

## Effect of Esthetic Outcome After Breast-Conserving Surgery on Psychosocial Functioning and Quality of Life

Jennifer F. Waljee, Emily S. Hu, Peter A. Ubel, Dylan M. Smith, Lisa A. Newman, and Amy K. Alderman

### ABSTRACT

#### Purpose

Although breast-conserving surgery (BCS) is often assumed to result in minimal deformity, many patients report postoperative breast asymmetry. Understanding the effect of asymmetry on psychosocial functioning is essential for patients to make an informed choice for surgery.

#### Patients and Methods

All women who underwent BCS at the University of Michigan Medical Center (Ann Arbor, MI) during a 4-year period were surveyed using a mailed questionnaire (N = 714; response rate = 79.5%). Women were queried regarding five aspects of psychosocial functioning: quality of life (QOL), depression, fear of recurrence, stigmatization, and perceived change in health status. Postoperative breast asymmetry was assessed using items from the Breast Cancer Treatment and Outcomes Survey. Multiple regression was used to examine the relationship between breast asymmetry and each outcome, controlling for age, time from surgery in years, race, education level, disease stage, surgical treatment, and the occurrence of postoperative complications.

#### Results

Women with pronounced breast asymmetry were significantly more likely to feel stigmatized as a result of their breast cancer treatment (odds ratio [OR] = 4.58; 95% CI, 2.77 to 7.55) and less likely to report unchanged or improved health after treatment (OR = 0.43; 95% CI, 0.27 to 0.66). Minimal breast asymmetry was associated with higher QOL scores (86.3 v 82.4,  $P < .001$ ). Finally, women with pronounced breast asymmetry were more likely to exhibit depressive symptoms (minimal asymmetry, 16.2%; moderate asymmetry, 18.0%; pronounced asymmetry, 33.7%, Wald test = 16.6;  $P = .002$ ).

#### Conclusion

Pronounced breast asymmetry after BCS is significantly correlated with poor psychosocial functioning. Identifying patients at risk for postoperative asymmetry at the time of consultation may allow for improved referral for supportive counseling, prosthetics, and reconstruction.

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### INTRODUCTION

Breast cancer patients comprise the largest group of cancer survivors in the United States, and psychological distress is common in this population.<sup>1</sup> Psychosocial outcomes, such as postoperative quality of life (QOL), are valuable data for patients and providers making treatment decisions.<sup>2,3</sup> Such outcomes can also be used to assess the quality of care delivered to breast cancer patients, and may be more appropriate measures than traditional outcomes such as operative mortality because surgical therapy is relatively low risk, and long-term survival rates are excellent.<sup>4-8</sup> However, the effect of surgical therapy on psychosocial outcomes is controversial, and the mechanisms by which surgical treatment influences psychosocial functioning are not well understood.

Previous work has focused largely on differences between mastectomy and breast-conserving surgery (BCS) patients.<sup>9-11</sup> Although BCS is considered to be the least disfiguring surgical option, esthetic outcomes vary widely, and the majority of women report breast asymmetry after BCS.<sup>12</sup> Many BCS patients require multiple excisions of their disease as well as radiation therapy, which can lead to poor esthetic results.<sup>13-15</sup> Furthermore, in contrast with mastectomy patients, BCS patients are not typically counseled regarding breast reconstruction at the time of consultation, and thus may have more limited reconstructive options after BCS. Although little is known regarding the effect of esthetic outcomes after BCS on postoperative QOL and psychosocial functioning, such information is essential for patients to make an informed choice for surgery.

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To study this, we surveyed women who underwent BCS at our institution to describe the influence of breast asymmetry on the following outcomes: (1) patient-reported QOL, (2) stigmatization related to breast surgery, (3) fear of recurrence, (4) depressive symptoms, and (5) change in perceived health before and after treatment.

## PATIENTS AND METHODS

### Study Population

We surveyed all women who underwent BCS at the University of Michigan Medical Center (Ann Arbor, MI) to treat a breast malignancy between January 2002 and May 2006 using a mailed questionnaire (n = 898). Of the eligible patients, 714 responded to the survey (response rate = 79.5%). Compared with responders, nonresponders were more likely to be nonwhite (21.2% v 9.5%) and less likely to have undergone re-operation (45.8% v 53.7%). There were no differences between responders and nonresponders with respect to disease stage. The study protocol was approved by the institutional review board at the University of Michigan.

### Dependent Variables

We queried women regarding five aspects of psychosocial functioning: overall QOL, depression, fear of recurrence, stigmatization, and perceived change in health status. QOL was measured on a scale from 0 to 100, and women were asked to rate their current QOL along this range.<sup>16</sup> Responses to this item were normally distributed, and were summed and averaged to generate mean scores.

To measure depressive symptoms, women completed items from the Center for Epidemiologic Studies Depression Scale. On the basis of previous literature, women who reported a score of 16 or higher are considered to have depressive symptoms.<sup>17</sup> Therefore, responses to this scale were dichotomized, with score of 16 or higher categorized as depressive symptoms.

Women were asked to rate how stigmatized they felt as a result of their breast surgery on a scale from 1 to 5. One was described as "not at all stigmatized," 3 was described as "somewhat stigmatized," and 5 was described as "stigmatized a great deal."<sup>18,21</sup> Because responses to this question were highly skewed toward less stigmatization and not normally distributed, responses to this variable were categorized, with ratings of 3 or higher grouped as stigmatized.

Women were asked to rate their fear of disease recurrence by completing items from the Concerns About Recurrence Scale, a previously validated approach to measure fear and anxiety among breast cancer patients.<sup>22</sup> Overall fear of recurrence was elicited, as well as specific aspects related to fear, including fear of death, fear of inability to fulfill roles, fear of loss of femininity, and fear regarding health. Overall fear was measured on a 6-point scale, and each subset of fear was measured on a 5-point scale. Because responses were not normally distributed, responses of 3 or higher were considered fearful along all scales.

Finally, we asked women to rate their current health on a scale of 1 to 5, and rate their health before their diagnosis of breast cancer on a scale of 1 to 5. Responses were subtracted from one another to generate the difference in perceived health before and after breast surgery, and responses were grouped into the following categories: much worse (difference of negative 2 or higher), slightly worse (difference of negative 1), no change, and improved (difference of positive 1 or higher).<sup>23</sup>

### Independent Variables

Demographic information was obtained by patient response on the mailed survey, including age, race, and level of education. Age was categorized into the following groups: 40 years or younger, 41 to 50 years, 51 to 60 years, 61 to 70 years, and 71 years and older. Race was categorized into the following groups: white, African American, and other. Level of education was categorized into the following groups: high school education or less, some college, or college graduates and beyond.

Information regarding disease stage was obtained by report to the University of Michigan Cancer Center registry. We included tumor stage in our analysis, based on the sixth edition of the *American Joint Commission on Cancer Coding and Staging Manual* and obtained by report to the University of Michigan Cancer Registry. Pathologic stage information was available for 84% of patients. For those patients in whom pathologic stage was not available, clinical stage was used (16%).

Information regarding surgical procedure was obtained from medical record review. Re-excision lumpectomy was defined as any further operation after either an excisional biopsy or lumpectomy, or if dictated as such in the operative report. Patients who required mastectomy after BCS were excluded from analysis. The occurrence of postoperative complications was obtained by patient report from the mailed survey.

Esthetic outcome after surgery was assessed by patient response to eight items from the Breast Cancer Treatment and Outcomes Survey.<sup>24</sup> Patients were also asked to rate differences in breast skin color along the same scale. Answers to each item were rated on a 4 point scale (1 = no difference between breasts, 2 = slight difference between breasts, 3 = moderate difference between breasts, and 4 = large difference between breasts). Responses were normally distributed, and averaged to generate an overall asymmetry score. For ease of reporting, response scores were categorized into three groups: minimal asymmetry (scores  $\leq 15$ ), moderate asymmetry (scores of 15 to 20), and pronounced asymmetry (scores  $> 20$ ).

### Analysis

We used descriptive statistics to display the characteristics of the patient sample. We used ordinal logistic regression to examine the relationship between breast asymmetry and perceived stigma related to breast cancer treatment and perceived health status. We used logistic regression to examine the relationship between breast asymmetry and fear of recurrence and depression. Linear regression was used to determine the effect of breast asymmetry in patient-reported QOL. All regression models included patient age, time from surgery in years, race, education level, disease stage, surgery received, and the occurrence of postoperative complications. Wald tests were used to test for differences in each outcome by group-level variables. All models were developed separately for each outcome, and examined for second-order interactions. No significant second-order interactions were identified. Adjusted proportions were determined by back-transforming logistic regression using the average values of the characteristics of the patients for each outcome. All tests used were two-sided, and a *P* value less than .05 was considered statistically significant. All statistical analyses were conducted using STATA 9.0 (StataCorp, College Station, TX).

## RESULTS

Table 1 details the characteristics of the study sample. Most patients were white (90.3%) with some college education or higher (77.5%). Approximately 9% of women were 40 years of age or older, 26.2% were age 41 to 50 years, 33.4% age 50 to 60 years, 18.1% age 61 to 70 years, and 13.8% 71 years of age or older. Most women (75.7%) were surveyed within 3 years of surgical treatment, and with stage I or in situ disease (67.8%). Nearly 31% of women reported pronounced breast asymmetry. More than half (54.1%) required additional excisions to obtain negative margins, and 11% ultimately required a mastectomy after attempted BCS. Finally, 28% of women experienced a postoperative complication, with wound infection and seroma the most commonly reported.

Table 2 details the unadjusted rates of psychosocial functioning in this sample. Overall QOL reported by women was high, with a mean QOL score of 85.2. In this sample, 17.8% reported feeling stigmatized by their breast surgery. With respect to fear of recurrence, approximately 27% of women reported high levels of overall fear. Specific aspects of fear reported among BCS patients included loss of

**Table 1.** Characteristics of the Study Population

Characteristic	No.	%
<b>Race</b>		
White	556	90.1
African American	34	5.5
Other	27	4.4
<b>Education</b>		
High school or less	145	23.3
Some college	214	34.4
College graduates or beyond	263	42.3
<b>Age, years</b>		
≤ 40	48	7.7
41-50	160	25.5
51-60	209	33.3
61-70	118	18.8
≥ 71	92	14.7
<b>Time from surgery, years</b>		
≤ 1	178	31.0
2-3	263	45.8
4	133	23.2
<b>Disease stage</b>		
0	138	22.0
I	302	48.1
II	160	25.5
III or IV	28	4.5
<b>Breast asymmetry</b>		
None to slight	225	36.3
Moderate	213	34.4
Pronounced	182	29.4
<b>No. of excisions</b>		
1	316	50.3
2	270	43.0
3	42	6.7
<b>Postoperative complications</b>		
Hemorrhage	11	1.8
Wound dehiscence	16	2.7
Thromboembolism	5	0.8
Infection	72	12.0
Seroma	79	13.1

**Table 2.** Psychosocial Outcomes Among Women Undergoing Breast-Conserving Surgery

Outcome	No.	%
<b>Quality of life</b>		
Mean		85.0
Standard deviation		3.81
No response	69	11.0
<b>Stigmatized by breast surgery</b>		
Yes	101	16.1
No	522	83.1
No response	5	0.80
<b>Fear of recurrence</b>		
<b>Overall fear</b>		
High	166	26.4
Low	458	72.9
No response	4	0.80
<b>Fearing loss of health</b>		
High	325	51.8
Low	294	46.8
No response	9	1.4
<b>Fearing loss of femininity</b>		
High	114	18.2
Low	503	80.1
No response	11	1.8
<b>Fearing inability to fulfill roles</b>		
High	188	29.9
Low	430	68.5
No response	10	1.6
<b>Fearing death</b>		
High	368	58.6
Low	250	39.8
No response	10	1.6
<b>Depressive symptoms</b>		
Yes	140	22.3
No	473	75.3
No response	15	2.4
<b>Difference in perceived health</b>		
Much worse	45	4.2
Slightly worse	154	24.5
The same	386	61.5
Improved	35	5.6
No response	8	1.3

health and fear of death. Approximately 22% of women reported depressive symptoms. Finally, the majority of women (61.3%) reported no change in their health from the time they were diagnosed with breast cancer, 33.1% reported worsened health, and 5.6% reported improved health.

Table 3 details the association between breast symmetry and patient-reported stigmatization resulting from breast cancer treatment, as well as patient-perceived health status, controlling for patient demographic and disease characteristics. Women with pronounced breast asymmetry were significantly more likely to report feeling stigmatized as a result of their breast cancer treatment (odds ratio [OR] = 4.58; 95% CI, 2.77 to 7.55) and less likely to report unchanged or improved health after breast cancer treatment compared with women who experienced minimal breast asymmetry (OR = 0.43; 95% CI, 0.27 to 0.66). In addition, younger women were more likely to report feeling stigmatized as a result of their breast cancer treatment compared with women age 51 to 60 years (≤ 40 years: OR = 3.10; 95% CI, 1.56 to 6.14; 41 to 50 years: OR = 1.99; 95% CI, 1.23 to 3.23). Women who experienced postoperative complications (OR = 0.53; 95% CI,

0.35 to 0.79) and with more advanced disease stage were less likely to report improved or unchanged health (stage I, OR = 0.56; 95% CI, 0.35 to 0.90; stage II, OR = 0.50; 95% CI, 0.30 to 0.85; stage III or IV, OR = 0.19; 95% CI, 0.08 to 0.46). Women who did not receive radiation therapy were more likely to report improved health than were women who did undergo radiation therapy (OR = 2.32; 95% CI, 1.15 to 4.69).

Figure 1 details the effect of postoperative breast asymmetry on patient-reported QOL. After adjusting for patient and disease characteristics, women who experienced minimal breast asymmetry reported significantly higher QOL scores compared with women who experienced pronounced asymmetry (86.3 v 82.4;  $P < .001$ ). Other covariates that were significantly correlated with QOL included education (high school or less, 83.1; some college, 83.5; college graduates and beyond, 87.1;  $P = .04$ ) and age (41 to 50 years: OR = 85.7  $v \geq 70$  years: OR = 78.7;  $P = .005$ ).

**Table 3.** Effect of Postoperative Breast Asymmetry on Patient-Perceived Stigmatization and Health Status After BCS

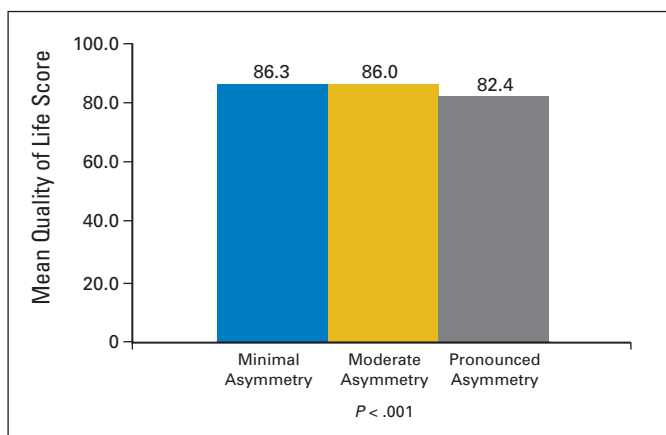
Characteristic	Reporting Perceived Stigma Related to BCS		Reporting Unchanged or Improved Health After BCS	
	Odds Ratio	95% CI	Odds Ratio	95% CI
<b>Demographics</b>				
Race				
White*	—			
African American	1.63	0.73 to 3.67	1.21	0.55 to 2.64
Other	1.23	0.49 to 3.11	1.33	0.53 to 3.34
Wald test		1.55		0.55
P		.46		.76
Education				
High school or less	1.66	0.97 to 2.84	1.15	0.71 to 1.85
Some college	1.47	0.94 to 2.28	1.06	0.71 to 1.59
College graduates or beyond*	—		—	
Wald test		4.48		0.32
P		.11		.85
Age, years				
< 40	3.10	1.56 to 6.14	0.78	0.39 to 1.55
41-50	1.99	1.23 to 3.23	0.60	0.38 to 0.94
51-60*	—		—	
61-70	1.17	0.65 to 2.11	0.79	0.48 to 1.32
> 71	0.37	0.16 to 0.89	0.98	0.53 to 1.83
Wald test		25.4		5.55
P		< .001		.24
<b>Clinical characteristics</b>				
No. of excisions				
1*	—		—	
2	1.07	0.72 to 1.60	0.91	0.63 to 1.31
3	0.79	0.34 to 1.85	1.06	0.50 to 2.27
Wald test		0.75		0.35
P		.76		.84
Breast asymmetry				
Minimal*	—		—	
Moderate	1.53	0.92 to 2.56	0.86	0.56 to 1.32
Pronounced	4.58	2.77 to 7.55	0.43	0.27 to 0.66
Wald test		41.1		16.55
P		< .001		< .001
Postoperative complication				
No*	—		—	
Yes	1.16	0.74 to 1.82	0.53	0.35 to 0.79
Received radiation therapy				
Yes*	—		—	
No	0.53	0.24 to 1.17	2.32	1.15 to 4.69
Disease stage				
In situ*	—		—	
I	1.32	0.77 to 2.26	0.56	0.35 to 0.90
II	1.61	0.92 to 2.81	0.50	0.30 to 0.85
III or IV	0.89	0.31 to 2.51	0.19	0.08 to 0.46
Wald test		3.50		15.21
P		.32		< .001
Time from surgery				
≤ 1 year*	—		—	
2-3 years	0.73	0.47 to 1.13	1.03	0.69 to 1.55
≥ 4 years	0.60	0.35 to 1.04	0.82	0.51 to 1.33
Wald test		3.69		1.09
P		.16		.58

Abbreviation: BCS, breast-conserving surgery.

\*Reference group.

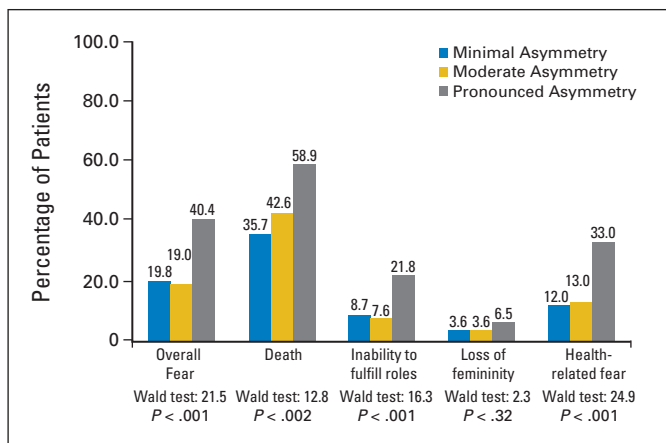
Figure 2 details the association of breast asymmetry and fear of recurrence. Although overall fear of recurrence was relatively the same among women with minimal and moderate asymmetry,

women with pronounced asymmetry were more likely to fear recurrence (minimal asymmetry, 19.8%; moderate asymmetry, 19.0%; pronounced asymmetry, 40.4%; Wald test = 21.5;  $P < .001$ ). Other



**Fig 1.** Effect of postoperative breast asymmetry on quality of life after breast-conserving surgery. Adjusted for surgical procedure (lumpectomy, re-excision), time from surgery, patient age, race, education, disease stage, receipt of radiation therapy, and occurrence of postoperative complications.

covariates significantly associated with overall fear included disease stage (stage 0, 15.9%; stage I, 25.6%; stage II, 30.7%; stage III and IV, 33.6%; Wald test = 7.83;  $P = .05$ ), and patient age ( $\leq 40$  years, 52.5%; 41 to 50 years, 25.9%; 51 to 60 years, 25.1%; 61 to 70 years, 21.6%;  $\geq 70$  years or older, 12.9%; Wald test = 18.4;  $P = .01$ ). Additionally, women with pronounced breast asymmetry more frequently cited a fear of loss of health (minimal asymmetry, 11.6%; moderate asymmetry, 13.4%; pronounced asymmetry, 31.3%; Wald test = 23.8;  $P < .001$ ) and inability to fulfill roles (minimal asymmetry, 8.3%; moderate asymmetry, 7.8%; pronounced asymmetry, 21.1%; Wald test = 14.5;  $P < .001$ ). Patient age was significantly correlated with fear of loss of health ( $\leq 40$  years, 37.6%; 41 to 50 years, 25.8%; 51 to 60 years, 18.2%; 61 to 70 years, 15.3%;  $\geq 70$  years, 3.6%; Wald test = 20.8;  $P < .001$ ), and fear of inability to fulfill roles ( $\geq 40$  years, 25.5%; 41 to 50 years, 18.1%; 51 to 60 years, 10.4%; 61 to 70 years, 9.1%;  $\geq 70$  years, 2.8%; Wald test = 15.2;  $P = .004$ ). Fear of loss of femininity was not significantly correlated with breast asymmetry after controlling for other factors.



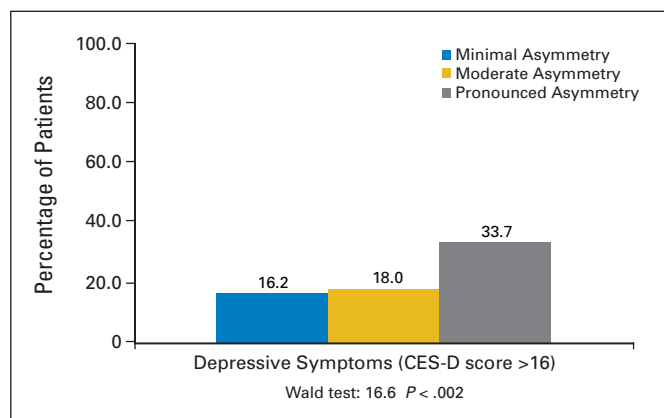
**Fig 2.** Overall fear of recurrence and specific aspects of fear of recurrence by breast asymmetry after breast-conserving surgery. Adjusted for surgical procedure (lumpectomy, re-excision), time from surgery, patient age, race, education, disease stage, receipt of radiation therapy, and occurrence of postoperative complications.

Figure 3 details the association between breast asymmetry and depression among women undergoing BCS. Women scoring more than 16 on the Center for Epidemiologic Studies Depression Scale items were classified as having depressive symptoms. In this sample, pronounced breast symmetry was correlated with depression, and women who experienced pronounced breast asymmetry were more likely to exhibit depressive symptoms compared with women with minimal or moderate asymmetry (minimal asymmetry, 16.2%; moderate asymmetry, 18.0%; pronounced asymmetry, 33.7%; Wald test = 16.6;  $P = .002$ ). Additionally, level of education was correlated with depressive symptoms after BCS, and women with a lower level of education were more likely to report depressive symptoms compared with women with a college degree (high school education or less, OR = 2.50; 95% CI, 1.41 to 4.44; some college, OR = 2.58; 95% CI, 1.57 to 4.23).

## DISCUSSION

Patient-perceived breast appearance after BCS is significantly associated with psychosocial outcomes, and women with pronounced breast asymmetry are more likely to experience poor psychosocial functioning compared with women with minimal breast asymmetry. After controlling for demographic and disease factors, pronounced breast asymmetry was significantly correlated with slightly worse QOL. Although differences in overall QOL may not be clinically appreciable, we observed notable differences with respect to specific aspects of QOL, including depressive symptoms and fear of recurrent disease. Women who experienced pronounced breast asymmetry were more also likely to report stigmatization resulting from their breast surgery, and to perceive worse health after treatment of their breast cancer.

There are several mechanisms that may underlie the association between breast appearance and psychosocial outcomes. It is possible that breast appearance is more associated with body image for patients who choose BCS than for those who opt for mastectomy.<sup>25</sup> In fact, most women who are faced with the choice for re-excision lumpectomy or mastectomy after BCS choose lumpectomy again in hopes of



**Fig 3.** Effect of postoperative breast asymmetry on depressive symptoms after breast-conserving surgery. Adjusted for surgical procedure (lumpectomy, re-excision), time from surgery, patient age, race, education, disease stage, receipt of radiation therapy, and occurrence of postoperative complications. CES-D, Center for Epidemiologic Studies Depression scale.

preserving their breast.<sup>14</sup> BCS patients may also be more sensitive to postoperative changes in their breast appearance. They may not receive the same level of preoperative counseling as mastectomy patients, and may not have accurate expectations of postoperative changes.<sup>26,27</sup> An important strength of the current study is the assessment of patient-reported esthetic result. Although previous studies have used expert opinion to rate postoperative esthetic outcomes, patient assessment of postoperative breast appearance may better reflect the effect of breast surgery on body image. Finally, breast asymmetry may be a constant reminder to these patients of their disease and treatment process, impairing their psychological adjustment after treatment. Previous studies have documented the correlation between anxiety and esthetic outcome, and many BCS patients fear that their surgical procedure is not final.<sup>28,29</sup>

In addition to breast asymmetry, we observed a consistent effect of patient demographic characteristics and disease factors on psychosocial outcomes among women undergoing BCS, consistent with previous literature.<sup>23,30</sup> Although younger women were more likely to report higher overall QOL scores, they did report feeling stigmatized by their breast cancer treatment and fearful of disease recurrence more frequently than older women. It is possible that younger women are more likely to have employment and caretaking responsibilities that are impeded by the effects of radiation therapy and chemotherapy. They may be less likely to have peers with comorbid conditions, and feel less social support after their diagnosis of breast cancer. We also observed that women with advanced education reported higher QOL and fewer depressive symptoms. It is possible that women with more education have more access to counseling and support resources during the diagnosis and treatment process to facilitate their postoperative adjustment.

Treatment factors were also correlated with psychosocial outcomes in this sample. Not surprisingly, advanced disease stage was correlated with fear of recurrence and death, and patients with advanced disease were less likely to report unchanged or improved health status. Women who reported a postoperative complication were more likely to report fearing death than were women who did not report a postoperative complication. Interestingly, women who underwent re-excision lumpectomy were less likely to report fearing death compared with women who underwent only one excision. Although the reasons for this are not clear, it is possible that re-excision of tumor margins gives patients greater confidence in their treatment course, despite the occurrence of complications or the presence of more extensive disease.

Our study has several important limitations. First, the study sample was drawn from a single institution, and was homogenous with respect to sociodemographic factors. Therefore, our results may not be generalizable to women cared for in other settings, and we were likely unable to capture variation in psychosocial functioning by ethnicity and socioeconomic factors. Furthermore, we were unable to adjust patient responses by specific surgeons, and cannot comment on

the effect of surgeon characteristics on these outcomes. This study was retrospective, and women's views regarding their treatment outcomes may change over time. Additionally, the study time period was limited to assess for disease recurrence and the effect of recurrence on psychosocial functioning. The associations between esthetic outcome and psychosocial functioning that we observed may be mediated by other factors we were unable to measure, including sexual function, body image, and use of psychological counseling during the treatment process. It is also possible that individuals who report psychosocial distress may respond negatively across all self-report measures, regardless of their disease experience. Future prospective studies may better address such phenomena. Finally, this study was cross-sectional in nature, and we can only speculate regarding the causal mechanisms that underlie the relationships we observed.

Although BCS is considered the standard of care for women with early breast cancer, many BCS patients experience suboptimal esthetic results, which can substantially diminish their QOL. Surgeons may not be aware of breast asymmetry because it may become more pronounced over time, during the wound healing process and after radiation therapy. Additionally, feelings of psychosocial distress may not manifest until much later in recovery for BCS patients compared with mastectomy patients.<sup>31</sup> However, it is important to identify patients at risk for poor esthetic outcomes after BCS at the time of consultation because oncoplastic techniques and mastectomy with reconstruction may offer these patients improved long-term QOL.<sup>32</sup> Finally, providers should be aware of the effect of breast asymmetry on psychosocial functioning, and provide early referral of BCS patients with poor esthetic outcome for supportive counseling, breast prosthetics, and reconstructive techniques.

#### AUTHORS' DISCLOSURES OF POTENTIAL CONFLICTS OF INTEREST

The author(s) indicated no potential conflicts of interest.

#### AUTHOR CONTRIBUTIONS

**Conception and design:** Jennifer F. Waljee, Peter A. Ubel, Dylan M. Smith, Amy K. Alderman

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#### REFERENCES

- Hewitt M, Herdman R, Holland J: Meeting the Psychosocial Needs of Women with Breast Cancer. Washington, DC, The National Academies Press, 2004
- Kuroi K, Shimozuma K, Ohsumi S, et al: Current status of health outcome assessment of medical

treatment in breast cancer. *Breast Cancer* 14:74-80, 2007

3. Ohsumi S, Shimozuma K, Kuroi K, et al: Quality of life of breast cancer patients and types of surgery for breast cancer: Current status and unresolved issues. *Breast Cancer* 14:66-73, 2007

4. Veronesi U, Banfi A, Salvadori B, et al: Breast conservation is the treatment of choice in small

breast cancer: Long-term results of a randomized trial. *Eur J Cancer* 26:668-670, 1990

5. Fisher B, Anderson S, Bryant J, et al: Twenty-year follow-up of a randomized trial comparing total mastectomy, lumpectomy, and lumpectomy plus irradiation for the treatment of invasive breast cancer. *N Engl J Med* 347:1233-1241, 2002

6. Fisher B, Jeong JH, Anderson S, et al: Twenty-five-year follow-up of a randomized trial comparing radical mastectomy, total mastectomy, and total mastectomy followed by irradiation. *N Engl J Med* 347:567-575, 2002
7. El-Tamer MB, Ward BM, Schiffner T, et al: Morbidity and mortality following breast cancer surgery in women: National benchmarks for standards of care. *Ann Surg* 245:665-671, 2007
8. Newman LA, Kuerer HM: Advances in breast conservation therapy. *J Clin Oncol* 23:1685-1697, 2005
9. Nissen MJ, Swenson KK, Ritz LJ, et al: Quality of life after breast carcinoma surgery: A comparison of three surgical procedures. *Cancer* 91:1238-1246, 2001
10. Shimozuma K, Ganz PA, Petersen L, et al: Quality of life in the first year after breast cancer surgery: Rehabilitation needs and patterns of recovery. *Breast Cancer Res Treat* 56:45-57, 1999
11. Irwig L, Bennetts A: Quality of life after breast conservation or mastectomy: A systematic review. *Aust N Z J Surg* 67:750-754, 1997
12. D'Aniello C, Grimaldi L, Barbato A, et al: Cosmetic results in 242 patients treated by conservative surgery for breast cancer. *Scand J Plast Reconstr Surg Hand Surg* 33:419-422, 1999
13. Cellini C, Hollenbeck ST, Christos P, et al: Factors associated with residual breast cancer after re-excision for close or positive margins. *Ann Surg Oncol* 11:915-920, 2004
14. Cellini C, Huston TL, Martins D, et al: Multiple re-excisions versus mastectomy in patients with persistent residual disease following breast conservation surgery. *Am J Surg* 189:662-666, 2005
15. Al-Ghazal SK, Blamey RW, Stewart J, et al: The cosmetic outcome in early breast cancer treated with breast conservation. *Eur J Surg Oncol* 25:566-570, 1999
16. Gold MR, Siegel JE, Russell LB, et al: Cost-Effectiveness in Health and Medicine: Report to the US Public Health Service by the Panel on Cost-Effectiveness in Health and Medicine. Washington, DC, Oxford University Press, 1996
17. Radloff L: The Center for Epidemiologic Studies Depression Scale: A self-report depression scale for research in the general population. *Appl Psychol Meas* 1:385-401, 1977
18. Smith DM, Sherriff RL, Damschroder L, et al: Misremembering colostomies? Former patients give lower utility ratings than do current patients. *Health Psychol* 25:688-695, 2006
19. Smith DM, Lowenstein G, Rozin P, et al: Sensitivity to disgust, stigma, and adjustment to life with a colostomy. *J Res Pers* 41:787-803, 2007
20. Lacey HP, Fagerlin A, Lowenstein G, et al: It must be awful for them: Healthy people overlook disease variability in quality of life judgements. *Judic Decis Making* 1:146-452, 2006
21. Ubel PA, Hershey J, Baron J, et al: Do nonpatients underestimate the quality of life associated with chronic health decisions because of a focusing illusion? *Med Decis Making* 21:190-199, 2001
22. Vickberg SM: The Concerns About Recurrence Scale (CARS): A systematic measure of women's fears about the possibility of breast cancer recurrence. *Ann Behav Med* 25:16-24, 2003
23. Janz NK, Mujahid M, Lantz PM, et al: Population-based study of the relationship of treatment and sociodemographics on quality of life for early stage breast cancer. *Qual Life Res* 14:1467-1479, 2005
24. Stanton AL, Krishnan L, Collins CA: Form or function? Part 1: Subjective cosmetic and functional correlates of quality of life in women treated with breast-conserving surgical procedures and radiotherapy. *Cancer* 91:2273-2281, 2001
25. Mandelblatt JS, Hadley J, Kerner JF, et al: Patterns of breast carcinoma treatment in older women: Patient preference and clinical and physical influences. *Cancer* 89:561-573, 2000
26. Levy SM, Haynes LT, Herberman RB, et al: Mastectomy versus breast conservation surgery: Mental health effects at long-term follow-up. *Health Psychol* 11:349-354, 1992
27. Levy SM, Herberman RB, Lee JK, et al: Breast conservation versus mastectomy: Distress sequelae as a function of choice. *J Clin Oncol* 7:367-375, 1989
28. Al-Ghazal SK, Blamey RW: Cosmetic assessment of breast-conserving surgery for primary breast cancer. *Breast* 8:162-168, 1999
29. Fallowfield LJ, Baum M, Maguire GP: Effects of breast conservation on psychological morbidity associated with diagnosis and treatment of early breast cancer. *BMJ (Clin Res Ed)* 293:1331-1334, 1986
30. Hopwood P, Haviland J, Mills J, et al: The impact of age and clinical factors on quality of life in early breast cancer: An analysis of 2208 women recruited to the UK START Trial (Standardisation of Breast Radiotherapy Trial). *Breast* 16:241-251, 2007
31. Cohen L, Hack TF, de Moor C, et al: The effects of type of surgery and time on psychological adjustment in women after breast cancer treatment. *Ann Surg Oncol* 7:427-434, 2000
32. Arora NK, Gustafson DH, Hawkins RP, et al: Impact of surgery and chemotherapy on the quality of life of younger women with breast carcinoma: A prospective study. *Cancer* 92:1288-1298, 2001

