

Patterns of Care for Immediate and Early Delayed Breast Reconstruction following Mastectomy

Sue A. Joslyn, Ph.D.

Cedar Falls, Iowa

Background: The purpose of this study was to analyze factors associated with immediate or early (up to 4 months) post-mastectomy reconstruction and to update and extend knowledge of patterns of care for reconstruction, using data from a large, population-based surveillance program.

Methods: Procedures included analysis of data for 27,703 women diagnosed with breast carcinoma who underwent mastectomy in the National Cancer Institute's Surveillance, Epidemiology, and End Results Program between 1998 and 2000. Descriptive, univariate, and multivariate logistic regression analyses were used to estimate the odds of selecting immediate or early reconstruction while simultaneously considering independent variables.

Results: Results of multivariate analyses showed that, for those women who underwent reconstruction, the proportion of black women was approximately one-third less than that of white women (odds ratio, 0.64; 95 percent CI, 0.55 to 0.74). Women who chose reconstruction were between two and four times more likely [odds ratio range, 2.27 (95 percent CI, 2.04 to 2.52) to 3.56 (95 percent CI, 2.53 to 4.58)] to be younger compared with those women aged 65 years and older, and were nearly 75 percent more likely to be diagnosed at the in situ stage compared with those diagnosed at later

stages. Women choosing reconstruction were significantly less likely to live in Iowa and Seattle/Puget Sound and more likely to live in Detroit and Atlanta compared with women in San Francisco/Oakland, Connecticut, Hawaii, New Mexico, and Utah, and were significantly less likely to have never married or be widowed compared with married women. Women undergoing reconstruction were more than twice as likely to have had mastectomy with removal of the uninvolved contralateral breast.

Conclusions: Results of this study updated previous research and showed that immediate or early reconstruction is used by a small but increasing proportion of women diagnosed with breast carcinoma who undergo mastectomy. Previous knowledge was extended by showing that use of reconstruction is most strongly associated with patient age and removal of the uninvolved contralateral breast and, to a lesser magnitude (but still significantly), with race, stage, marital status, and geographic location. (*Plast. Reconstr. Surg.* 115: 1289, 2005.)

Breast carcinoma is the most common malignancy among women in the United States, with an estimated 215,990 new cases diagnosed in 2004.¹ Recent improvements in diagnosing women at earlier stages of disease have resulted in increased use of breast-conserving surgery in

From the Division of Health Promotion and Education, University of Northern Iowa. Received for publication April 1, 2004; revised June 14, 2004.

DOI: 10.1097/01.PRS.0000156974.69184.5E

treating breast carcinoma. Even so, mastectomy remains the surgical treatment of choice for the majority of women diagnosed with breast carcinoma, as it has been for the past two millennia.²

Before safe and acceptable techniques were available for breast reconstruction, women undergoing mastectomy often experienced emotional and psychological sequelae related to loss of the breast(s). Many women suffered from depression and impaired body image as a result of mastectomy.³ With the introduction of breast implants in the 1960s⁴ and subsequent development of related surgical techniques, postmastectomy reconstruction offers women the option of achieving aesthetically acceptable cosmesis, along with an improved emotional and psychological outcome.^{5,6} For the majority of women who undergo mastectomy, reconstruction is a viable option of treatment.

Although delaying the decision of reconstruction until after initial treatment for breast carcinoma may allow a woman additional time to make the decision, the use of immediate or early reconstruction has two major benefits. First, immediate or early reconstruction helps reduce negative emotional and psychological consequences of mastectomy.³ Second, breast reconstruction performed at the time of mastectomy is significantly less expensive than delayed reconstruction.⁷ Understanding factors associated with immediate or early reconstruction, along with patterns of use, are of importance to surgeons in providing highest quality treatment to women diagnosed with breast carcinoma.

Many studies of the epidemiologic patterns of postmastectomy reconstruction have used smaller samples or single-institution data,⁷⁻¹⁰ which introduces selection biases and/or results in less powerful statistical analyses. Other studies that have analyzed population-based surveillance information have presented more limited samples.¹¹⁻¹³ Therefore, the purpose of this study was to analyze factors associated with postmastectomy reconstruction and to update and extend knowledge of patterns of care for reconstruction, using data from a large, population-based surveillance program.

PATIENTS AND METHODS

Procedures for this study included analysis of data for women diagnosed with breast carcinoma in the National Cancer Institute's Surveillance, Epidemiology, and End Results Pro-

gram. This national cancer surveillance program has information on all cases of invasive cancer diagnosed in residents of nine geographic areas of the United States: metropolitan Atlanta, metropolitan Detroit, the San Francisco/Oakland Standard Metropolitan Statistical Area, the Seattle/Puget Sound Standard Metropolitan Statistical Area, and the states of Connecticut, New Mexico, Hawaii, Utah, and Iowa since 1973 (1974 for Seattle/Puget Sound, 1975 for Atlanta). The geographic areas of the program comprise approximately 12 percent of the United States population, and are representative of national demographic characteristics. In addition to collecting cancer-related and demographic information at the time of cancer diagnosis, the program tracks patients annually for survival status.

Although breast carcinoma data have been collected since 1973, the focus of this study will be on women diagnosed between 1998 and 2000, as information on breast reconstruction has been collected in the Surveillance, Epidemiology, and End Results Program only since 1998. The sample was limited to those women undergoing mastectomy, to capture the group most likely to be presented with the option of reconstruction. These cases included those with simultaneous cancer diagnoses in which primary breast carcinoma was present. Variables analyzed included reconstruction, race, age, program site, marital status, removal of uninvolved contralateral breast, and stage at time of diagnosis.

The reconstruction variable describes those women who chose immediate or early (up to 4 months) postmastectomy reconstruction. The Surveillance, Epidemiology, and End Results Program records data on first line of treatment only, which excludes women undergoing mastectomy who choose reconstruction at a later date. Categories of reconstruction included no reconstruction, reconstruction not otherwise specified, breast implant without flap procedure, breast implant with flap procedure not otherwise specified, latissimus dorsi flap, rectus abdominis flap, flap procedure not otherwise specified with implant, latissimus dorsi flap with implant, rectus abdominis flap with implant, and reconstruction unknown. Race was categorized as black or white. Small numbers of cases in the "other races" category precluded meaningful statistical analyses for this group and were not analyzed in this study. Age

was analyzed using the categories of younger than 35 years, 35 to 44 years, 45 to 54 years, 55 to 64 years, 65 to 74 years, 75 to 84 years, and 85 years and older. Marital status was categorized as never married, married, separated/divorced, or widowed.

Stage at time of diagnosis was categorized using the American Joint Committee on Cancer tumor, node, metastasis coding scheme. The American Joint Committee on Cancer system takes into account information on tumor size and extension, regional lymph node involvement, and the presence of distant metastasis. Stage categories analyzed in this study included in situ, I, IIA, IIB, II not otherwise specified, IIIA, IIIB, and IV.

Data were analyzed using SAS version 8 statistical software (SAS Institute, Inc., Cary, N.C.). Numbers and percentages of subjects in race categories were calculated for type of reconstruction, age category, Surveillance, Epidemiology, and End Results Program site, marital status, and stage at time of diagnosis. The chi-square statistic was used to determine significant differences between race, age, and other variables.

Logistic regression analyses were used to estimate the odds of selecting immediate or early reconstruction while simultaneously considering the independent variables age, race, program site, mastectomy of uninvolved contralateral breast, and marital status. Logistic regression results compare odds of one category of a variable to one "reference" category. When a variable had two response categories (e.g., race), one category was considered the arbitrary reference category to which the other category was compared. When the variable had more than two response categories (e.g., age), "dummy" variables were created for each of the response categories except for the arbitrary reference category, to allow single comparisons between groups. Interpretation of results is thus limited to the context of these data. Odds ratios were estimated for each independent variable in the full multivariate model as the exponentiation of the regression coefficient (β). Confidence intervals (95 percent) were calculated for each estimated risk ratio as exponentiation [$\beta \pm 1.96 * \text{standard error}(\beta)$]. The logistic regression model used in this study assumes no interactions among variables used in the analyses.

RESULTS

Women residing in one of the nine Surveillance, Epidemiology, and End Results Program sites who were diagnosed with primary breast carcinoma between 1998 and 2000 and who underwent a mastectomy were subjects for these analyses ($n = 27,703$). Black women in this sample were significantly younger ($p < 0.0001$), less likely to be married or widowed ($p < 0.0001$), and more likely to have been diagnosed at a later stage ($p < 0.0001$) compared with white women (Table I). Black and white women in the youngest and oldest age groups accounted for the smallest proportions in the sample. Reconstruction was more common among younger women, those who were currently married or separated/divorced, and those diagnosed at the in situ stage. Black women were more likely to undergo reconstruction overall compared with white women, and women in Detroit and Atlanta were more likely to undergo reconstruction compared with women living in the other program sites. Women who underwent mastectomy with removal of the contralateral uninvolved breast were most likely to choose reconstruction. A separate analysis of this variable stratified by program site revealed interesting patterns of bilateral mastectomy. Percentages of women who underwent bilateral mastectomy when breast carcinoma was not detected in the contralateral breast were highest in Atlanta (16.2 percent of all women undergoing mastectomy), followed by San Francisco/Oakland (13.1 percent), New Mexico (8.9 percent), Iowa (7.3 percent), Seattle/Puget Sound (7.0 percent), Hawaii (4.7 percent), Utah (4.2 percent), Detroit (4.0 percent), and Connecticut (3.5 percent).

Electing to have reconstruction as a first course of treatment and type of reconstruction were significantly different between black and white women ($p < 0.0001$) (Table II). However, actual differences between races were small, with the exception of rectus abdominis flap reconstruction, with black women nearly twice as likely to choose this type of reconstruction compared with white women. Each type of reconstruction was used significantly more often among women younger than 65 years ($p < 0.0001$) compared with those aged 65 years and older (Table II).

When further stratifying the sample by marital status, black and white women under the

TABLE I

Description of Women Diagnosed with Primary Breast Cancer between 1998 and 2000 Undergoing Mastectomy in the National Cancer Institute's Surveillance, Epidemiology, and End Results Program*

Variable	Mastectomy		Reconstruction	
	No.	%†	No.	%‡
Age				
<35 years	583	2.1	202	36.2
35–44 years	3311	11.9	1200	37.1
45–54 years	6086	22.0	1866	31.5
55–64 years	5694	20.6	942	17.1
65–74 years	5858	21.2	388	6.9
75–84 years	4868	17.6	95	2.0
85+ years	1303	4.7	11	0.9
Marital status				
Never married	3196	11.9	608	19.6
Married	15,629	58.0	3229	21.3
Separated/divorced	2593	9.6	525	20.9
Widowed	5536	20.5	245	4.6
Stage at diagnosis				
In situ	3957	14.6	1240	32.3
I	9024	33.4	1437	16.5
IIA	6427	23.7	983	15.8
IIB	4284	15.8	604	14.6
II NOS	233	0.9	45	19.8
IIIA	1347	5.0	173	13.3
IIIB	1154	4.3	92	8.3
IV	632	2.3	49	8.1
Race				
White	23,181	97.3	4048	18.1
Black	2217	8.7	445	20.8
SEER location				
San Francisco/Oakland	4308	15.6	745	17.3
Connecticut	3098	11.2	450	14.5
Detroit	4638	16.7	1032	24.0
Hawaii	1269	4.6	102	8.1
Iowa	4199	15.2	453	10.8
New Mexico	1548	5.6	270	17.5
Seattle/Puget Sound	4345	15.7	490	12.4
Utah	1824	6.6	277	15.7
Atlanta	2474	8.9	885	36.8
Mastectomy with removal of contralateral uninvolved breast				
No	21,573	93.0	3269	15.7
Yes	1637	7.0	676	42.4

NOS, not otherwise specified.

* Numbers do not always add up to the total population because of missing data; $p < 0.0001$ for all.

† Mastectomy %: percentage of women in specified category undergoing mastectomy of total number of women undergoing mastectomy.

‡ Reconstruction %: percentage of women undergoing reconstruction of those in specified category undergoing mastectomy.

age of 65 years were nearly identical in their use of reconstruction in each marital status category, although black women who were widowed were less likely to undergo reconstruction ($p < 0.0001$) (Table III). Black women aged 65 years and older who never married were more likely, and those who were married were less likely, to choose immediate reconstruction compared with white women matched by age and marital status ($p < 0.0001$).

Logistic regression analyses were conducted to assess the simultaneous effect of factors associated with electing immediate reconstruction for women choosing mastectomy (Table IV). In the full logistic model, results of multi-

variate analyses showed that, for those women who underwent reconstruction, the proportion of black women was approximately one-third less than that of white women (odds ratio, 0.64; 95 percent CI, 0.55 to 0.74). Women who chose reconstruction were between two and four times more likely [odds ratio range, 2.27 (95% CI, 2.04 to 2.52) to 3.56 (95% CI, 2.53 to 4.58)] to be younger compared with those women aged 65 years and older, and were nearly 75 percent more likely to be diagnosed at the in situ stage compared with those diagnosed at later stages. Women choosing reconstruction were significantly less likely to live in Iowa and Seattle/Puget Sound and more likely to live in Detroit and Atlanta compared with

TABLE II

Type of Reconstruction Stratified by Race and Age for Women Diagnosed with Primary Breast Cancer between 1998 and 2000 Undergoing Mastectomy in the National Cancer Institute's Surveillance, Epidemiology, and End Results Program*

Reconstruction	White (%)	Black (%)	<65 Years (%)	65+ Years (%)
No reconstruction	18,338 (79.1)	1700 (76.7)	11,011 (70.3)	11,088 (92.2)
Reconstruction NOS	1031 (4.5)	65 (2.9)	1017 (6.5)	127 (1.1)
Implant without flap	825 (3.6)	68 (3.1)	831 (5.3)	110 (0.9)
Implant with flap NOS	565 (2.4)	69 (3.1)	554 (3.5)	99 (0.8)
Latissimus dorsi flap	117 (0.5)	25 (1.1)	126 (0.8)	25 (0.2)
Rectus abdominis flap	1035 (4.5)	174 (7.9)	1199 (7.7)	73 (0.6)
Flap NOS plus implant	237 (1.0)	22 (1.0)	246 (1.6)	25 (0.2)
LD flap plus implant	120 (0.5)	15 (0.7)	127 (0.8)	16 (0.1)
Rectus abdominis flap plus implant	118 (0.5)	7 (0.3)	110 (0.7)	19 (0.2)
Unknown reconstruction	795 (3.4)	72 (3.3)	453 (2.9)	447 (3.7)

NOS, not otherwise specified; LD, latissimus dorsi.

* $p < 0.0001$ for all.

women in San Francisco/Oakland, Connecticut, Hawaii, New Mexico, and Utah, and were significantly less likely to have never married or be widowed compared with married women. Women undergoing reconstruction were more than twice as likely to have had mastectomy with removal of the uninvolved contralateral breast.

DISCUSSION

The purpose of this study was to determine factors associated with postmastectomy reconstruction and to update and extend knowledge of patterns of care for reconstruction, using data from the National Cancer Institute's Surveillance, Epidemiology, and End Results Program. Similar to previous studies,^{7,10,12,13} age was a major factor associated with women undergoing reconstruction, with younger women significantly more likely to have immediate or early reconstruction following mastectomy compared with older women. Program data do not allow analyses of age as a factor in whether women were offered reconstruction. However, previous studies have indicated ageism is a significant factor in breast carcinoma treatment

decisions, irrespective of serious comorbidities that determine whether treatment is appropriate.¹⁴ It is of interest to note the relatively small but indisputable number of women aged 65 years and older who underwent reconstruction. A study of complication rate following reconstruction¹⁰ found that women aged 60 years and older were actually less likely to experience complications and required fewer operations to receive final reconstruction compared with women younger than age 60 years. From the current study and previous reports, it is important to recognize that breast reconstruction among older women is not rare and that it is safe and may provide a significant psychosocial benefit; therefore, patient age should not prevent presenting the option of reconstruction to women of any age.

Previous studies that have analyzed racial differences in reconstruction use show inconsistent results. Desch et al.⁷ found no significant differences in reconstruction between black and white women, whereas multivariate analyses used by Morrow et al.¹³ show 60 percent higher odds of reconstruction for women who were not African American. In the current

TABLE III

Breast Reconstruction for Women Diagnosed with Primary Breast Cancer between 1998 and 2000 Undergoing Mastectomy, Stratified by Race, Age, and Marital Status, in the National Cancer Institute's Surveillance, Epidemiology, and End Results Program*

	Never Married (%)	Married (%)	Separated/Divorced (%)	Widowed (%)
White (calculate totals and percentages)				
<65 years	429 (27.5)	2614 (30.6)	386 (28.0)	89 (18.5)
65+ years	28 (4.0)	263 (6.0)	38 (5.9)	125 (3.1)
Black				
<65 years	122 (27.0)	188 (32.6)	82 (30.5)	14 (14.0)
65+ years	6 (6.7)	5 (2.8)	4 (5.3)	9 (2.9)

* $p < 0.001$ for all.

TABLE IV

Logistic Regression Analyses of Factors Associated with Immediate Reconstruction in Women Diagnosed with Primary Breast Cancer between 1998 and 2000 Undergoing Mastectomy in the National Cancer Institute's Surveillance, Epidemiology, and End Results Program

Variable	Odds Ratio	95% Confidence Interval
Race		
White	1.00	Reference
Black	0.64	0.55-0.74
Age category		
<35 years	3.56	2.83-4.48
35-44 years	3.09	2.73-3.49
45-54 years	2.27	2.04-2.52
55-64 years	1.00	Reference
65-74 years	0.37	0.32-0.43
75-84 years	0.12	0.10-0.16
85+ years	0.06	0.03-0.11
Stage at diagnosis		
In situ	1.73	1.54-1.94
I	1.00	Reference
IIA	0.75	0.67-0.84
IIB	0.63	0.55-0.72
II NOS	0.69	0.46-1.02
IIIA	0.50	0.41-0.62
IIIB	0.32	0.25-0.42
IV	0.27	0.18-0.40
SEER site		
San Francisco/Oakland	1.00	Reference
Connecticut	0.93	0.78-1.12
Detroit	1.71	1.46-2.00
Hawaii	0.77	0.55-1.10
Iowa	0.63	0.53-0.74
New Mexico	1.19	0.96-1.47
Seattle/Puget Sound	0.60	0.50-0.71
Utah	0.89	0.73-1.08
Atlanta	3.11	2.60-3.72
Marital status		
Married	1.00	Reference
Never married	0.77	0.68-0.87
Separated/divorced	0.91	0.50-1.66
Widowed	0.75	0.63-0.89
Mastectomy with removal of uninvolved contralateral breast		
No	1.00	Reference
Yes	2.18	1.92-2.47

NOS, not otherwise specified.

study, univariate analyses showed black women were more likely to undergo reconstruction, but in multivariate analyses controlling for confounding factors, black women were 40 percent less likely to undergo reconstruction.

As socioeconomic status is correlated with race in the United States, lower rates of reconstruction among black women may be related to perceived lack of insurance coverage for the procedure. Previous studies^{13,15} found that women with lower incomes were less likely to undergo reconstruction, even though legislation mandates insurance coverage of reconstruction as part of standard breast carcinoma

treatment. The authors of those studies hypothesized that women of lower income may not be aware of mandated insurance coverage, or may not feel able to devote time and resources to issues of body image.^{13,16} However, in a 1999 study, costs of breast reconstruction, mastectomy, and breast-conserving surgery were compared⁷ using data from the Virginia Cancer Registry linked with medical insurance records for 529 women in Virginia. Results of the study revealed that performing immediate breast reconstruction was \$8800 less expensive than delayed reconstruction. The difference between immediate reconstruction and breast-conserving surgery was less than \$2000, which was not statistically significant.

Women with breast carcinoma diagnosed at the in situ stage were most likely to undergo reconstruction following mastectomy compared with women diagnosed at every other stage, similar to results of Morrow et al.¹³ Women diagnosed with stages II, III, and IV breast carcinoma were significantly less likely to undergo reconstruction, although this finding may be the artifact of postponing reconstruction until after adjuvant therapy (radiation and/or chemotherapy). Although patients may make treatment decisions based on fears that reconstruction may lead to treatment delay and worse prognosis, studies show that immediate reconstruction does not delay administration of adjuvant radiation or chemotherapy.¹⁷⁻²⁰ However, increased risk of reconstruction-related morbidity may exist for women choosing immediate reconstruction and who receive concurrent adjuvant radiotherapy.^{21,22}

Regional geographic differences were noted in use of reconstruction, with women in Iowa and Seattle significantly less likely and women in Detroit and Atlanta significantly more likely to undergo reconstruction, compared with women in San Francisco/Oakland, Connecticut, Hawaii, New Mexico, and Utah. No regional patterns could be discerned from results of the current study, unlike those of Morrow et al.,¹³ which showed that women in regions other than the Midwest or South were approximately 30 percent more likely to undergo reconstruction. In the present study, the percentage of women undergoing reconstruction in almost all of the Surveillance, Epidemiology, and End Results Program locations was higher than that found during studies of the earlier time periods (1985 to 1990, 3.4 percent reconstruction rate; 1994 to 1995, 8.3 percent reconstruc-

tion rate) in the Morrow et al. study. It was also of great interest to note the significantly higher rates of removal of the uninvolved contralateral breasts in San Francisco/Oakland and Atlanta compared with other program locations. This result may be attributable to procedures performed in relatively fewer medical centers in these cities compared with those performed statewide in many of the other program locations but is worthy of further investigation so that patterns of care can be understood.

In the current study, women who were married at the time of breast carcinoma diagnosis were most likely to undergo reconstruction compared with women who had never married, were separated/divorced (nonsignificant difference), or were widowed. These results conflict with a previous but smaller study,²³ which found that marital status did not influence a woman's decision to undergo reconstruction following mastectomy. It seems feasible that a married woman undergoing mastectomy may be more concerned with her sexuality and body image related to her husband's perception. However, this concern may dissipate over time, and, in fact, one study found that initial differences in psychosocial adjustment between women undergoing mastectomy plus reconstruction and those undergoing mastectomy alone might be minimal and disappear with time.²⁴

Although the National Cancer Institute's Surveillance, Epidemiology, and End Results Program provides a large, population-based database that allows powerful statistical analyses with relatively low or nonexistent risk of bias, the database is limited by available variables recorded in the abstracted case files. The main limitation of the program's database with respect to this study is that information on timing of reconstruction is limited to whether reconstructive surgery is performed at any time during the first 4 months following diagnosis. Although reconstruction performed within this 4-month period is most likely performed at the time of mastectomy surgery, distinction between immediate and early delayed reconstruction is not possible, given the program's data collection methods. Therefore, the above-mentioned psychological and economic benefits of immediate reconstruction may not be appropriately generalized to the entire group of women in this study. A second limitation of the current study is lack of information on physician attitudes and whether reconstruction

was offered or recommended to the majority of women as a safe, viable treatment option. Patient factors associated with reconstruction use, such as race, age, and marital status, may negatively affect physician perceptions and attitudes that are not supported by any available research.

CONCLUSIONS

This study showed that immediate or early reconstruction is used by a small but increasing proportion of women diagnosed with breast carcinoma who undergo mastectomy. Use of reconstruction is most strongly associated with patient age and removal of the uninvolved contralateral breast and, to a lesser magnitude (but still significantly), with race, stage, marital status, and geographic location.

Sue A. Joslyn, Ph.D.

*Division of Health Promotion and Education
University of Northern Iowa*

221 WRC

Cedar Falls, Iowa 50614-0241

sue.joslyn@uni.edu

ACKNOWLEDGMENTS

This project was supported by the Rod Library and the Graduate College of the University of Northern Iowa.

REFERENCES

1. Jemal, A., Tiwari, R. C., Murray, T., et al. Cancer statistics, 2004. *CA Cancer J. Clin.* 54: 8, 2004.
2. Robinson, J. O. Treatment of breast cancer through the ages. *Am. J. Surg.* 151: 317, 1986.
3. Bostwick, J., III. Breast reconstruction following mastectomy. *CA Cancer J. Clin.* 45: 289, 1995.
4. Malata, C. M., McIntosh, S. A., and Purushotham, A. D. Immediate breast reconstruction after mastectomy for cancer. *Br. J. Surg.* 87: 1455, 2000.
5. Brandberg, Y., Malm, M., and Blomqvist, L. A prospective and randomized study, "SVEA," comparing effects of three methods for delayed breast reconstruction on quality of life, patient defined problem areas of life, and cosmetic result. *Plast. Reconstr. Surg.* 105: 66, 2000.
6. Wilkins, E. G., Cederna, P. S., Lowery, J. C., et al. Prospective analysis of psychosocial outcomes in breast reconstruction: One year post-operative results from the Michigan Breast Reconstruction Outcome Study. *Plast. Reconstr. Surg.* 106: 1014, 2000.
7. Desch, C. E., Penberthy, L. T., Hillner, B. E., et al. A sociodemographic and economic comparison of breast reconstruction, mastectomy and conservative surgery. *Surgery* 125: 441, 1999.
8. Trabulsky, P. P., Anthony, J. P., and Mathes, S. J. Changing trends in postmastectomy breast reconstruction: A 13-year experience. *Plast. Reconstr. Surg.* 93: 1418, 1994.
9. Pusic, A., Thompson, T. A., Kerrigan, C. L., et al. Surgical options for early-stage breast cancer: Factors associated with patient choice and postoperative quality of life. *Plast. Reconstr. Surg.* 104: 1325, 1999.

10. August, D. A., Wilkins, E., and Rea, T. Breast reconstruction in older women. *Surgery* 115: 663, 1994.
11. Polednak, A. P. Type of breast reconstructive surgery among breast cancer patients: A population based study. *Plast. Reconstr. Surg.* 93: 1418, 1994.
12. Alderman, A. K., McMahon, L., and Wilkins, E. G. The national utilization of immediate and early delayed breast reconstruction and the effect of sociodemographic factors. *Plast. Reconstr. Surg.* 111: 695, 2003.
13. Morrow, M., Scott, S. K., Menck, H., Mustoe, T. A., and Winchester, D. P. Factors influencing the use of breast reconstruction postmastectomy: A National Cancer Database study. *J. Am. Coll. Surg.* 192: 1, 2001.
14. Joslyn, S. A. Radiation therapy and patient age in the survival from early stage breast cancer. *Int. J. Radiat. Oncol. Biol. Phys.* 44: 821, 1999.
15. Charavel, M., Bremond, A., and Courtial, I. Psychological profile of women seeking breast reconstruction. *Eur. J. Obstet. Gynecol. Reprod. Biol.* 74: 31, 1997.
16. Overgaard, M., Hansen, P. S., Overgaard, J., et al. Post-operative radiotherapy in high-risk premenopausal women with breast cancer who receive adjuvant chemotherapy. *N. Engl. J. Med.* 337: 949, 1997.
17. Clough, K. B., Bourgeois, D., Falcou, M. C., Renolleau, C., and Durand, J. C. Immediate breast reconstruction by prosthesis: A safe technique for extensive intraductal and microinvasive carcinomas. *Ann. Surg. Oncol.* 3: 212, 1996.
18. Yule, G. J., Concannon, M. J., Croll, G., and Puckett, C. L. Is there liability with chemotherapy following immediate breast reconstruction? *Plast. Reconstr. Surg.* 97: 969, 1996.
19. Furey, P. C., Macgillivray, D. C., Castiglione, C. L., and Allen, L. Wound complications in patients receiving adjuvant chemotherapy after mastectomy and immediate breast reconstruction for breast cancer. *J. Surg. Oncol.* 55: 194, 1994.
20. Rosen, P. B., Jabs, A. D., Kister, S. J., and Hugo, N. E. Clinical experience with immediate breast reconstruction using tissue expansion or transverse rectus abdominis musculocutaneous flaps. *Ann. Plast. Surg.* 25: 249, 1990.
21. Dickson, M. G., and Sharpe, D. T. The complications of tissue expansion in breast reconstruction: A review of 75 cases. *Br. J. Plast. Surg.* 40: 629, 1987.
22. Von Smitten, K., and Sundell, B. The impact of adjuvant radiotherapy and cytotoxic chemotherapy on the outcome of immediate breast reconstruction by tissue expansion after mastectomy for breast cancer. *Eur. J. Surg. Oncol.* 18: 119, 1992.
23. Handel, N., Silverstein, M. J., Waisman, E., and Waisman, J. R. Reasons why mastectomy patients do not have reconstruction. *Plast. Reconstr. Surg.* 86: 1118, 1990.
24. Schain, W. S. Breast reconstruction: Update of psychosocial and pragmatic concerns. *Cancer* 68 (Suppl. 5): 1170, 1991.