

Patient-Reported Outcomes following Breast Conservation Therapy and Barriers to Referral for Partial Breast Reconstruction

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Background: The purpose of this study was to evaluate the self-reported aesthetic outcome of breast conservation therapy in a generalized sample of patients, and to describe potential barriers to referral for partial breast reconstruction. **Methods:** Consecutive breast conservation therapy patients completing radiotherapy over a 1-year period at a regional cancer center were identified. Eligible patients were contacted by means of mail/e-mail and invited to participate. Participants completed the BREAST-Q breast conservation therapy module along with a questionnaire examining feelings about breast reconstruction. Multiple regression analysis was performed using the satisfaction with breasts scale as the dependent variable.

Results: Surveys were completed by 185 of 592 eligible participants (response rate, 31.3 percent; mean age, 61 years) an average of 38 months after lumpectomy. The mean score for the BREAST-Q satisfaction with breasts scale was 59 of 100. Younger age ($p = 0.038$), lumpectomy reexcision ($p = 0.018$), and lumpectomy at a nonacademic center ($p = 0.026$) were significantly associated with lower satisfaction. Bra size, months from lumpectomy, and tumor quadrant/size were not significantly associated with satisfaction ($p > 0.05$). The most common statements regarding reconstruction were “I don’t feel the need for it” (60.0 percent), “I don’t like the thought of having breast implants” (22.7 percent), and “I don’t want any more surgeon/doctor visits” (22.2 percent). Before lumpectomy, only 1.6 percent had a consultation for reconstruction, and only 22.7 percent were aware of this option. If offered, 33.1 percent of patients would have attended this consultation.

Conclusion: There is an unmet demand for partial breast reconstruction, with an opportunity to advocate and increase awareness on behalf of patients undergoing breast conservation therapy. (*Plast. Reconstr. Surg.* 141: 1, 2018.)

Breast conservation therapy is the most commonly performed treatment for early-stage breast cancer today.¹ This approach involves tumor excision with minimal margins (lumpectomy), sentinel lymph node biopsy, and postoperative radiation therapy. Although the long-term oncologic safety and efficacy of this approach have been well described,²⁻⁵ patient satisfaction from an aesthetic perspective is not fully understood.

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For nearly four decades, multiple authors have investigated aesthetic outcomes following breast conservation therapy using ad hoc scoring or non-validated rating scales⁶⁻³⁰; however, a lack of well-developed, validated measurement tools limits the clinical applicability and generalizability of these studies. With the advent of the BREAST-Q, a validated patient-reported outcome measure, investigators are better equipped to quantify patient satisfaction following a surgical intervention. The BREAST-Q has been used increasingly in aesthetic and reconstructive surgery,³¹ and only recently has a breast conservation therapy-specific module been available.³²

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Revisiting aesthetic outcomes following breast conservation therapy in the era of patient-reported outcome measures is of particular value given the popularization and acceptance of the oncoplastic approach to partial breast reconstruction.³³ If a significant portion of patients undergoing breast conservation therapy is found to have poor satisfaction with aesthetic outcome, there would be an impetus for plastic surgeons to become more involved in the multidisciplinary breast cancer team. A recent survey of American Society of Plastic Surgeons members found that half of respondents felt that partial breast reconstruction was limited in their practice because of limited referrals.³⁴ Recently, many studies have reported on barriers to postmastectomy breast reconstruction, identifying significant factors such as age, race, socioeconomic status, geographic location, insurance plan, hospital resources, and disease stage as significant factors.^{35–44} To date, no study has investigated barriers to partial breast reconstruction from the patient perspective.

A pilot project at our institution looked at a sample of breast conservation therapy patients who were referred to plastic surgery for consultation regarding possible partial breast reconstruction. Using patient-reported outcome measures, it was shown that breast conservation therapy had a significant negative aesthetic impact in this small, selected cohort. In addition, barriers to reconstruction were identified, including a lack of discussion between treating physicians and breast conservation therapy patients with regard to aesthetic impact, and a lack of understanding of the role of oncoplastic surgery. The purpose of this study was to evaluate, in a generalized sample of breast conservation therapy patients, the self-reported aesthetic impact of breast conservation therapy using the BREAST-Q breast conservation therapy module, and to describe potential barriers to referral for partial breast reconstruction faced by this population.

PATIENTS AND METHODS

Study Population

The study population consisted of consecutive patients with breast cancer undergoing breast conservation therapy at a large regional cancer center over a 1-year period. A prospectively maintained radiation oncology database was queried for patients with *International Classification of Diseases, Ninth Revision*, codes for breast cancer who completed radiotherapy as part of breast conservation

therapy at Sunnybrook Health Sciences Centre between May 1, 2012, and April 30, 2013. The participant selection procedure is shown in Figure 1. A retrospective chart review was performed to collect data on tumor characteristics. This study was approved by the Research Ethics Board at Sunnybrook Health Sciences Centre (no. 024-2014).

Our inclusion criteria were female breast cancer patients aged 18 years or older who completed breast conservation therapy (lumpectomy and radiotherapy) and were able to read and write in English. We excluded patients with recurrent or bilateral breast cancer, those who went on to require completion mastectomy, those who had died, those with metastatic spread, and those who could not complete the survey for medical reasons (e.g., dementia).

Initially, 695 patients were identified and mailed a letter of introduction with an invitation to participate in the study. For those patients who did not reply to the initial invitation, three follow-up telephone calls were attempted, after which 178 patients were deemed unreachable. Of the remaining potential participants, 152 declined participation and 103 were excluded (Fig. 1). In total, 262 of 592 eligible patients agreed to participate and were sent the survey and BREAST-Q by means of secure e-mail, or by means of mail with a postage-paid envelope, depending on their preference. Consent was implied by participants returning their completed surveys.

Survey

Before initiating the current study, our group organized an information session for patients referred for reconstruction following breast conservation therapy. Patient responses to a general questionnaire were adapted to develop the survey used in the current study. The survey collected demographic information and a summary of breast cancer treatment. Participants were asked about possible aesthetic outcomes discussed by their surgical oncologist before their lumpectomy. Our pilot study was used to design questions related to participants' feelings about breast reconstruction, and potential barriers to reconstruction.

BREAST-Q

The BREAST-Q is a validated patient-reported outcome instrument with various modules related to cosmetic and reconstructive breast surgery.³¹ Our study used the breast conservation therapy module to assess patient satisfaction and health-related quality of life across nine domains. Each

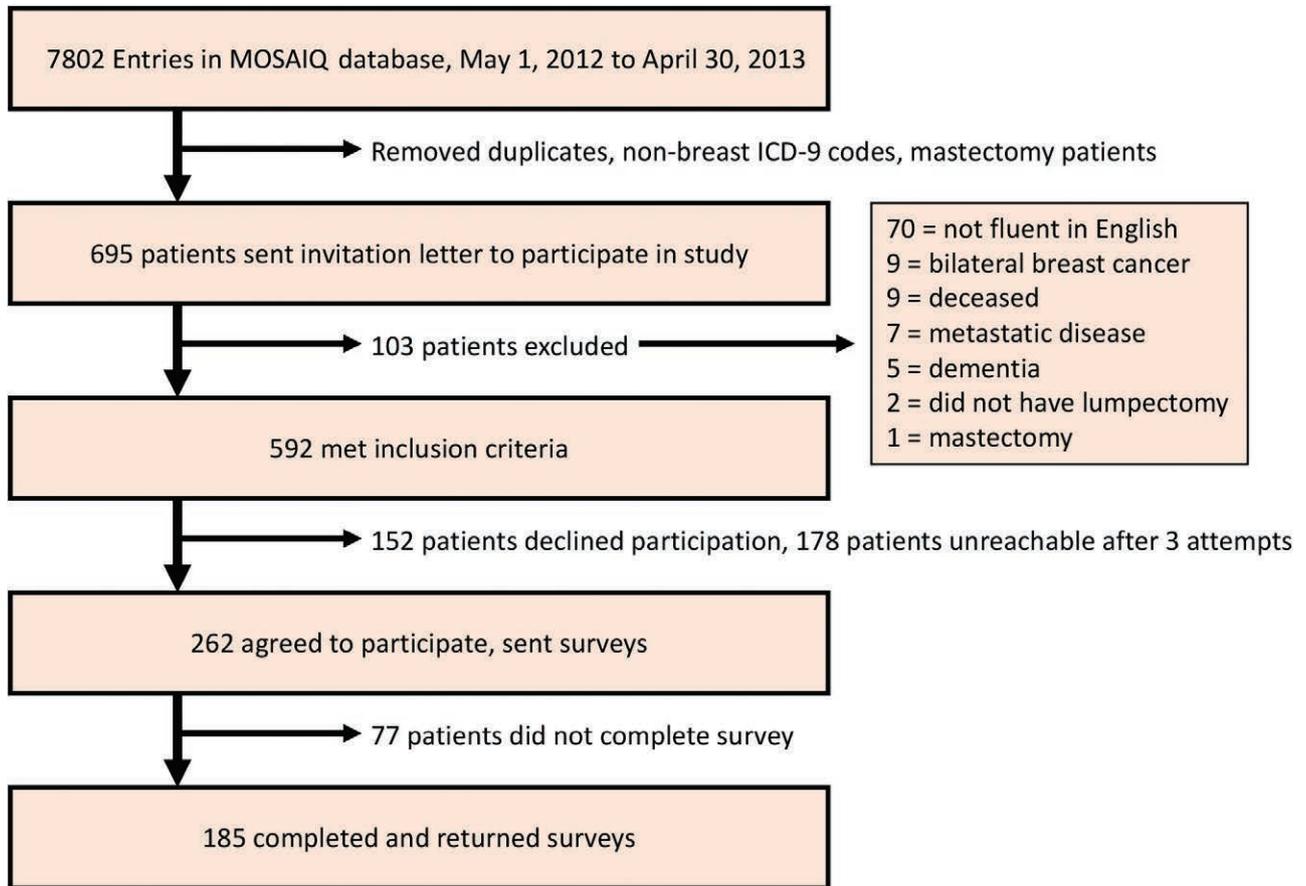


Fig. 1. Participant selection procedure. ICD-9, International Classification of Diseases, Ninth Revision.

domain consists of seven to 14 questions with choices along a Likert scale. Each domain is independent and respondents could choose to complete some or all of these domains. Participant scores for each domain are converted to a number between 0 (very dissatisfied) and 100 (very satisfied) using a Rasch model.

Statistical Analysis

Survey data were tabulated and the nine BREAST-Q domains were scored. Descriptive statistics were calculated, and multiple regression analysis was performed using the satisfaction with breasts domain as the dependent variable. All statistical analysis was performed using SAS version 9.4 (SAS Institute, Inc., Cary, N.C.).

RESULTS

This cross-sectional study investigated consecutive patients undergoing breast conservation therapy at a regional cancer center over a 1-year period. In total, 185 of 592 identified patients (31.3 percent) completed and returned surveys,

which included the BREAST-Q breast conservation therapy module. Table 1 details the demographic data of our study population. The mean age of the patients was 61.6 years at the time of survey completion. Tumors were distributed between left (49.2 percent) and right (47.0 percent) breasts (3.8 percent, location unknown), and tumors were most commonly located in the upper outer quadrant (35.7 percent). The most frequent final pathologic evaluation was invasive ductal carcinoma (70.8 percent). All patients underwent breast conservation therapy, with a mean time of 38.9 and 34.4 months from lumpectomy and radiotherapy, respectively, to survey completion. The majority of patients underwent lumpectomy at a nonacademic center (68.6 percent). Only seven of 185 respondents (3.8 percent) had undergone some form of breast reconstruction at the time of survey completion, one at the time of lumpectomy (local flap), and six of which were delayed (local flap, $n = 3$; fat grafting, $n = 2$; and implant insertion, $n = 1$).

Table 2 outlines the participants' perspectives on the prelumpectomy discussion with their surgical oncologist, as it related to aesthetic outcomes.

Table 1. Characteristics of the Study Population

Variable	Value (%)
No. of patients	185
Demographics	
Age, yr	
Mean ± SD	61.6 ± 11.6
Range	25–92
Female	185 (100)
Bra size (patient reported)	
A or B cup	68 (36.8)
C or D cup	81 (43.8)
>D cup	22 (11.9)
Unknown	14 (7.6)
Tumor characteristics	
Type	
Invasive ductal carcinoma	131 (70.8)
Invasive lobular carcinoma	15 (8.1)
Ductal carcinoma in situ	36 (19.5)
Other	3 (1.6)
Laterality	
Right	87 (47.0)
Left	91 (49.2)
Unknown	7 (3.8)
Location	
Upper inner quadrant	22 (11.9)
Upper outer quadrant	66 (35.7)
Central	22 (11.9)
Lower inner quadrant	19 (10.3)
Lower outer quadrant	49 (26.5)
Unknown	7 (3.8)
Size (pathology)	
≤1 cm	48 (25.9)
>1 - 2 cm	72 (38.9)
>2 cm	59 (31.9)
Unknown	6 (3.2)
Treatment	
Time from lumpectomy, mo	
Mean ± SD	38.9 ± 5.8
Range	23.3 – 61.5
Time from completion of radiotherapy, mo	
Mean ± SD	34.4 ± 4.5
Range	23.7 – 55.1
Breast surgeon practice	
Academic center	58 (31.4)
Community center	127 (68.6)
Need for lumpectomy reexcision (yes)	27 (14.6)
Reconstruction (yes)	7 (3.8)

When asked, 19.6 percent of respondents recalled being told that they may not be happy with how their breast appeared following lumpectomy. Similarly, a fraction of patients recalled discussing changes in nipple position (21.4 percent), skin

color (36.2 percent), breast size (44.7 percent), breast shape (43.2 percent), or a divot/crater in the breast (26.6 percent).

Participants were then asked about their current feelings regarding breast reconstruction (Table 3). Respondents could select from multiple statements generated from the pilot study, or write free text. The most common statement in our population was “I don’t feel the need for [breast reconstruction]” (60.0 percent), followed by “I don’t like the thought of having breast implants” (22.7 percent) and “I don’t want any more surgeon/doctor visits” (22.2 percent).

Participants were next given a series of questions related to barriers to receiving breast reconstruction. Among respondents, 22.7 percent (42 of 185) were aware that plastic surgeons would meet with patients before lumpectomy to discuss immediate reconstruction; three patients (1.6 percent) in our population had done so preoperatively. Of the remaining participants, 33.1 percent (62 of 182) would have seen a plastic surgeon preoperatively, if offered, to discuss immediate breast reconstruction. At the time of the survey, 11.5 percent (21 of 182) had met with a plastic surgeon following completion of breast conservation therapy, 14 of which had to specifically ask for the referral. Surgical oncologists were the most common referring physicians (11 of 21), followed by medical oncologists (five of 21), family physicians (three of 21), a radiation oncologist (one of 21), and an unknown referring physician (one of 21).

Table 4 summarizes the results from the BREAST-Q breast conservation therapy module for each of its nine domains. Our primary outcome measure, satisfaction with breasts, had a mean score of 59.3. A multiple regression analysis was performed using the satisfaction with breasts domain as the dependent variable (Table 5). Younger age ($p = 0.038$), lumpectomy at a nonacademic center ($p = 0.026$), and need for lumpectomy reexcision ($p = 0.018$) were the only variables that were statistically significant in predicting a lower satisfaction with breasts score. Bra cup size,

Table 2. Patient Survey*

Discussion of Possible Changes after Lumpectomy	No.	Yes (%)	No (%)	Unsure (%)
You might not be happy with how your breast appears	183	36 (19.6)	99 (54.1)	48 (26.2)
You might have a change in nipple position	182	39 (21.4)	104 (57.1)	39 (21.4)
You might have a change in skin color	177	64 (36.2)	81 (45.8)	32 (18.1)
You might have a difference in size between your breasts	179	80 (44.7)	72 (40.2)	27 (15.1)
You might have a difference in shape between your breasts	178	77 (43.2)	77 (43.2)	24 (13.5)
You might have a divot or crater in your breast	177	47 (26.6)	89 (50.3)	41 (23.2)

*Responses to the question: “Before your lumpectomy, were you told about any of the following possible changes in how your breast appear after lumpectomy?”

Table 3. Patient Survey*†

Statement	No. (%)
I don't feel the need for it	111 (60.0)
I don't like the thought of having breast implants	42 (22.7)
I don't want any more surgeon/doctor visits	41 (22.2)
I don't want to go through recovery	36 (19.5)
I don't like the thought of tissue being taken from somewhere else in my body	33 (17.8)
I'm worried about side effects	31 (16.8)
I'm worried about it making it harder to tell if the cancer has come back	25 (13.5)
I am thinking about having breast reconstruction	23 (12.4)
I am worried that I wouldn't be satisfied with the result	19 (10.3)
I can't take any more time away from work/home activities	11 (5.9)
I don't know	10 (5.4)
I live too far away from the hospital to come for follow-up visits	8 (4.3)
I have had breast reconstruction	7 (3.8)
I am too old	3 (1.6)

*Responses to the question: "At this point, which statements below describe your feelings about breast reconstruction?"
 †n = 185 (participants could select multiple statements).

Table 4. Mean BREAST-Q Breast Conservation Therapy Module Scores

Domain	No.	Rasch Score (Mean ± SD)
Satisfaction with breasts	178	59.3 ± 21.1
Adverse effects of radiation	180	80.3 ± 20.7
Psychosocial well-being	179	73.5 ± 21.2
Sexual well-being	124	53.3 ± 19.5
Physical well-being	180	74.0 ± 19.1
Satisfaction with information from breast surgeon	177	66.0 ± 21.7
Satisfaction with breast surgeon	179	86.3 ± 19.8
Satisfaction with medical team	179	93.3 ± 15.7
Satisfaction with members of the office staff	179	91.0 ± 16.9

tumor size, and quadrant were not significantly associated with the satisfaction with breasts score ($p > 0.05$).

DISCUSSION

The first objective of this study was to evaluate the aesthetic impact of breast conservation therapy using a patient-reported outcome measure. The BREAST-Q breast conservation therapy module was given to a generalized sample of patients who were on average 3 years after lumpectomy; the primary outcome measure, satisfaction with breasts, was found to be 59 of 100. Although this mean value falls toward the middle of the scale, it must be interpreted carefully, as it is only a snapshot in time of this patient sample. It serves as a point of reference for patients who have undergone breast conservation therapy, and as the

Table 5. Results of the Multiple Regression Analysis Using Satisfaction with Breasts as the Dependent Variable*

	β (SE)	p
Age	0.33 (0.16)	0.038†
Bra cup size		
Small (A or B)	3.00 (5.39)	0.578
Medium (C or D)	1.61 (5.36)	0.764
Large (>D)	Reference	
Quadrant		
Lower outer	5.38 (5.38)	0.358
Upper outer	0.65 (5.65)	0.909
Lower inner	-4.43 (7.28)	0.544
Upper inner	-3.09 (6.75)	0.648
Central	Reference	
Tumor size		
>2 cm	-4.23 (4.58)	0.357
>1 - 2 cm	-4.35 (4.43)	0.328
≤1 cm	Reference	
Surgical oncologist		
Community hospital	-8.49 (3.77)	0.026†
Academic center	Reference	
Need for lumpectomy reexcision		
No	11.53 (4.80)	0.018†
Yes	Reference	

*n = 148, R² = 0.14; p = 0.03.

†Statistically significant.

BREAST-Q literature expands it can be used to interpret minimal clinically important differences in scores between other patient groups and different interventions.^{45,46}

O'Connell et al. recently published their experience with the BREAST-Q breast conservation therapy module in a series of 200 patients seen in follow-up for surveillance mammography, with similar patient characteristics as in our study.⁴⁷ The mean satisfaction with breasts score in their sample of breast conservation therapy patients was rated relatively higher at 69 of 100. Comparable results are noted across the other domains, with the exception of satisfaction with information from breast surgeon, which was higher in their cohort (77 of 100) than in ours (66 of 100). Using the BREAST-Q, Atisha et al. surveyed a large cohort of patients treated with mastectomy, implant-based and autologous reconstruction, and breast conservation therapy; however, they did not report numerical values for satisfaction with breasts, and the complete BREAST-Q breast conservation therapy module was not used.⁴⁸ Other studies incorporating the BREAST-Q have included both standard and oncoplastic breast conservation therapy patients, although these were done using different modules that were not specifically validated in breast conservation therapy.⁴⁹⁻⁵⁴ In a review of studies published to date, the BREAST-Q group stressed the importance of using the modules as they were intended, as

changes could invalidate results³¹; accordingly, making meaningful comparisons between those studies and the present study is challenging.

Numerous studies have attempted to identify variables that lead to a poor aesthetic outcome following breast conservation therapy; however, consistency in study design and assessment techniques is lacking. Variables such as age,^{11,16,27,55} race,^{16,23} body mass index,^{7,26,29,47} breast size,^{7,9,13,29,56} tumor location,^{12,13,18,22,27,28,56} tumor size,^{7,9,10,25,28,55} tumor palpability,¹⁴ resection volume,^{14,16,18,22,25,30,56} surgical technique,^{6,7,9,12,13,16,30} reexcision,^{14,56} scar visibility,^{26,55,56} delayed wound healing,^{30,47} seroma,³⁰ hematoma,¹⁸ infection,¹⁸ axillary dissection,^{12,13,47} radiation technique and dose,^{6,8,9,12,14–16,21,23,28,56} chemotherapy,^{21,28} and hormone therapy²³ have been documented as predictors of aesthetic outcome following breast conservation therapy. Our multiple regression analysis demonstrated that lower satisfaction with breasts scores were associated with younger patients, those who required a reexcision, and patients who had their lumpectomy at a nonacademic center. It is difficult to know why patients who had their lumpectomy at a nonacademic center reported poorer aesthetic outcomes. It is possible that academic centers may have subspecialized surgeons or surgical oncologists, or larger breast-related operative volumes, but interpretation is beyond the scope of this study. However, our results do indicate that younger patients and those requiring lumpectomy reexcision for positive margins are more at risk for lower satisfaction with breasts following breast conservation therapy, so that they may be groups of patients most in need of education and possible referral to a plastic surgeon. Breast size, tumor size, and the breast quadrant involved were not significantly associated with the satisfaction with breasts domain in our model. Too few breast conservation therapy patients in our cohort underwent reconstruction to allow comparison of satisfaction with breasts to patients who did not undergo reconstruction.

The second objective of this study was to describe any barriers these patients encountered in seeking consultation for partial breast reconstruction. In a generalized sample of breast conservation therapy patients, we found very low (1.6 percent) referral rates to plastic surgeons before lumpectomy; similarly, we found low (12 percent) referral rates following lumpectomy. Two-thirds of those who were seen in consultation by a plastic surgeon had to specifically request a referral from the referring physician. At the time of survey completion, only seven patients (3.8 percent) in our

population had undergone some form of partial breast reconstruction. If offered, one-third of our sample stated that they would have wanted a referral to discuss partial breast reconstruction before their breast conservation therapy. To our knowledge, no previous study has quantified the rate of partial breast reconstruction in a cross-section of breast conservation therapy patients.

One explanation for low partial breast reconstruction referral rates could be that the aesthetic impact of breast conservation therapy may be understated preoperatively by the surgical oncologist. In our sample, only one-fifth of participants recalled being informed by their surgical oncologist that they may not be satisfied with the appearance of their breast after lumpectomy. Only a minority could recall any discussion surrounding postoperative changes to breast shape, size, contour, and nipple position. This finding is limited by recall bias; however, a survey of general surgeons in Maryland and Quebec found that physical impact of breast conservation therapy was estimated to be nondisfiguring in 68 and 72 percent of patients, respectively.⁵⁷

Another barrier to referral relates to patient education and awareness of partial breast reconstruction. Only 22 percent of patients were aware that plastic surgeons would meet with breast conservation therapy patients before their lumpectomy to discuss reconstructive options. When asked about feelings regarding breast reconstruction, several misconceptions were identified that could be addressed and clarified by a plastic surgeon during an initial consultation. For example, 22.7 percent of patients did not like the thought of having breast implants; however, alloplastic devices have a limited role in postlumpectomy reconstruction. Some patients did not like the thought of tissue taken from elsewhere in their body (17.8 percent); much of postlumpectomy reconstruction involves reduction techniques and local rearrangement of tissues, rather than regional or free flaps. Valid concerns regarding additional postoperative recovery time (19.5 percent) and the need for additional appointments (22.2 percent) could be addressed by offering immediate reconstruction with oncoplastic techniques in a multidisciplinary breast cancer program. Participants also expressed concern about monitoring for cancer recurrence following reconstruction (13.5 percent); several studies have indicated that partial breast reconstruction is safe with respect to disease surveillance.^{58,59}

The findings of this study are paralleled by Maxwell et al., who recently surveyed general

surgeons in Ontario, Canada, about use and perceived barriers of oncoplastic techniques.⁶⁰ For general surgeons who did not use oncoplastic techniques, lack of training and limited access to plastic surgeons were identified as significant barriers. Losken et al., surveying breast surgeons and plastic surgeons in the United States, found that a majority of respondents in both groups were interested in participating in more lumpectomy cases.³⁴ Plastic surgeons (50.2 percent) felt that a lack of referrals was limiting the role of partial breast reconstruction in their practice. Interestingly, only a minority of breast surgeons (10.3 percent) stated that limited access to plastic surgeons was a limiting factor; this may represent differences between the American and Canadian health care systems. A majority of both groups agreed that increased awareness will be required to further expand the adoption of these techniques. Considered together with the present study, these surveys would suggest there exists an unmet demand for partial breast reconstruction, which could be addressed by better collaboration and communication between surgical oncologists and plastic surgeons. The American Society of Plastic Surgeons formed a task force to address this, and believes that access to partial breast reconstruction can be achieved with public education initiatives and better coordination with the breast cancer treatment team.⁶¹

This survey study is one of only two evaluations of aesthetic outcome following breast conservation therapy using a validated patient-reported outcome measure in a generalized cross-section of patients. To our knowledge, it is the first study to describe referral and reconstruction rates following breast conservation therapy and to begin to identify barriers to referral for partial breast reconstruction from a patient perspective. It has a minimum follow-up approaching two years or more to allow for the late effects of surgery and radiation therapy to be realized, and a participation rate greater than 30 percent, which is rare for opt-in mail surveys.⁶²

One of the main limitations of our study is the potential recall bias of participants answering survey questions. Respondents began their breast cancer treatment up to five years before participating, which may have limited what they recall from specific clinical encounters. Because our survey was not validated in other languages, non-English speakers were excluded, which may limit generalizability to diverse patient populations. Referral patterns for specialist care can vary significantly between health care systems and could potentially

limit generalizability to other patient populations. Although our response rate is high for an opt-in mail survey,⁶² it captures only one-third of the study population. In terms of the multiple regression analysis of factors associated with lower satisfaction with breasts scores, the study may not have been powered to detect clinically important variables such as tumor quadrant or breast size. Finally, the cross-sectional design limits our assessment to a single time point. A prospective multicenter study that accounts for changes in aesthetic outcome of breast conservation therapy across multiple time points, and captures a cohort of patients who undergo both immediate and delayed partial breast reconstruction, would have the potential to address these limitations.

CONCLUSIONS

This is the second study to use the complete BREAST-Q breast conservation therapy module to evaluate the aesthetic impact in a generalized cross-section of patients in the late postoperative period. These results will serve as a reference point for individual patients undergoing breast conservation therapy and for future studies that compare interventions such as partial breast reconstruction. In our multiple regression analysis, age, the need for reexcision, and lumpectomy performed at a nonacademic center were associated with lower satisfaction with breasts scores. It is the first study to investigate barriers to partial breast reconstruction from the patient perspective, and found very low referral and reconstruction rates following breast conservation therapy. One-third of our sample stated that they would have wanted a referral to discuss partial breast reconstruction before their lumpectomy. This represents an unmet demand for partial breast reconstruction, with an opportunity to advocate and increase awareness on behalf of patients undergoing breast conservation therapy.

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