22 (31.9)	23 (30.7)	
Education, *n* (%)					0.26
None or some university	74 (24.5)	42 (27.1)	12 (17.1)	20 (26.0)	
University or more	228 (75.5)	113 (72.9)	58 (82.9)	57 (74.0)	
Income, *n* (%)					0.14
Less than $40,000/year	76 (27.6)	41 (29.1)	12 (18.5)	23 (33.3)	
More than $40,000/year	199 (72.4)	100 (70.9)	53 (81.5)	46 (66.7)	
Ethnicity, *n* (%)					0.034
Caucasian	198 (65.6)	101 (65.2)	53 (76.8)	44 (56.4)	
Non-Caucasian	104 (34.4)	54 (34.8)	16 (23.2)	34 (43.6)	
Marital status, *n* (%)					0.91
Single	121 (40.3)	64 (41.6)	27 (39.1)	30 (39.0)	
Married	179 (59.7)	90 (58.4)	42 (60.9)	47 (61.0)	
Receipt of chemotherapy, *n* (%)	144 (49.2)	61 (41.5)	30 (44.1)	53 (68.0)	0.001
Receipt of radiation, *n* (%)	194 (66.9)	133 (91.1)	14 (20.6)	47 (61.8)	< 0.001
Receipt of hormonal therapy, *n* (%)	163 (58.2)	87 (60.8)	26 (40.0)	50 (69.4)	0.002
Unilateral versus bilateral surgery, *n* (%)					< 0.001
Unilateral	226 (74.6)	148 (95.5)	21 (30.0)	57 (73.1)	
Bilateral	77 (25.4)	7 (4.5)	49 (70.0)	21 (26.9)	
Cancer stage, *n* (%)					< 0.001
In situ	26 (9.2)	2 (1.3)	17 (30.9)	7 (9.2)	
Stage 1	173 (60.9)	110 (71.9)	28 (50.9)	35 (46.1)	
Stage 2	85 (29.9)	41 (26.8)	10 (18.2)	34 (44.7)	

BCS breast-conserving surgery; *MA* mastectomy alone; *IBR* mastectomy with immediate breast reconstruction

TABLE 2 Baseline and 12-month BREAST-Q questionnaire scores

	BCS	IBR	MA	*p* value unadjusted	*p* value adjusted
Baseline					
Breast satisfaction, mean (SD)	67.8 (24.6)	63.5 (21.7)	63.0 (22.4)	0.26	0.16*
Psychosocial well-being, mean (SD)	70.6 (18.9)	69.3 (18.9)	70.8 (19.5)	0.99	0.60*
Chest physical well-being, mean (SD)	88.9 (15.3)	78.2 (13.8)	74.6 (13.8)	< 0.001	< 0.001*
Sexual well-being, mean (SD)	61.1 (19.8)	58.1 (18.5)	48.0 (25.4)	0.003	0.008*
12-Month					
Breast satisfaction, mean (SD)	72.1 (19.6)	60.0 (18.0)	49.9 (78.0)	< 0.001	< 0.001**
Psychosocial well-being, mean (SD)	78.5 (20.4)	69.9 (20.6)	64.1 (20.0)	< 0.001	< 0.001**
Chest physical well-being, mean (SD)	74.2 (18.3)	71.5 (15.1)	60.6 (21.3)	0.0002	0.27**
Sexual well-being, mean (SD)	58.8 (19.7)	47.7 (21.5)	51.3 (24.0)	0.033	0.82**

*Adjusted for age, ethnicity, education, income, and cancer stage

**Adjusted for age, baseline score, ethnicity, education, income, cancer stage, unilateral versus bilateral surgery, receipt of chemotherapy/radiation/hormonal therapy

SD standard deviation; *BCS* breast-conserving surgery; *MA* mastectomy alone; *IBR* mastectomy with immediate breast reconstruction

TABLE 3 Baseline and 12-month Hospital Anxiety and Depression Scale (HADS) and Impact of Event Scale (IES) questionnaire scores

	BCS	IBR	MA	*p* value unadjusted	*p* value adjusted
HADS					
Baseline					
Anxiety, mean (SD)	8.4 (4.9)	8.6 (4.7)	8.9 (4.4)	0.87	0.65*
Depression, mean (SD)	3.8 (3.6)	4.2 (3.3)	4.7 (3.8)	0.077	0.40*
12-Month					
Anxiety, mean (SD)	5.6 (4.5)	6.1 (4.8)	6.0 (4.3)	0.68	0.75**
Depression, mean (SD)	3.2 (3.9)	3.3 (3.3)	3.3 (3.2)	0.59	0.58**
IES					
Baseline					
Total, mean (SD)	29.0 (16.5)	27.8 (14.7)	32.6 (15.1)	0.019	0.012*
Intrusion, mean (SD)	13.7 (8.9)	14.6 (8.7)	15.2 (7.8)	0.36	0.19*
Avoidance, mean (SD)	15.3 (9.4)	13.2 (7.9)	17.4 (8.9)	0.001	0.003*
12-Month					
Total, mean (SD)	18.2 (17.4)	19.6 (18.2)	18.6 (17.6)	0.94	0.055**
Intrusion, mean (SD)	8.1 (8.3)	9.2 (8.8)	8.2 (8.3)	0.91	0.25**
Avoidance, mean (SD)	10.1 (10.1)	10.4 (10.7)	10.4 (10.4)	0.73	0.020**

SD standard deviation, *BCS* breast-conserving surgery, *MA* mastectomy alone, *IBR* mastectomy with immediate breast reconstruction

*Adjusted for age, ethnicity, education, income, and cancer stage

**Adjusted for age, baseline score, ethnicity, education, income, cancer stage, unilateral versus bilateral surgery, receipt of chemotherapy/radiation/hormonal therapy

Table 4 reports on the multivariable linear regression for outcomes at 12 months. BREAST-Q breast satisfaction scores were significantly higher in the BCS group compared with MA ($p < 0.001$) and IBR groups ($p = 0.008$). Women with IBR had significantly higher mean breast satisfaction scores compared with women with MA ($p = 0.046$). With regards to psychosocial well-being, IBR patients had similar scores to BCS or MA patients ($p > 0.05$). MA patients had significantly lower psychosocial well-being than BCS patients ($p < 0.001$). Mean scores for chest physical well-being, sexual well-being, anxiety, and depression were similar in all three groups

TABLE 4 Linear regression model with beta-coefficients of factors associated with the 12-month scores

Predictor	Unadjusted beta coefficient (95% CI)	*p* value	Adjusted beta coefficient[a] (95% CI)	*p* value
BREAST-Q				
Satisfaction breast				
MA versus BCS	−24.5 (−30.2 to −18.8)	< 0.001	−22.9 (−30.2 to −15.6)	< 0.001
IBR versus BCS	−12.8 (−19.0 to −6.5)	< 0.001	−13.9 (−24.0 to −3.7)	0.008
IBR versus MA	11.7 (4.6–18.9)	0.001	9.0 (0.2–17.8)	0.046
Psychosocial well-being				
MA versus BCS	−16.6 (−22.8 to −10.4)	< 0.001	−16.6 (−23.5 to −9.8)	< 0.001
IBR versus BCS	−8.6 (−15.4 to −1.9)	0.013	−8.8 (−18.4 to 0.8)	0.073
IBR versus MA	8.0 (0.2–15.7)	0.043	7.8 (−0.6 to 16.3)	0.068
Chest physical well-being				
MA versus BCS	−11.9 (−17.6 to −6.2)	< 0.001	−5.1 (−12.1 to 2.0)	0.16
IBR versus BCS	−2.3 (−8.4 to 3.8)	0.45	−0.4 (−9.8 to 9.0)	0.94
IBR versus MA	9.6 (2.5–16.6)	0.008	4.7 (−3.4 to 12.8)	0.26
Sexual well-being				
MA versus BCS	−8.3 (−15.6 to −0.9)	0.028	−1.9 (−10.9 to 7.2)	0.68
IBR versus BCS	−8.4 (−16.2 to −0.7)	0.033	−3.8 (−15.8 to 8.2)	0.53
IBR versus MA	−0.2 (−8.7 to 8.3)	0.97	−1.9 (−12.1 to 8.2)	0.71
HADS				
Anxiety				
MA versus BCS	0.4 (−0.9 to 1.8)	0.52	−0.5 (−2.0 to 0.9)	0.46
IBR versus BCS	−0.3 (−1.7 to 1.2)	0.71	−0.5 (−2.5 to 1.5)	0.63
IBR versus MA	−0.7 (−2.4 to 0.9)	0.40	0.1 (−1.7 to 1.8)	0.94
Depression				
MA versus BCS	0.5 (−0.5 to 1.6)	0.31	−0.6 (−1.9 to 0.6)	0.31
IBR versus BCS	0.1 (−1.0 to 1.3)	0.81	−0.6 (−2.3 to 1.1)	0.49
IBR versus MA	−0.4 (−1.7 to 0.9)	0.54	0.0 (−1.4 to 1.5)	0.96
IES total score				
MA versus BCS	0.6 (−4.8 to 6.0)	0.82	−5.4 (−12.6 to 1.9)	0.15
IBR versus BCS	−0.5 (−6.4 to 5.4)	0.86	3.7 (−5.4 to 12.8)	0.42
IBR versus MA	−1.1 (−7.8 to 5.6)	0.74	9.1 (1.2–16.9)	0.024

BCS breast-conserving surgery, *MA* mastectomy alone, *IBR* mastectomy with immediate breast reconstruction, *HADS* Hospital Anxiety and Depression Scale, *IES* Impact of Event Scale

*Adjusted for age, baseline score, ethnicity, education, income, cancer stage, unilateral versus bilateral surgery, receipt of chemotherapy/radiation/hormonal therapy

($p > 0.05$). The IES total score was similar for women with MA and IBR compared with women with BCS ($p > 0.05$). Women with IBR had significantly higher mean scores for total cancer-related distress (total IES) compared with women with MA ($p = 0.024$).

Figure 1 shows the longitudinal changes in BREAST-Q scores for all three procedures from baseline to 12 months. For breast satisfaction and psychosocial well-being, divergent patterns are seen between baseline and 12 months. As early as 6 months postoperatively, the changes in the scores are apparent with BCS providing the highest satisfaction or well-being. At 12 months, the difference in scores is more pronounced. For chest physical and sexual well-being, scores decrease between baseline and 6 months as expected and have minimal variation thereafter (Fig. 1c, d).

DISCUSSION

This prospective, longitudinal study compared the psychosocial functioning outcomes in 303 consecutive early breast cancer patients who underwent BCS, MA or IBR at a single tertiary care center. At our breast center, all early-stage breast cancer patients should be presented with all three surgical options per our Ontario breast reconstruction clinical guidelines implemented since 2015.[36] At

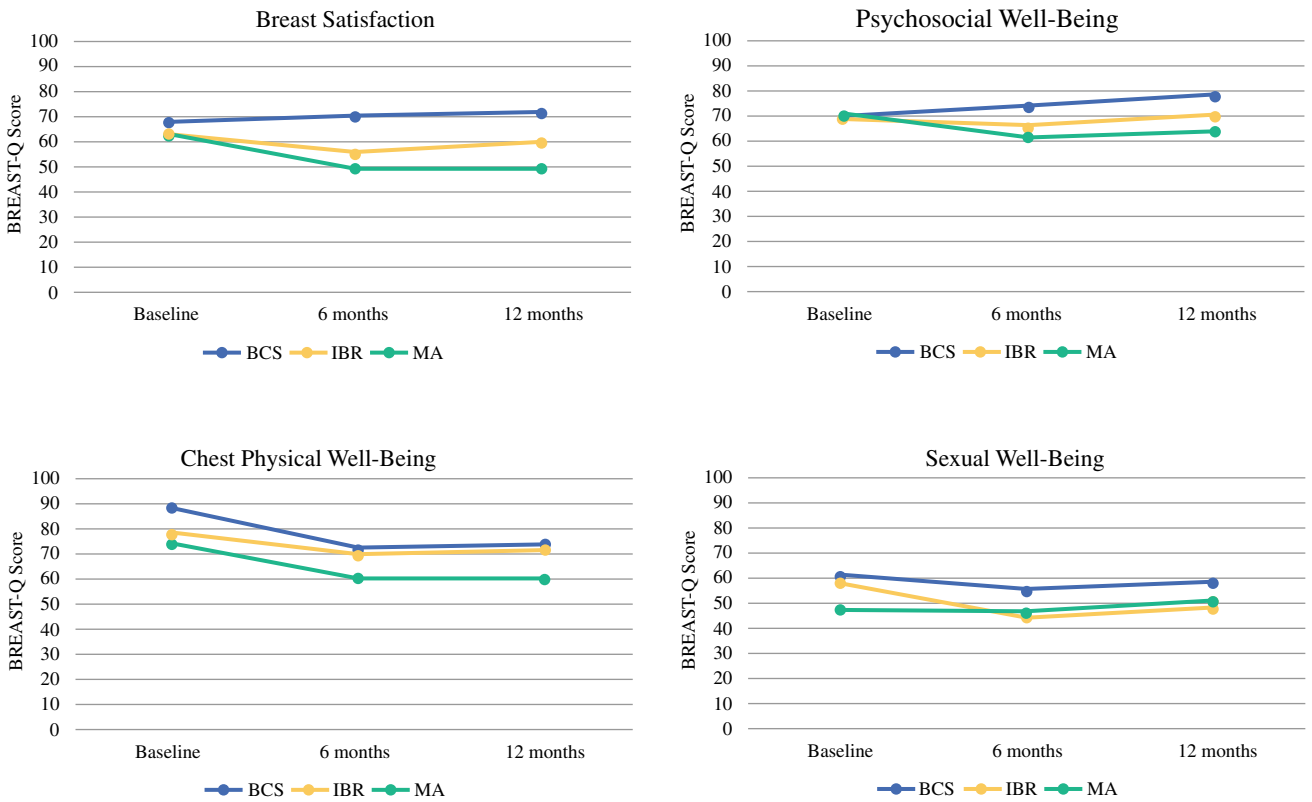

FIG. 1 BREAST-Q score from baseline to 12 months postoperatively. **a** BREAST-Q Breast satisfaction domain. **b** BREAST-Q Psychosocial well-being domain. **c** BREAST-Q Chest Physical well-being domain. **d** BREAST-Q Sexual well-being domain

12 months, the BREAST-Q breast satisfaction score was significantly higher in the BCS group compared with MA and IBR. With regards to psychosocial well-being, IBR patients had similar scores to BCS and MA patients, whereas MA patients experienced significantly lower well-being compared with BCS. For chest physical and sexual well-being as well as HADS, all three groups had comparable scores at 12 months. Lastly, for the IES total score, BCS was similar to MA or IBR, but IBR led to greater stress compared to MA.

This study provides new insights into differences in psychosocial functioning at baseline between MA, BCS, and IBR. Patients who underwent MA experienced significantly higher levels of stress before their surgery compared with the BCS or IBR patients. This may be due to a higher proportion of stage 2 cancer in the MA group (44.7%) compared with the BCS (26.8%) and IBR (18.2%). Thus, the greater negative impact of the diagnosis of breast cancer on their well-being. It also is plausible that patients experiencing more stress around their diagnosis of breast cancer may self-select the surgical option that completely removes their breasts without a concomitant procedure. A third plausible explanation is that patients with stage 2 breast cancer are less likely to be referred to plastic surgeons for IBR due to the slightly elevated possibility that they may require postmastectomy radiation. Furthermore, we found the chest physical well-being of BCS patients at baseline to be significantly higher than the IBR and MA patients. It is likely that patients who underwent BCS had relatively smaller tumours in favourable anatomical locations, whereas patients with larger tumours in a cosmetically sensitive region of the breast were likely counselled instead to undergo MA with or without breast reconstruction. Therefore, BCS, MA, and IBR patients had different baseline cancer stage and may have had different anatomical or tumour characteristics, likely explaining the variations in the baseline scores.

Our long-term findings that breast satisfaction is highest in BCS patients is not consistently supported by the literature. Howes et al., Lagendijk et al., and Atisha et al. reported that breast satisfaction was higher in IBR patients compared with BCS patients.[18,37,38] However, studies by Fung et al., Kim et al., and Chand et al. support our findings that BCS provides higher satisfaction compared with IBR.[13,22,39] These inconsistencies in the literature may be due to the use of different questionnaires in each study to evaluate patients' psychosocial functioning. In our study, we used a validated and procedure-specific questionnaire, the BREAST-Q, which strengthens the validity of our conclusions. Furthermore, these differences may be

explained by the selection of patients for BCS at our institution by our breast surgeons. Although we did not specifically review the surgical details, the patients in the BCS group likely had tumour and anatomical characteristics that were favourable for this treatment option, thus reporting high satisfaction with this procedure. Patients who had tumours unfavourable to undergo BCS or patients who desired to have the entire breast removed were likely counselled by their breast surgeon to undergo mastectomy with or without immediate breast reconstruction. Also, breast surgeons at our institution are experts in oncoplastic techniques for BCS, providing excellent breast cosmesis to patients who undergo BCS. Thus, our finding that BCS patients had higher breast satisfaction compared with IBR may be partly explained by the selection of patients for BCS versus IBR and by breast surgeons expertise in oncoplastic techniques at our center.

Our findings that IBR and BCS patients have similar psychosocial, physical, and sexual well-being are supported by some literature.[13,18,20,22,39–42] Howes et al.[18] found that psychosocial well-being was similar between the groups using the BREAST-Q. Jagsi et al.[20] similarly found no differences in social well-being, emotional well-being, and functional well-being between the groups. Aguiar et al.[41] found that implant-based IBR and MA patients had similar physical and sexual well-being. Chand et al.[13] found that physical and emotional wellbeing were similar between BCS, MA, and IBR but interestingly found that sexual well-being was the lowest for BCS patients. Furthermore, our long-term findings that psychosocial functioning was most preserved following BCS or IBR compared with MA were supported by several studies. In fact, Atisha et al.[37] found that abdominal flap breast reconstruction yielded the highest satisfaction, with MA patients having the lowest satisfaction. Kim et al.[39] found that BCS and IBR enhanced QoL compared with MA. Overall, our study aligns with the existing literature in that IBR or BCS provide higher well-being compared with MA. These findings encourage the use of both BCS and IBR, because the IBR and BCS patients both report their physical well-being of the chest, psychosocial, and sexual well-being to be well preserved 1-year following surgery.

Our study is limited by the presence of selection bias. Due to the nonrandomized nature of the study, the choice of surgical procedure was based on patient preference and surgeon recommendations. To account for this limitation, multivariable regression was performed. Of note, we attempted to include as many clinically important factors in the regression, but not all factors (e.g., extent of resection for BCS) were available to be included. A randomized trial could reduce this bias but would not be possible, because randomizing patients to different surgeries would not be ethical. In addition, because the type of surgery performed was based on patient's preference and cancer characteristics, we could not guarantee that every patient was seen in consultation with a plastic surgeon. However, per our provincial clinical breast reconstruction guidelines and our institutional policy, all eligible patients should have been offered all three surgical options.[36] Lastly, our study is limited by the inclusion of a single institution; however, this is a high-volume tertiary breast cancer center with nine full-time breast surgeons and plastic surgeons. Despite these limitations, the prospective longitudinal study design and rigorous analysis techniques make our study findings a valuable addition to the literature.

CONCLUSIONS

We found that, in a multidisciplinary breast cancer centre where all three surgical options are available to early stage breast cancer patients, both BCS and IBR can be used to provide patients with a high degree of satisfaction and psychosocial well-being compared with MA in the long-term. MA, on the other hand, is more frequently used in patients with more advanced disease and higher existing stress, resulting in poorer long-term postoperative satisfaction and psychosocial well-being. This vulnerable group of patients should be examined in greater detail to see what targeted interventions may be most appropriate to help them cope with their breast cancer and support their decision-making.

DISCLOSURE Dr. Toni Zhong is the Belinda Stronach Chair of University Health Network Breast Cancer Reconstructive Surgery and the recipient of the Canadian Institutes of Health Research (CIHR), Foundation Scheme Live Pilot.

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