The Impact of Obesity on Patient Satisfaction with Breast Reconstruction

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Background: As the U.S. population becomes increasingly overweight, a growing number of patients with body mass indexes greater than 30 are seeking mastectomy reconstruction. The authors' purpose was to prospectively evaluate the effect of body mass index on patient satisfaction with breast reconstruction.

Methods: Women undergoing first-time breast reconstruction at one of 12 centers in the United States and Canada were surveyed preoperatively and at postoperative year 1. Satisfaction was evaluated with two scales assessing general and aesthetic satisfaction. Using Centers for Disease Control and Prevention criteria, patients were classified as normal weight, overweight, or obese. Logistic regressions evaluated the effects of body mass index on patient satisfaction with expander/implant, pedicled transverse rectus abdominis musculocutaneous (TRAM) flap, and free TRAM flap techniques while controlling for patient age and timing of reconstruction.

Results: Data were available for a total of 262 patients. Patient body mass index had a significant effect on aesthetic satisfaction, particularly among patients undergoing expander/implant procedures. Compared with normal weight individuals, obese patients with expander/implants were significantly less satisfied aesthetically (odds ratio, 0.14, $p = 0.02$). However, there was no significant difference between obese and normal weight patients in aesthetic satisfaction with TRAM flap reconstruction. Finally, body mass index had no significant effects on general satisfaction for either expander/implant or TRAM flap technique.

Conclusion: Although previous investigators have reported relatively high complication rates and modest aesthetic results for breast reconstruction in overweight and obese women, the authors' study suggests that patient satisfaction with reconstruction is surprisingly high in this population, particularly in cases of autogenous tissue reconstruction. (*Plast. Reconstr. Surg.* 121: 1893, 2008.)

Between 1980 and 2002, the prevalence of obesity doubled in adults aged 20 years or older.[1] From 2003 to 2004, the prevalence of overweight and obese women aged 20 years or older was 61.8 percent, of which 33.2 percent were considered obese.[1] Given the large prevalence of overweight and obese women in the United States, plastic surgeons will continue to face the challenge of performing postmastectomy reconstruction in heavier patients. Many surgeons are reluctant to perform reconstruction in the obese breast cancer patient because of concerns over poor aesthetic results and high complication rates associated with obesity.[2–8] Despite these issues, many plastic surgeons continue to offer breast reconstruction to obese patients with the hope of improving health-related outcomes.[9,10] However, little is known about obese patients' self-reported satisfaction with breast reconstruction and, in particular, whether satisfaction varies by the type of reconstructive procedure.

As a key quality of care and outcomes measure,[11] patient satisfaction is being used as a basis for policy formulation[12] and quality improve-

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ment programs, and to help direct the patient/physician decision-making process.[13] Patient satisfaction surveys provide consumer feedback about the structure, process, and outcomes of care. Currently, clinicians and researchers evaluate health care not just by assessing objective outcomes (e.g., complication rates and length of hospitalization) but also from the consumer's point of view in terms of patient satisfaction.[14]

Our purpose was to evaluate the impact of body mass index on general and aesthetic satisfaction with breast reconstruction through a prospective, multicenter study. In particular, we sought to assess the effects of body mass index on patient satisfaction with two common types of breast reconstruction: expander/implant and transverse rectus abdominis musculocutaneous (TRAM) flap techniques. We hypothesized that (1) body mass index would have significant effects on aesthetic and general satisfaction with reconstruction and (2) these effects would vary by procedure type.

PATIENTS AND METHODS

Study Population

Patients were recruited as part of the Michigan Breast Reconstruction Outcome Study, a prospective, multicenter cohort study of mastectomy reconstruction patients. Women undergoing a first-time immediate or delayed expander/implant, pedicled TRAM flap, or free TRAM flap procedure were eligible for participation. Both unilateral and bilateral reconstructions were included. Choices of reconstructive options were based on patient and surgeon preferences. Twenty-three plastic surgeons from 12 centers in Michigan, Pennsylvania, Louisiana, and Ontario contributed patients to the study from 1994 to 1999. These patients were followed for at least 1 year. For the current analysis, we excluded patients with latissimus dorsi or double-pedicled TRAM flap procedures because of the small sample sizes for those procedures. We also excluded bilateral reconstructions in which different techniques were used on the two sides. The power of our study was 67.3 percent for general satisfaction and 99.9 percent for aesthetic satisfaction to detect a difference in responses between TRAM flap and expander/implant patients using a two-tailed test at the 0.05 level.

Measures

As the primary dependent variable of interest, self-reported aesthetic satisfaction and general satisfaction were assessed using seven items that had undergone face and content validity before administration of the survey. Construct validity was tested using confirmatory factor analysis models that separated the seven items into two subscales, five questions assessing general satisfaction and two measuring aesthetic satisfaction (Table 1). Survey items addressing general satisfaction reflected patient perception of the treatment process: gathering information, making decisions, and undergoing surgery. The questionnaire's aesthetic subscale addressed issues of breast contour and softness.

Item responses were scored using a five-point Likert scale ranging from very satisfied to very dissatisfied. Reliability was confirmed using the Cronbach α, calculated at 0.90 for general satisfaction and 0.54 for aesthetic satisfaction. Responses for each of the subscales were dichotomized into "satisfied" versus "not satisfied" using the following criteria[15]: scores of "very satisfied" or "satisfied" (a 4 or 5 on the five-point Likert scale) for all questions within a subscale were designated as "satisfied"[11]; all other scores were labeled "not satisfied." These admittedly stringent criteria were used for dichotomizing the data because, in general, previous research has found that the majority of patients are satisfied with their breast reconstruction.[16] Therefore, this dichotomization allowed for the identification of patients with very high levels of satisfaction.

The independent variables in our analysis included (1) body mass index, (2) timing of surgery, (3) type of surgery, and (4) patient age. Body mass index was calculated using patients' preoperative heights and weights and categorized using Centers for Disease Control and Prevention criteria as follows: normal weight (body mass index, 18.5 to 24.99 kg/m^2); overweight (body mass index, 25.0

Table 1. Patient Satisfaction Questionnaire*

Subscale: General satisfaction

1. Knowing what I know today, I would definitely choose to have breast reconstruction.
2. Knowing what I know today, I would definitely choose to have the type of reconstruction I had.
3. Overall, I am satisfied with my reconstruction.
4. I would recommend the type of reconstructive procedure that I had to a friend.
5. I felt that I received sufficient information about by reconstruction options to make an informed choice of either TRAM or implant procedure.

Subscale: Aesthetic satisfaction

1. The size and shape of my breasts are the same.
2. My reconstructed breasts feel soft to touch.

*The responses to the questionnaire were based on a Likert scale ranging from "very dissatisfied" to "very satisfied."

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to 29.99 kg/m^2); and obese (body mass index, ≥30 kg/m^2). Surgical timing was categorized as immediate or delayed. We believed that it was important to control for this variable in the analyses because the timing of reconstruction can affect psychological outcomes, quality of life, and body image after breast reconstruction.[9,10,17–20] The type of surgical procedure was categorized as tissue expander/implant or TRAM flap, including both free and pedicled TRAM flap techniques. Patient age was included in the analysis as a continuous variable because there was a statistically significant difference in age between the body mass index categories ($p = 0.003$). Also, age was considered a potential confounder because younger women may have higher aesthetic expectations for breast reconstruction.[21,22] Furthermore, younger patient age has been associated with psychosocial maladjustment after breast reconstruction.[23] Although a study by Andrade et al.[24] reported an association between complication rates and patient satisfaction, chi-square analysis of complication rates among the three body mass index groups in our study found no statistically significant differences ($p = 0.420$). Therefore, complication rates were not included in our regression analysis.

Statistical Analysis

The proportion of satisfied patients was calculated by procedure type across the three body mass index categories. The effects of the independent variables on general and aesthetic satisfaction were evaluated using logistic regressions. As a measure of association, adjusted odds ratios and their 95 percent confidence intervals were calculated for each of the independent variables, using coefficients and their standard errors estimated from the logistic regression model. For a continuous independent variable, such as age, the odds ratio measures the relative change in the odds of patient satisfaction for a one-unit increase in the independent variable. In the case of a categorical independent variable, such as body mass index or timing, the odds ratio measures the odds of patient satisfaction relative to the reference category. Normal weight was held as a reference category in the logistic regression so that overweight and obese would individually be compared with normal body mass index. We felt it would be most informative to practicing surgeons to compare the satisfaction of larger patients to normal weight patients so that heavier patients could be advised about their outcomes relative to normal weight patients. In addition, plastic surgeons need a clear understanding about whether or not to continue to offer breast reconstruction in the face of higher complication rates and the possibility of poor aesthetic outcomes. All analyses were performed using SPSS 14.0 statistical software (SPSS, Inc., Chicago, Ill.).

RESULTS

Of the 460 patients enrolled in the Michigan Breast Reconstruction Outcome Study, 64 withdrew by 1 year after reconstruction, yielding a dropout rate of 14 percent. Two hundred eighty-five patients completed the 1-year questionnaire. Height and weight measurements to calculate body mass index were available for 262 of the 285 patients, of which 119 had a normal body mass index, 96 were overweight, and 47 were obese. For the entire sample, the mean body mass index was 26.2 ± 4.7, with a range of 18.6 to 47.0. The mean body mass index was 22.4 ± 1.7 for normal weight, 27.2 ± 1.4 for overweight, and 33.8 ± 3.8 for obese patients. For procedures, 202 patients underwent autogenous reconstruction with either free or pedicled TRAM flaps, and 60 patients underwent expander/implant procedures. The mean age for each body mass index category was 46.6 years of normal body mass index, 49.6 years for overweight body mass index, and 51.1 years for obese body mass index. Age differences among body mass index categories were statistically significant at $p = 0.003$. Table 2 summarizes the distribution of cases by type and timing of reconstruction and patients' body mass index category.

Figure 1 displays procedural differences in general satisfaction by body mass index category. In the overweight group, only 53 percent of patients with expander/implants were generally satisfied with their results, compared with 82 percent of patients with a TRAM flap reconstruction ($p = 0.01$). Figure 2 illustrates procedural differences in aesthetic satisfaction by body mass index category. Procedure type had significant effects on aesthetic satisfaction across all body mass index groups. Patients were found to be significantly more aesthetically satisfied with autogenous tissue reconstruction regardless of body mass index cat-

Table 2. Study Population by Body Mass Index and Reconstructive Procedure Type

	TRAM Flap (free and pedicled)	Expander/Implant
Normal	90	29
Overweight	81	15
Obese	31	16
Total	202	60

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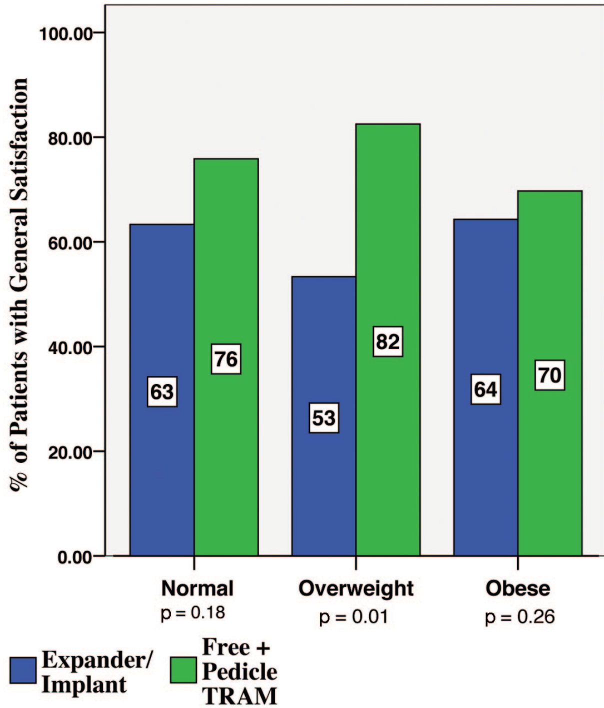

Fig. 1. Procedural differences in general satisfaction by body mass index category.

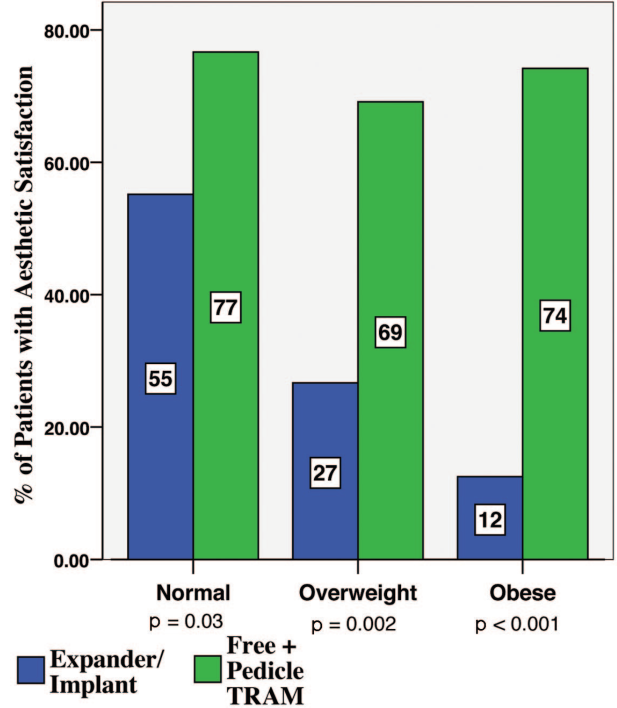

Fig. 2. Procedural differences in aesthetic satisfaction by body mass index categories.

egory. Specifically, the proportions of patients aesthetically satisfied with their surgical outcomes for expander/implant versus TRAM flap procedures were 55 percent versus 77 percent in the normal weight group ($p = 0.03$), 27 percent versus 69 percent in the overweight group ($p = 0.002$), and 12 percent versus 74 percent in the obese group ($p < 0.001$), respectively.

Tables 3 and 4 list the regression results for general and aesthetic satisfaction by procedure type. Patient body mass index did not have a significant effect on general satisfaction for either procedure type. However, aesthetic satisfaction with postmastectomy reconstruction did appear to differ across body mass index categories. Although not statistically significant, overweight patients were less than half as likely to be aesthetically satisfied with expander/implant reconstruction than normal weight patients (odds ratio, 0.28; $p = 0.09$). Obese patients with expander/implant reconstructions were significantly less likely to be aesthetically satisfied compared with normal weight patients (odds ratio, 0.14; $p = 0.02$). In other words, obese patients were one-seventh as likely to be aesthetically satisfied with their expander/implants when compared with normal weight patients with expander/implants. For TRAM flaps, body mass index did not have a significant effect on aesthetic satisfaction.

Table 3. Multivariate Analysis of Patients' General Satisfaction with Breast Reconstruction by Procedure Type

	TRAM Flap		Expander/Implant	
	OR (95% CI)	*p*	OR (95% CI)	*p*
Overweight*	1.46 (0.66–3.20)	0.35	0.58 (0.14–2.33)	0.44
Obese*	0.73 (0.29–1.87)	0.52	1.25 (0.29–5.35)	0.77
Timing†	1.25 (0.60–2.59)	0.55	0.32 (0.08–1.26)	0.10
Age	0.98 (0.94–1.02)	0.38	1.01 (0.95–1.08)	0.77

OR, odds ratio; CI, confidence interval (for the effect of the independent variables on general satisfaction by procedure type).
*Normal weight and †immediate reconstruction are the reference groups.

Table 4. Multivariate Analysis of Patients' Aesthetic Satisfaction with Breast Reconstruction by Procedure Type

	TRAM Flap		Expander/Implant	
	OR (95% CI)	*p*	OR (95% CI)	*p*
Overweight*	0.62 (0.31–1.26)	0.19	0.28 (0.06–1.24)	0.09
Obese*	0.79 (0.30–2.08)	0.63	0.14 (0.02–0.74)	0.02
Timing†	1.40 (0.71–2.75)	0.33	0.11 (0.01–1.0)	0.05
Age	1.00 (0.97–1.04)	0.85	0.99 (0.09–1.06)	0.70

OR, odds ratio; CI, confidence interval (for the effect of the independent variables on general satisfaction by procedure type).
*Normal weight and †immediate reconstruction are the reference groups.

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Age and timing were the other independent variables controlled for in the regression for general and aesthetic satisfaction. Age and timing did not have significant effects on general satisfaction. Likewise, for aesthetic satisfaction, age did not have a significant effect. However, patients with immediate expander/implants were significantly less likely to be aesthetically satisfied with their reconstructions compared with women undergoing delayed expander/implant reconstruction (odds ratio, 0.11; $p = 0.05$).

DISCUSSION

Breast reconstruction in overweight and obese patients presents a difficult challenge for plastic surgeons. Previous studies have reported higher complication rates[2–6] and disappointing aesthetic results[7] in this population compared with normal weight women. In an earlier analysis of expander/implant and TRAM flap reconstructions by our group, higher body mass index was associated with a greater likelihood of postoperative complications.[3] High body mass index has also been associated with poor aesthetic outcomes for breast reconstruction: Beahm and colleagues observed less favorable aesthetic outcomes in patients with body mass indexes over 35.[7]

Few existing studies have assessed the impact of body mass index on patient satisfaction in breast reconstruction. However, the analyses that did assess this outcome noted lower satisfaction among obese women. Fee-Fulkerson et al. performed a retrospective analysis of expander/implant reconstructions and found that patients with higher body mass indexes reported lower levels of satisfaction compared with women with normal body mass indexes.[8] Similarly, Beahm et al. observed lower satisfaction with breast reconstruction for patients with body mass indexes greater than 35.

The current study's findings suggest that, despite a higher associated risk of complications, obesity may not constitute an automatic contraindication for reconstruction following mastectomy. Our analysis noted that overweight and obese women were as likely to be generally satisfied with breast reconstruction as normal weight patients. For those undergoing TRAM flap procedures, there was also no significant body mass index effect on aesthetic satisfaction. Obesity did have a significant effect on aesthetic satisfaction for expander/implant reconstructions: obese women were less satisfied than normal weight women with their aesthetic results. These latter findings may be explained by the challenges of achieving acceptable symmetry with unilateral breast reconstructions in larger patients. Because TRAM flaps may offer greater flexibility than implants in the creation of a variety of breast shapes, autogenous tissue options may be better suited to matching large, ptotic contralateral breasts in overweight and obese women. Our findings may also be attributable to higher overall levels of aesthetic satisfaction for TRAM flap reconstructions over expander/implant techniques, as previously reported by our group[14] and others.[25–29]

Our study had several major strengths. Data were collected prospectively, with satisfaction being measured at a specified time interval (1 year) after reconstruction. This approach avoided the potential bias inherent in assessing patients at varying lengths of time after surgery. We used patient self-reported measures to assess the outcomes of reconstruction from the consumer's point of view. The health care services literature increasingly supports measurements of patient satisfaction as valid indicators of quality of care.[11] Unlike most previous research on patient satisfaction in breast reconstruction, the current study involved multiple centers and surgeons, thereby lessening the potential confounding effects of these variables. Thus, the scope of our research design may provide greater generalizability for our findings compared with earlier single-center or single-surgeon studies. Finally, in evaluating the effects of body mass index on patient satisfaction, our analyses controlled for several other potential confounding variables, such as procedure type, timing of reconstruction, and patient age, which may impact satisfaction independent of body mass index.

Our study did have limitations. Breast reconstruction outcomes may be affected by a variety of potential confounding variables, encompassing a wide range of patient, surgeon, and study site characteristics. No matter how well designed, a cohort study cannot control for all of these factors. Although a randomized controlled trial design would be more effective in controlling for confounders (both known and unknown), a breast reconstruction randomized controlled trial would likely prove to be ethically and logistically challenging, as most patients and surgeons have strong preferences for specific reconstructive procedures.

Because our study population included only women undergoing TRAM flap or expander/implant procedures, our findings cannot be generalized to other breast reconstruction options, such as latissimus dorsi or perforator flaps. The impact of body mass index on patient satisfaction for

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these techniques remains to be evaluated by future research. It should also be noted that our patient satisfaction questionnaire was not previously validated, nor was its reliability tested. At the time of this study, no condition-specific instruments were available for assessing patient satisfaction in breast reconstruction. Therefore, we may not have captured all elements of satisfaction with our measures, and we may have underestimated important differences in satisfaction among the study cohorts. Condition-specific surveys for breast reconstruction patients are now becoming available and will likely prove useful for future studies of this type.[30] Finally, this study was underpowered for general satisfaction comparisons. That is, we may not have had sufficient patient numbers to detect a statistically significant difference between procedure groups for general satisfaction, if in fact such a difference exists.

Over the past 30 years, several studies have documented the psychological, social, emotional, and functional benefits of breast reconstruction, including improved psychological health, self-esteem,[17,31,32] sexuality, body image,[10,16,17,33–41] and reduced concerns of cancer recurrence.[42–45] Our study supports the notion that, regardless of body mass index, women who want or need breast reconstruction may benefit from it. Although obese patients are at a higher risk for surgical complications, patient satisfaction with postmastectomy reconstruction is high among these women, particularly with autogenous tissue reconstruction. For overweight and obese patients, potential quality-of-life benefits from breast reconstruction appear to outweigh the added surgical risks associated with these procedures.

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