

# Prospective Analysis of Long-term Psychosocial Outcomes in Breast Reconstruction

## *Two-year Postoperative Results From the Michigan Breast Reconstruction Outcomes Study*

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**Objective:** To prospectively evaluate the psychosocial outcomes and body image of patients 2 years postmastectomy reconstruction using a multicenter, multisurgeon approach.

**Background:** Although breast reconstruction has been shown to confer significant psychosocial benefits in breast cancer patients at year 1 postreconstruction, we considered the possibility that psychosocial outcomes may remain in a state of flux for years after surgery.

**Methods:** Patients were recruited as part of the Michigan Breast Reconstruction Outcome Study, a 12 center, 23 surgeon prospective cohort study of mastectomy reconstruction patients. Two-sided paired sample *t* tests were used to compare change scores for the various psychosocial subscales. Multiple regression analysis was used to determine whether the magnitude of the change score varied by procedure type.

**Results:** Preoperative and postoperative year 2 surveys were received from 173 patients; 116 with immediate and 57 with delayed reconstruction. For the immediate reconstruction cohort, significant improvements were observed in all psychosocial subscales except for body image. This occurred essentially independent of procedure type. In the cohort with delayed reconstruction, significant change scores were observed only in body image. Women with transverse rectus abdominis musculocutaneous flaps had significantly greater gains in body image scores ( $P = 0.003$  and  $P = 0.034$ , respectively) when compared with expander/implants.

**Conclusions:** General psychosocial benefits and body image gains continued to manifest at 2 years postmastectomy reconstruction. In addition, procedure type had a surprisingly limited effect on psychosocial well being. With outcomes evolving beyond year 1, these

data support the need for additional longitudinal breast reconstruction outcome studies.

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Over the past 30 years, researchers have documented the psychologic, social, emotional, and functional benefits of breast reconstruction. For women receiving reconstruction following mastectomy, previous studies have demonstrated positive effects on psychologic health, self-esteem,<sup>1–3</sup> sexuality, body image<sup>1,3–14</sup> and reduced concerns of cancer recurrence.<sup>1,15–18</sup> The literature provides strong support for the notion that mastectomy reconstruction in breast cancer patients is one of the most important determinants of long-term health and well being.

Our group previously reported the 1-year postoperative psychosocial outcomes of patients enrolled in the Michigan Breast Reconstruction Outcomes Study (MBROS), a multicenter prospective cohort study of women undergoing common types of breast reconstruction, including expander/implants, pedicle transverse rectus abdominis musculocutaneous (TRAM) flap and free TRAM flap techniques.<sup>1</sup> In this study, both immediate and delayed reconstruction resulted in substantial psychosocial benefits for mastectomy patients. For most of the measures used, procedure type did not significantly affect the gains observed. Despite the reports of MBROS and similar research, little is known about psychosocial and quality of life outcomes of breast reconstruction beyond 1 year. The few long-term studies which have been published are flawed by single center or single surgeon design,<sup>2–4</sup> use of nonvalidated measures, or retrospective design.<sup>3–6</sup>

Research on long-term outcomes in breast reconstruction is important because results of these procedures seem to evolve over time. Previous investigators have demonstrated that natural tissue and implant-based techniques have different short- and long-term complications and different aging processes.<sup>7–11</sup> In addition, the aesthetics of different reconstructive procedures may also change over time. In a prospective longitudinal study of TRAM flap patients,<sup>12</sup> Clough et al<sup>13</sup> found that TRAM flaps provided stable, satisfactory

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aesthetic results over an 8-year period. By contrast, a prospective analysis of the long-term cosmetic outcomes of implant breast reconstruction noted that the appearance of implants deteriorated over time and that the aesthetic problems observed were difficult to correct.

Patient satisfaction may be another outcome that takes years to stabilize following breast reconstruction. In a recent analysis of patients in the MBROS study, we found that patient satisfaction changed between postreconstruction years 1 and 2, such that procedural differences that were initially observed in women's general satisfaction with breast reconstruction diminished at postreconstruction year 2.<sup>14</sup> By contrast, procedure differences in aesthetic satisfaction noted at year 1 seemed to persist at year 2 following reconstruction: compared with women choosing expander-implant techniques, TRAM patients were significantly more aesthetically satisfied with their results at both 1 and 2 years postoperatively.

Because outcomes such as complications, aesthetics, and patient satisfaction seem to evolve with time, we sought to evaluate whether the psychosocial benefits previously observed for breast reconstruction at 1 year would still be in evidence at 2 years after surgery. We analyzed data from a multicenter prospective cohort study to assess and compare 2 year postoperative psychosocial outcomes for expander/implant, pedicle TRAM, and free TRAM flap reconstructions.

## METHODS

### Study Population

Patients were recruited as part of the MBROS study, a prospective multicenter cohort study of mastectomy reconstruction patients. Women undergoing first-time, immediate or delayed expander/implant, pedicle TRAM flap or free TRAM flap procedures 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. Patients were followed for up to 2 years postreconstruction. For the current analysis, we excluded patients with latissimus dorsi flaps because of the small sample sizes for those procedures.

### Data Collection

Before reconstruction, and at postoperative years 1 and 2, patients completed a series of questionnaires soliciting quality of life, satisfaction, health status, general well being, and psychosocial information. Questionnaires were completed at home and returned to the study coordinator by mail. The psychometric battery of instruments used in MBROS included 2 previously published, validated health-related quality of life surveys: the Medical Outcome Study Short Form-36 (SF-36), and the Functional Assessment of Cancer Therapy-Breast (FACT-B). The SF-36 is a 36-item, self-administered questionnaire that has been widely used in a variety of healthcare settings to evaluate symptom changes and treatment outcomes for patients undergoing medical interventions. This generic measure of health status consists of 8 subscales: physical functioning, role limitations due to

physical problems, role limitations due to emotional problems, bodily pain, vitality, social functioning, mental health, and general health. For purposes of describing patients' psychosocial status in our study, we analyzed data from the role limitations due to emotional problems (role-emotional), vitality, social functioning, and mental health subscales (Fig. 1). Scores for each subscale were summed and then transformed to a scale from 1 to 100 to facilitate comparison of scores across the independent variables of interest.

The second quality of life instrument used was the FACT-B, a condition-specific instrument designed for breast cancer patients. Like the SF-36, the FACT-B includes an array of subscales assessing physical well being, social well being, relationship with providers, emotional well being, functional well being, and additional concerns. Responses were scored such that higher scores represented better psychosocial well being. Both the social and functional well being subscales include seven questions. The questions best representing a patient's overall psychosocial status are those in the social and functional well being subscales (Fig. 2).<sup>1</sup> For each subscale, scores for the seven items were summed to get an overall score ranging from 0 to 28.

A new condition-specific item set, consisting of nine questions, was designed to evaluate patients' perceptions of their physical appearances (Fig. 3). To evaluate the extent to which these nine questions represented a single construct (body image), Cronbach  $\alpha$  was calculated for various combinations of items. Results of this analysis showed that the largest correlation (0.8950) was achieved with all questions combined into a single scale. Therefore, a condition specific body image scale was designated for this study consisting of all nine items. These items were scored on a 5-point Likert scale, and item responses were summed to determine a total score for the scale. Total possible scores range from 9 to 45, with high scores indicating more positive assessments of body image.

### Analysis

To describe the population of year 2 responders, we evaluated the differences between year 2 responders and nonresponders. This was done by comparing each group's demographic data and their year 1 psychosocial outcomes and patient satisfaction.

In previous analyses, we have observed that immediate and delayed reconstruction patients differ significantly in their pre- and postoperative scores for many of the psychosocial and body image measures.<sup>1,19</sup> This is not surprising, given the contrast in clinical scenarios between the two groups: before surgery, immediate reconstruction patients have not yet lost their breasts to mastectomies but are often struggling to cope with new breast cancer diagnoses. By contrast, most delayed reconstruction patients have successfully completed treatment for breast cancer but have also been dealing with the loss of one or both breasts. Because reconstructive procedure effects on psychosocial status and body image may differ by timing of reconstruction, we elected to analyze the immediate and delayed reconstruction groups separately.

Change scores (the differences between post- and preoperative scores) for the various subscales were initially compared across the procedure types using 2-sided, paired *t*

tests. Multiple regression analyses were used to determine whether the magnitude of changes between preoperative and postoperative year 2 scores varied by procedure type, while controlling for age, and the preoperative scores from each of the psychosocial scales. Age and baseline score were included as independent variables because of their significant effects on multiple outcomes in previous MBROS analyses.<sup>1,15,20</sup> Other investigators have noted that younger women may have higher aesthetic expectations for breast reconstruction.<sup>15,20</sup> Furthermore, younger patient age is associated with

differences in quality of life outcomes<sup>16</sup> and psychosocial maladjustment after breast reconstruction.<sup>17</sup> The final regression model included the change score for each psychosocial subscale as the dependent variable, whereas the independent variables included procedure type, age centered around the mean, and the preoperative scores from each of the psychosocial scales. Surgical procedure was categorized as tissue expander/implant, free TRAM, or and pedicle TRAM techniques. Patient age was included as a continuous variable. Statistical significance was designated at the  $P < 0.05$  level.

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### Medical Outcome Study Short Form 36 (SF-36): Subscales and Questions

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**Role-Emotional:** During the past four weeks, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

Cut down on the amount of time you spent on work or other activities.

Accomplished less than you would like.

Didn't do work or other activities as carefully as usual.

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**Vitality:** How much of the time during the past four weeks...

Do you feel full of pep?

Do you have a lot of energy?

Did you feel worn out?

Did you feel tired?

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**Social Functioning:** During the past four weeks...

To what extent have your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors or groups?

How much of the time has your physical health or emotional problems interfered with your social activities (like visiting friends, relatives, etc.)?

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**Mental Health:** How much of the time during the past four weeks...

Have you been a very nervous person?

Have you felt so down in the dumps that nothing could cheer you up?

Have you felt calm and peaceful?

Have you felt downhearted and blue?

Have you been a happy person?

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FIGURE 1. Subscales and questions of the medical outcome study short-form (SF-36).

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**Functional Well-being**

I am able to work (including the work in home).  
 My work (including work in home) is fulfilling.  
 I am able to enjoy life.  
 I have accepted my illness.  
 I am sleeping well.  
 I am content with the quality of my life right now.  
 I am enjoying the things I usually do for fun.

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**Social Well-being**

I get emotional support from my family.  
 I feel distant from my friends.  
 I get support from my friends and family.  
 My family has accepted my illness.  
 Family communication about my illness is poor.  
 I feel close to my partner (or person who is my main support).  
 I am satisfied with my sex life.

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**FIGURE 2.** Subscales of the functional assessment of cancer therapy-breast (FACT-B).

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I feel whole.  
 I like the way my blouses/sweaters fit.  
 I like the way I look in a bathing suit.  
 My bra fits comfortably.  
 I feel attractive.  
 I think of my cancer when I look at my breasts.  
 I like the appearance of my breasts.  
 My significant other likes the appearance of my breasts.  
 I feel self-conscious during sexual activity because of the appearance of my breasts.

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**FIGURE 3.** Body image scale items.**RESULTS****Study Population**

Preoperative surveys were completed by 287 patients. Following reconstruction, questionnaires were ob-

tained from 273 women at year 1 and 173 at year 2, yielding a response rate of 60.3% at year 2. Because many patients did not complete all survey items, sample sizes for the year 2 analyses ranged from 169 to 173. Of the 173 women responding at year 2, 42 received expander/im-



**TABLE 1.** Distribution of Procedure Type and Timing of Year 2 Responders

	Immediate		Delayed		Total	
	N	%	N	%	N	%
Pedicle TRAM	55	60.4	36	39.6	91	100
Free TRAM	26	65	14	35	40	100
Expander/implant	35	83.3	7	16.7	42	100
Total	116	67.1	57	32.9	173	100

plants, 91 pedicle TRAM flaps, and 40 free TRAM flaps. A total of 116 immediate and 57 delayed reconstructions were performed. The average ages for expander/implant, free TRAM, and pedicle TRAM patients were 48.5, 46.0, and 49.7 years, respectively ( $P = 0.0134$ ). Table 1 summarizes the distribution of the study population by procedure type and timing.

### Immediate Reconstruction

As outlined in Table 2 women choosing immediate reconstruction demonstrated statistically significant gains (by 2-tailed, paired  $t$  tests) in SF-36 role emotional, vitality,

general mental health, and social functioning, and in FACT-B functional well being subscales. By contrast, gains in body image were not significant. For the FACT-B social well being subscale, women with immediate reconstruction reported significantly lower scores at year 2 than preoperatively. Using regression analysis to control for age and preoperative scores, changes in all 7 psychosocial subscales did not vary significantly by procedure type (Figs. 4–10), except for the FACT-B social well being subscale. Although the pedicle TRAM and expander/implant groups demonstrated declines in social well being at 2 years, the mean score for this outcome for the free TRAM cohort increased following reconstruction. This procedure difference was statistically significant ( $P = 0.024$ ) (Fig. 9).

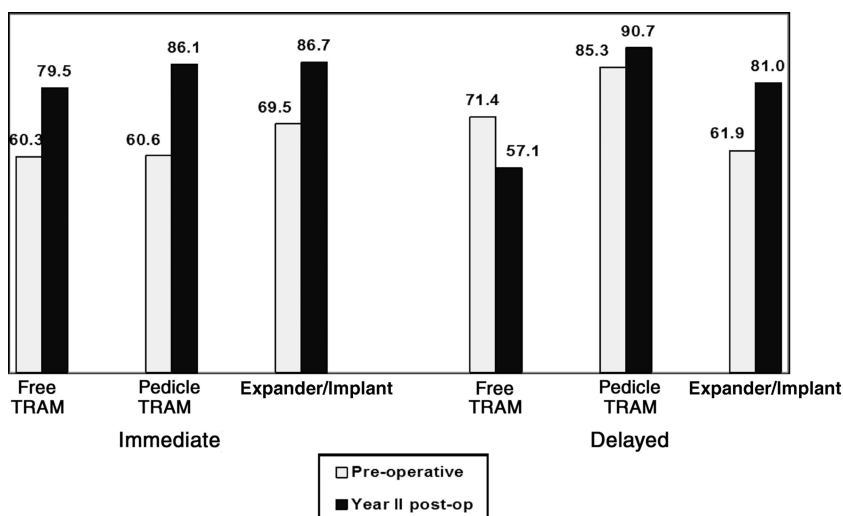
### Delayed Reconstruction

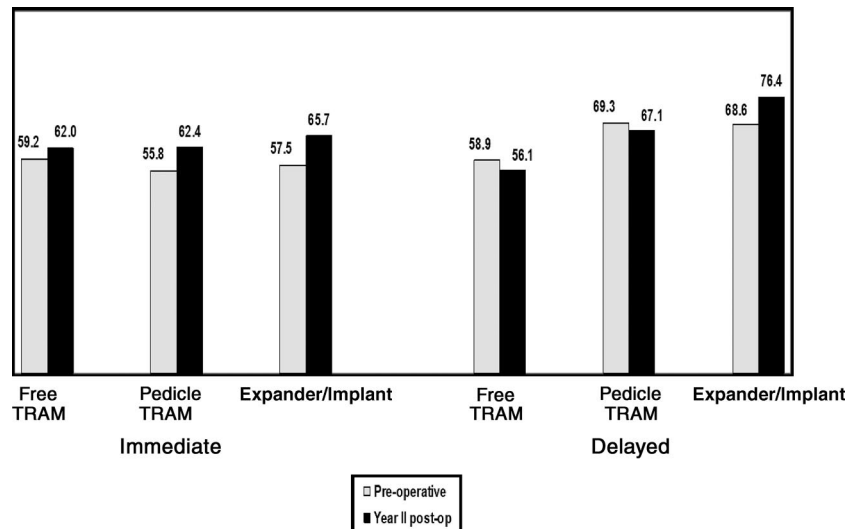
Among delayed reconstruction patients, modest gains were reported in SF-36 general mental health and FACT-B emotional well being and functional well being. Significant gains were reported in body image (by 2-tailed, paired  $t$  tests) (Table 3). For SF-36 vitality, SF-36 social functioning, and Fact-B social well being, there seemed to be slight decreases 2 years postreconstruction. However,

**TABLE 2.** Comparison of Year 2 Pre- and Postoperative Psychosocial Scores in Patients With Immediate Reconstruction

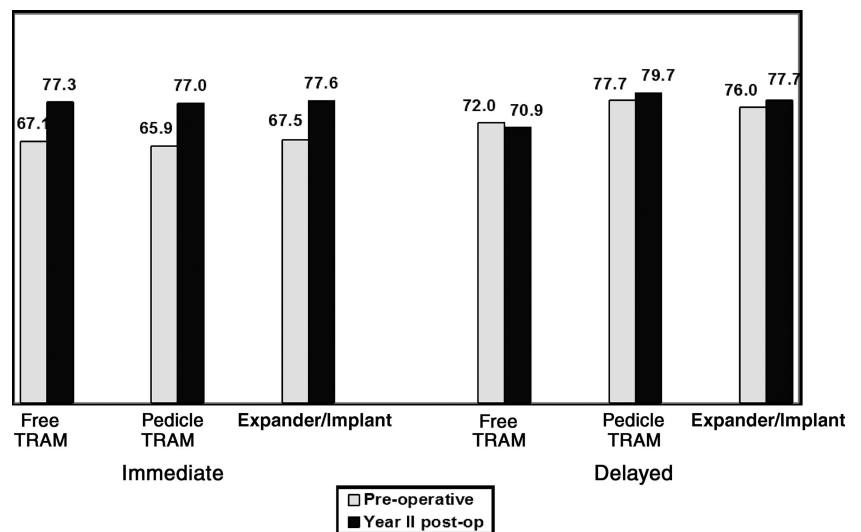
	N	Prereconstruction Mean Score	Postreconstruction Mean Score	Mean Difference	SD	P
SF-36 RE	116	63.21	84.77	21.55	42.22	<0.0001
SF-36 V	114	57.09	63.32	6.29	21.84	0.0029
SF-36 GMH	114	66.67	77.24	10.57	19.62	<0.0001
SF-36 Soc	116	77.05	87.28	10.23	26.35	0.0001
FACT-B Fn	116	21.13	23.64	2.51	5.37	<0.0001
FACT-B Soc	115	21.07	20.12	−0.95	3.90	0.0099
Body image	116	34.32	34.68	0.36	8.33	0.6394

The psychosocial variables include SF-36 RE (SF-36 emotional well being subscale), SF-36 V (SF-36 vitality subscale), SF-36 GMH (SF-36 general mental health subscale), SF-36 Soc (SF-36 social functioning), FACT-B Fn (FACT-B functional well being scale), FACT-B Soc (FACT-B social well being subscale), and body image.

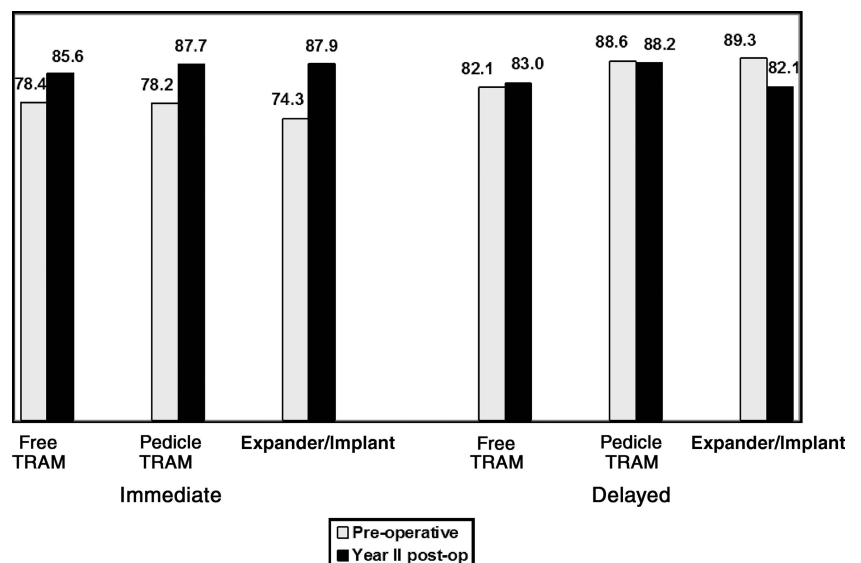
**FIGURE 4.** Mean pre- and postoperative scores for the SF-36 "Role Emotional" subscale for free TRAM, pedicle TRAM, and expander/implant reconstructions.



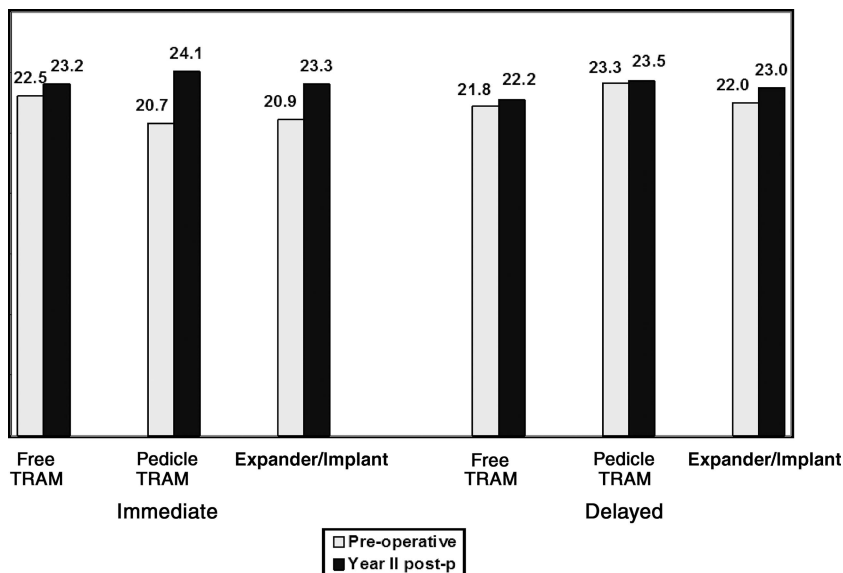
**FIGURE 5.** Mean pre- and postoperative scores for the SF-36 "Vitality" subscale for free TRAM, pedicle TRAM, and expander/implant reconstructions.



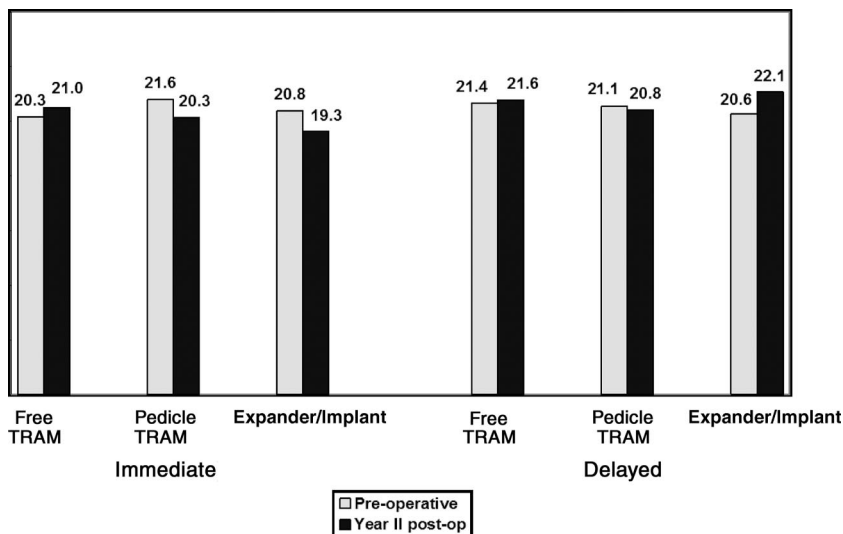
**FIGURE 6.** Mean pre- and postoperative scores for the SF-36 "General Mental Health" subscale for free TRAM, pedicle TRAM, and expander/implant reconstructions.



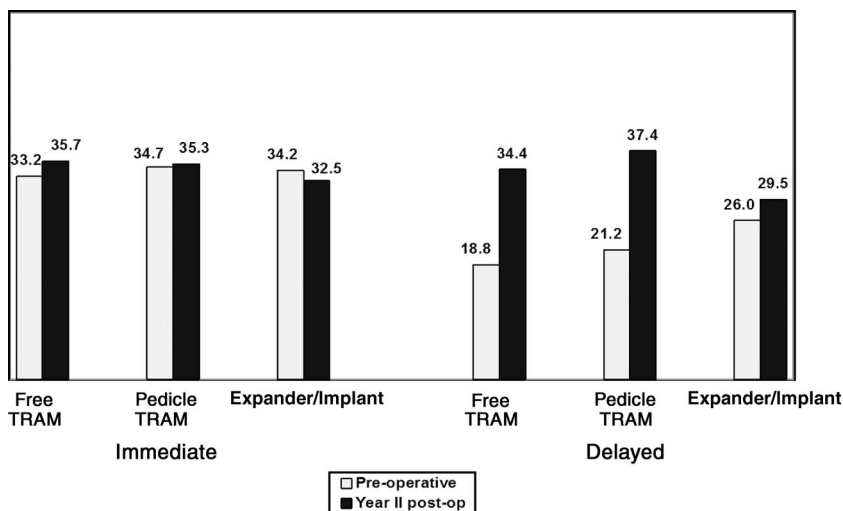
**FIGURE 7.** Mean pre- and postoperative scores for the SF-36 "Social Functioning" subscale for free TRAM, pedicle TRAM, and expander/implant reconstructions.



**FIGURE 8.** Mean pre- and postoperative scores for the FACT-B "Functional Well Being" subscale for free TRAM, pedicle TRAM, and expander/implant reconstructions.



**FIGURE 9.** Mean pre- and postoperative scores for the FACT-B "Social Well Being" subscale for free TRAM, pedicle TRAM, and expander/implant reconstructions.



**FIGURE 10.** Mean pre- and postoperative scores for "Body Image" for free TRAM, pedicle TRAM, and expander/implant reconstructions.

**TABLE 3.** Comparison of Year 2 Pre- and Postoperative Psychosocial Scores in Patients With Delayed Reconstruction

	N	Prereconstruction Mean Score	Postreconstruction Mean Score	Mean Difference	SD	P
SF-36 RE	55	78.79	81.82	3.03	41.21	0.5878
SF-36 V	56	66.64	65.18	-1.46	16.87	0.5204
SF-36 GMH	55	76.0	77.02	1.02	18.86	0.6905
SF-36 Soc	56	87.06	85.94	-1.12	26.36	0.7525
FACT-B Fn	55	22.76	23.22	0.45	4.54	0.4611
FACT-B Soc	54	21.09	21.06	-0.30	4.46	0.9611
Body image	54	21.25	35.62	14.37	9.51	<0.0001

The psychosocial variables include SF-36 RE (SF-36 emotional well being subscale), SF-36 V (SF-36 vitality subscale), SF-36 GMH (SF-36 general mental health subscale), SF-36 Soc (SF-36 social functioning), FACT-B Fn (FACT-B functional well being scale), FACT-B Soc (FACT-B social well being subscale), and body image.

**TABLE 4.** Comparison of Year 1 Outcomes of the Year 2 Responders and Nonresponders

	Responders	Nonresponders	P
General satisfaction	76%	73%	0.46
Aesthetic satisfaction	67%	61%	0.29
Role emotional	85.43	77.53	0.068
Vitality	63.76	56.74	0.011
Social functioning	88.59	81.34	0.008
General mental health	77.95	71.01	0.004
Functional well being	23.54	21.04	<0.001
Social well being	20.67	19	0.007
Body image	35.23	32.69	0.009

Year 2 nonresponders had significantly lower psychosocial scores at postoperative year 1.

these differences were not statistically significant. In the regression analysis, patients with pedicle and free TRAM reconstruction had greater gains in their body image scores over 2 years compared with patients with expander/implant reconstruction ( $P = 0.003$  and  $P = 0.034$  respectively; Fig. 10). For the SF-36 role emotional subscale, patients with free TRAM flaps demonstrated near significant decreases in the magnitude of change score compared with those with pedicle TRAM and expander/implant reconstructions ( $P = 0.066$ ; Fig. 4).

### Comparison of Year 2 Survey Responders Versus Nonresponders

With the 23.8% decline (273–173) in survey responses between postoperative years 1 and 2, we analyzed potential differences between year 2 responders and nonresponders. Among demographic variables, statistically significant group differences were observed only for patient age, with nonresponders having a mean age of 47.44 years, compared with 49.25 years for responders ( $P = 0.04$ ). No statistically significant differences were noted for race, ethnicity, educational level, employment status, marital status, or procedure type between the 2 groups. For postoperative year 1 psychosocial outcomes, there were no statistically significant differences in SF-36 role-emotional or in patient satisfaction (general or aesthetic) scores between year 2 responders and nonre-

sponders. However, there were significant differences in most other psychosocial outcomes (Table 4). Year 2 responders scored significantly higher on their year 1 outcomes for SF-36 vitality ( $P = 0.01$ ), social functioning ( $P = 0.008$ ), and general mental health ( $P = 0.004$ ), and in FACT-B functional well being ( $P < 0.001$ ), FACT-B social well being ( $P = 0.007$ ), and body image ( $P = 0.009$ ) compared with the nonresponders.

## DISCUSSION

Our results suggest that, as a healthcare intervention, breast reconstruction achieves its intended goals of improving patient well being and promoting the recovery of breast cancer survivors 2 years postreconstruction. The findings of the current study demonstrate that at postoperative year 2, general psychosocial benefits are still evident in patients with immediate reconstruction and positive effects on body image continue to manifest in patients with delayed reconstruction. Furthermore, the type of reconstructive operation has surprisingly little effect on psychosocial outcomes.

### Long-term Outcomes

Based on our findings in this multicenter prospective analysis, it is our belief that the psychosocial benefits of mastectomy reconstruction continue over the long-term. Consistent with these results, Al-ghazal et al<sup>4</sup> also found that psychosocial benefits of breast reconstruction persist in the long term, particularly in comparison to mastectomy alone. In their analysis of psychosocial morbidity in women who underwent breast conservation therapy, mastectomy alone, or mastectomy with reconstruction, statistically significant differences were found between the 3 procedures. At an average of 51.2 months, psychosocial morbidity was lowest in those with breast conservation followed by mastectomy with reconstruction. Patients receiving mastectomy without reconstruction reported the highest levels of morbidity.

There does not seem to be consensus in the literature regarding the impact and duration of breast reconstruction effects on quality of life outcomes. Harcourt et al,<sup>18</sup> found significant quality of life benefits in women with breast reconstruction over those with mastectomy alone at 3 months; however, these differences disappeared at 12 months. Nano et



al<sup>2</sup> and Fung et al<sup>21</sup> did not find differences in quality of life outcomes in patients with breast conservation, mastectomy alone, or mastectomy with reconstruction. Additional multicenter, prospective studies are needed to evaluate the impact of breast reconstruction on long-term quality of life. Furthermore, to appropriately evaluate psychosocial outcomes, well-developed, validated patient questionnaires are needed<sup>22</sup> to assess issues specific to breast reconstruction patients (ie, “condition-specific” measures).

## The Evolution of Outcomes

We know from previous studies that breast reconstruction outcomes evolve with time.<sup>9,10,12,14,19,20,23</sup> In the present study, patients with immediate reconstruction seem to hold onto their quality of life benefits for a longer period of time than patients with delayed reconstruction. Two years after surgery, the immediate reconstruction cohort reported significant gains in all psychosocial subscales except for body image and social well being. Patients with delayed reconstruction only reported statistically significant gains in body image. This differs from our year 1 analysis, in which patients with delayed reconstruction had significant increases in emotional well being, vitality, general mental health, functional well being, and body image.

The point at which psychosocial outcomes and body image outcomes stop evolving is unknown. Currently, decision making on the preferred type and timing of breast reconstruction is based on anecdotal experience or at best, prospective data gathered from women less than 2 years postreconstruction. Availability of long-term prospective data will not only facilitate reconstructive decision-making for patients and surgeons, but may also further demonstrate the value of these procedures to health care payers and policymakers allocating increasingly scarce resources.

## The Effects of Procedure Type

As we found in our year 1 analysis, the 2-year data indicate that procedure type has a limited effect on psychosocial outcomes. In the immediate reconstruction group, procedure type’s only significant effect was on the change score for the FACT-B social well being subscale. Although this procedure difference was statistically significant, the clinical significance of this finding is less certain, given the relatively small increases and decreases observed in the mean scores over time for the procedure cohorts (Fig. 9).

Other studies have found a relatively limited effect of procedure type on psychosocial outcomes in breast reconstruction. In a study comparing the SF-36 scores of pedicle versus free TRAM procedures, Edsander-Nord et al<sup>24</sup> reported no significant differences between the procedure types. Similarly, in a randomized, controlled trial (RCT) of women undergoing delayed reconstruction, Brandberg et al<sup>6</sup> found no significant differences in the SF-36 subscales between the pedicle TRAM flap, latissimus dorsi flap, and the lateral thoracodorsal flap patients.

Procedure type did significantly influence body image. At postoperative year 2, postmastectomy reconstruction produced significant gains in body image for women with delayed reconstruction ( $P < 0.0001$ ). When analyzed by

procedure type (Fig. 10), both free and pedicle TRAM reconstruction patients had significantly greater gains in body image scores compared with women with delayed expander/implant reconstruction. Although there was not a statistically significant procedure effect on body image for immediate reconstruction at year 2, autogenous tissue reconstruction patients again fared better on this measure compared with women receiving expander/implant reconstruction. These findings are similar to our year 1 analysis and to other studies which favor autogenous tissue reconstruction over implant techniques in terms of aesthetical superiority and patient satisfaction.<sup>1,12,20,25–29</sup>

Interestingly, women undergoing immediate breast reconstruction reported little change in their body image scores between their pre and 2-year postoperative surveys. These women seem to have been “protected” from the body image disturbances normally associated with mastectomy. Combined with the lack of significant procedure effects on body image in immediate reconstruction, this finding leads us to believe that availability of reconstruction at the time of mastectomy is what matters most to patients, rather than the specific type of operation performed.

## Strengths

In our study, data were collected prospectively, with psychosocial outcomes and body image being measured at a specified time interval (2 years) following reconstruction. This approach avoided the potential bias inherent in assessing patients at varying lengths of time after surgery. This design also provided us with the ability to compare the progress and evolution of outcomes in our patient population. Unlike most previous research, the current study involved multiple centers and surgeons, thereby lessening the potential confounding effects of these variables. Thus, the scope of our research design provides for greater generalizability of our findings.

Another major strength is that we mainly used previously validated, reliability-tested patient measures to assess quality of life and psychosocial well being—the SF-36 and FACT-B. We also used condition-specific surveys to assess outcomes related to primary breast cancer treatment, such as the FACT-B and the body image scale. Compared with more generic surveys, condition-specific instruments are more likely to detect changes and differences in our patient population. Finally, in evaluating the effects of procedure type on psychosocial outcomes, our analyses controlled for several other potential confounding variables, including timing of reconstruction, patient age, and preoperative baseline scores, which may independently impact psychosocial outcomes.

## Limitations

This study did have some limitations. Our response rate at 2 years was 60.3%. Comparison of 1 year outcomes between the year 2 responders and nonresponders indicates that there may have been some fundamental differences in the 2 groups’ responses to reconstruction. Because the 2 year nonresponders seemed to be faring less well at year 1, we may be overestimating the psychosocial benefits and body image gains at 2 years.

Outcomes of reconstruction may be affected by variety of confounding variables, encompassing a wide range of patient, surgeon, and study site characteristics. No matter how well designed, a prospective cohort study cannot control for these unknown confounders. Although an RCT may be more effective in controlling confounding, there are practical and (perhaps) ethical barriers to conducting an RCT for breast reconstruction procedures. Ultimately, the choice of breast reconstruction is a shared decision made between plastic surgeons and their patients. Convincing both parties to give up this prerogative in favor of an RCT would likely be met with fierce resistance. Finally, our study did not include patients undergoing perforator flaps or latissimus dorsi flaps, as the numbers of these procedures at the participating sites were not sufficient for analysis.

## CONCLUSIONS

General psychosocial benefits and body image gains were still evident at 2 years following mastectomy reconstruction. Procedure type had a surprisingly limited effect on psychosocial well being. With outcomes evolving beyond 1 year, these data support the need for additional longitudinal breast reconstruction outcome studies.

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