Bilateral Mastectomy versus Breast-Conserving Surgery for Early-Stage Breast Cancer: The Role of Breast Reconstruction

Claudia R. Albornoz, M.D., M.Sc.
Evan Matros, M.D., M.M.Sc.
Clara N. Lee, M.D., M.P.P.
Clifford A. Hudis, M.D.
Andrea L. Pusic, M.D., M.H.S.
Elena Elkin, Ph.D.
Peter B. Bach, M.D., M.A.P.P.
Peter G. Cordeiro, M.D.
Monica Morrow, M.D.

New York, N.Y.; and Chapel Hill, N.C.

Background: Although breast-conserving surgery is oncologically safe for women with early-stage breast cancer, mastectomy rates are increasing. The objective of this study was to examine the role of breast reconstruction in the surgical management of unilateral early-stage breast cancer.
Methods: A retrospective cohort study of women diagnosed with unilateral early-stage breast cancer (1998 to 2011) identified in the National Cancer Data Base was conducted. Rates of breast-conserving surgery, unilateral and bilateral mastectomy with contralateral prophylactic procedures (per 1000 early-stage breast cancer cases) were measured in relation to breast reconstruction. The association between breast reconstruction and surgical treatment was evaluated using a multinomial logistic regression, controlling for patient and disease characteristics.
Results: A total of 1,856,702 patients were included. Mastectomy rates decreased from 459 to 360 per 1000 from 1998 to 2005 ($p < 0.01$), increasing to 403 per 1000 in 2011 ($p < 0.01$). The mastectomy rates rise after 2005 reflects a 14 percent annual increase in contralateral prophylactic mastectomies ($p < 0.01$), as unilateral mastectomy rates did not change significantly. Each percentage point of increase in reconstruction rates was associated with a 7 percent increase in the probability of contralateral prophylactic mastectomies, with the greatest variation explained by young age(32 percent), breast reconstruction (29 percent), and stage 0 (5 percent).
Conclusions: Since 2005, an increasing proportion of early-stage breast cancer patients have chosen mastectomy instead of breast-conserving surgery. This trend reflects a shift toward bilateral mastectomy with contralateral prophylactic procedures that may be facilitated by breast reconstruction availability. (*Plast. Reconstr. Surg.* 135: 1518, 2015.)

Multiple prospective randomized trials, now with long-term follow-up, have demonstrated that survival rate after breast-conserving surgery and whole-breast radiotherapy is equivalent to survival rate after mastectomy.[1] Over time, rates of local recurrence after breast-conserving surgery have decreased and are now very similar to those seen after mastectomy.[2,3] In spite of this, a recent increase in rates of mastectomy in the United States has been observed after years of steady decline.[4] In particular, women increasingly opt for bilateral instead of unilateral mastectomies even in the absence of a genetic predisposition or oncologic risk factor supporting the use of contralateral prophylactic mastectomy.[5–7] This trend is particularly concerning, as rates of contralateral breast cancer have also decreased because of the widespread use of adjuvant systemic therapy for early-stage breast cancer, and there is no evidence that bilateral mastectomies with contralateral prophylactic mastectomy prolong survival for women with sporadic breast cancer.[8] Greater use of mastectomy, and particularly contralateral prophylactic mastectomy, have been associated with younger age at diagnosis, greater educational attainment and socioeconomic status,

From the Plastic and Reconstructive Surgery Department, Breast Cancer Medicine Service, The Center for Health Policy and Outcomes, and the Breast Surgical Service, Memorial Sloan Kettering Cancer Center; and the Division of Plastic and Reconstructive Surgery, University of North Carolina.
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The first two authors contributed equally to this article.

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race, higher histologic grade, and in situ cancer (stage 0).[4,6,9] Although single-institution studies have shown an association between breast reconstruction and bilateral mastectomies with contralateral prophylactic mastectomy, little is known about this relationship in larger and more representative patient samples.[7]

The Women's Cancer and Health Rights Act was enacted in 1998 to secure insurance coverage for breast reconstruction following mastectomy.[10] Since the introduction of this legislation, rates of immediate breast reconstruction have increased gradually to approximately 38 percent of mastectomies.[11] Greater access of immediate breast reconstruction may be an important unmeasured factor in women's choice of surgical treatment for early-stage breast cancer. For example, women who choose bilateral mastectomy have reconstruction rates approximately twice as high as women who choose unilateral mastectomy.[11] The aim of the current study was to examine trends in the surgical management of early-stage breast cancer and simultaneously assess the role of breast reconstruction. We hypothesized that greater access to breast reconstruction is associated with the use of mastectomy for early-stage breast cancer.

PATIENTS AND METHODS

Data Source and Study Cohort

The primary data source was the National Cancer Data Base, a joint initiative of the Commission on Cancer, the American College of Surgeons, and the American Cancer Society. The National Cancer Data Base is a nationwide oncology outcomes database for more than 1500 Commission-accredited cancer programs. It includes information about patient and disease characteristics, treatment, and outcomes for approximately 70 percent of all newly diagnosed cancers in the United States and Puerto Rico.[12] The study was approved by the Commission on Cancer review board. The Commission on Cancer of the American Cancer Society does not require institutional review board approval for the current study because no patient identifiers are collected as part of the database.

The study cohort included women diagnosed with unilateral early-stage breast cancer (stage 0, I, or II according to criteria published in the American Joint Commission *Breast Cancer Staging*, 7th ed.) from 1998 to 2011.[13] Patients with synchronous bilateral cancers were excluded.

Outcomes and Predictors

The primary outcome was type of surgery, based on National Cancer Data Base site-specific codes for breast-conserving surgery, unilateral mastectomy, and bilateral procedures with contralateral prophylactic mastectomy. Contralateral prophylactic mastectomy was defined as bilateral mastectomy performed for unilateral breast cancer. Patients with unspecified or unknown type of surgery were excluded from analysis. The predictor of interest was the availability of breast reconstruction, based on annual rates of immediate, postmastectomy breast reconstruction as recorded by the National Cancer Data Base. All patients treated in a calendar year were assumed to have the same access to reconstruction.

Sociodemographic covariates and health characteristics included age at diagnosis; race, Charlson comorbidity score, median income and percentage of non–high school graduates in the zip code of residence, type of health insurance, urban versus rural residence, and facility geographic location. Disease characteristics included histology (lobular versus ductal), tumor size, grade, invasion, and the number of positive lymph nodes.

Statistical Analysis

Rates of each surgical procedure per 1000 cases of early-stage breast cancer were estimated for each year. Trends over time were analyzed using the Cochrane-Armitage test and Poisson regression. For the Poisson model, the dependent variable was the procedure rate, and the single independent variable was calendar year, with an observation for each year in the study period. The incidence rate ratio estimated for year describes the trend in procedure rate over time, with values greater than 1.0 implying an increase and values less than 1.0 suggesting a decrease. The influence of breast reconstruction rates on surgical treatment was estimated using a multinomial logistic regression model, controlling for sociodemographic and disease characteristics. In this model, we estimated the impact of the predictor and covariates on the relative risk of contralateral prophylactic mastectomy and the relative risk of unilateral mastectomy, each compared with breast-conserving surgery. Variables were considered significant independent predictors of the outcome for values of $p < 0.05$.

To estimate the proportion of variability in contralateral prophylactic mastectomy and unilateral mastectomy use associated with each predictor, two separate multivariable logistic regression

models for two outcomes were estimated: contralateral prophylactic mastectomy (versus breast-conserving surgery) and unilateral mastectomy (versus breast-conserving surgery). Changes in the pseudo-R^2 for each model as each predictor was included and excluded were evaluated.[14] All statistical analyses were performed using Stata 11.0 (Stata Corp., College Station, Texas).

RESULTS

A total of 1,856,702 patients diagnosed with early-stage breast cancer from 1998 to 2011 were identified in the National Cancer Data Base. The mean age at diagnosis was 60 years, and 76 percent of patients were Caucasian (Table 1). Over 90 percent of patients had a Charlson comorbidity score of 0. More than half of the cohort (56 percent) had private health insurance, and only 2 percent were uninsured. Invasive cancer was present in 85 percent of cases, and of these, 60 percent of patients had tumors smaller than 2 cm (T1). Only 14 percent of tumors were of lobular histology, and 79.5 percent did not have nodal involvement.

Figure 1 and Table 2 show rates of breast-conserving surgery and mastectomy per 1000 cases of early-stage breast cancer from 1998 to 2011. Mastectomy rates decreased from 459 per 1000 in 1998 to a nadir of 361 per 1000 in 2005 ($p < 0.01$ for trend). Thereafter, mastectomy rates increased steadily to 403 per 1000 in 2011 ($p < 0.01$).

Figure 2 is a graphic representation of surgical trends for early-stage breast cancer stratified by mastectomy type. From 1998 to 2005, breast-conserving surgery use increased from 540 to 639 per 1000 early-stage breast cancer cases (incidence rate ratio, 1.02; $p < 0.01$), whereas the rates of unilateral mastectomy decreased from 437 to 306 per 1000 early-stage breast cancer cases (incidence rate ratio, 0.94; $p < 0.01$) (Fig. 1). After 2005, the rates of breast-conserving surgery declined by 2 percent per year, from 637 to 597 per 1000 early-stage breast cancer cases (incidence rate ratio, 0.98; $p < 0.01$), but without a significant corresponding increase in unilateral mastectomy (incidence rate ratio, 0.99; p = not significant). The rate of contralateral prophylactic mastectomy increased significantly throughout the entire study period (incidence rate ratio, 1.13; $p < 0.01$). From 2005 to 2011, the rate of breast-conserving surgery decreased by 42 per 1000 cases, and there was a simultaneous increase in the rate of contralateral prophylactic mastectomy of 64 per 1000 cases of early-stage breast cancer (from 54 to 118 per 1000 cases of early-stage breast cancer). This corresponds with a decrease in rates of unilateral mastectomy by 22 per 1000 cases during that time (from 306 to 284 per 1000 cases of early-stage breast cancer).

Reconstruction use varied by year and by type of surgery (Table 3). Women who had contralateral prophylactic mastectomy were more than twice as likely to undergo reconstruction as their

Table 1. Characteristics of the Cohort

Characteristic	Value
Mean age ± SD, yr	60.4 ± 13.3
Race, no. (%)	
African American	161,972 (8.7)
Caucasian	1,406,389 (75.8)
Asian	44,192 (2.4)
Hispanic	225,528 (12.6)
Other	18,621 (1.0)
Charlson comorbidity score, no. (%)	
0	1,693,848 (91.2)
≥1	162,854 (8.8)
Zip code median income, no. (%)	
<$30,000	201,285 (11.4)
$31,000–$34,999	287,626 (16.3)
$35,000–$45,999	481,254 (27.3)
≥$46,000	795,034 (45.0)
Zip code population without high school diploma, no. (%)	
≥29%	250,352 (14.2)
20.0–28.9%	370,449 (21.0)
14.0–19.9%	412,742 (23.4)
<14.0%	731,534 (41.4)
Health insurance, no. (%)	
Private	1,040,948 (56.1)
Medicaid	74,774 (4.0)
Medicare	648,683 (35.0)
Other public	13,766 (0.7)
Uninsured	33,675 (1.8)
Residence, no. (%)	
Urban	1,726,267 (98.3)
Rural	30,456 (1.7)
Facility location, no. (%)	
Northeast	409,269 (22.0)
South	651,354 (35.0)
Midwest	462,740 (25.1)
West	333,339 (17.9)
Tumor size (T) , no. (%)	
T0 (DCIS)	286,481 (15.4)
T1 (<2 cm)	1,120,490 (60.4)
T2 (2–4.9 cm)	429,379 (23.1)
T3 (>5 cm)	20,352 (1.1)
Positive lymph nodes, no. (%)	
N0 (None)	1,475,372 (79.5)
N1 (1–3)	381,330 (20.5)
Tumor grade, no. (%)	
Well differentiated	380,124 (20.5)
Moderately differentiated	699,526 (37.7)
Poorly differentiated	535,519 (28.8)
Undifferentiated	24,194 (1.3)
Carcinoma invasion, no. (%)	
Invasive	1,573,418 (84.7)
DCIS	238,284 (15.3)
Lobular histology, no. (%)	
No	1,596,551 (86.0)
Yes	260,151 (14.0)

DCIS, ductal carcinoma in situ.

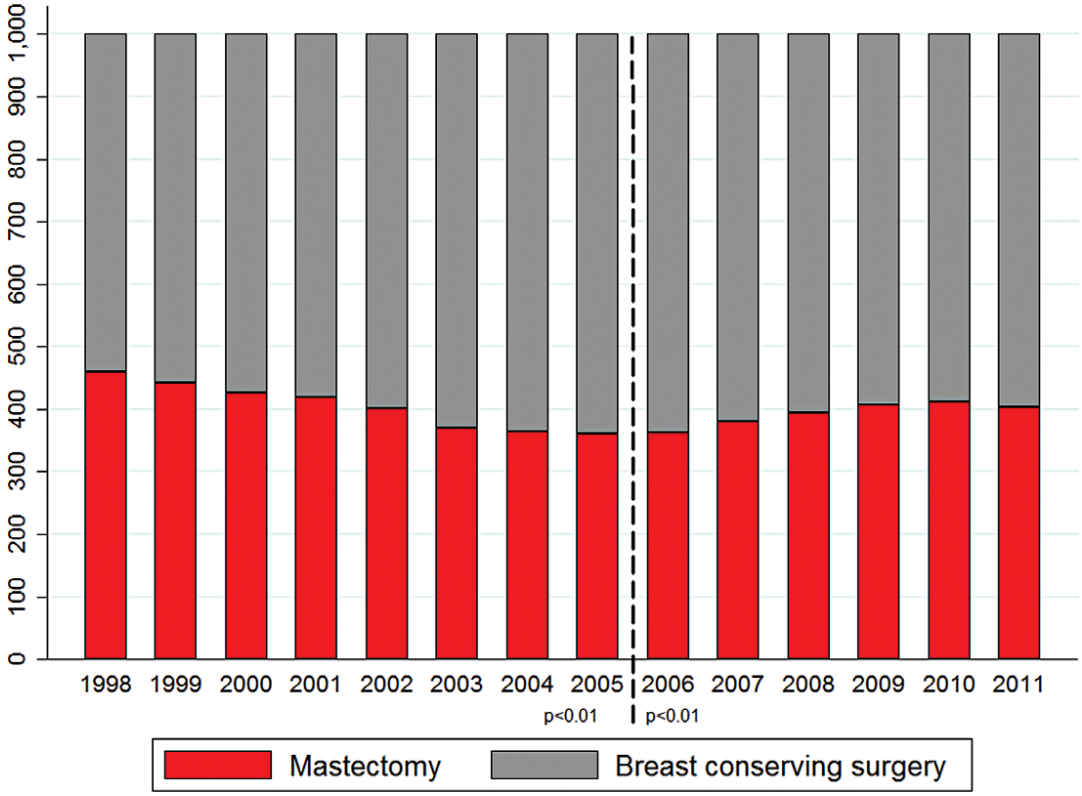

Fig. 1. Surgical treatment for early-stage breast cancer by year. *Dashed line* represents the nadir of mastectomy rates.

Table 2. Annual Rates of Mastectomy Compared to Breast-Conserving Surgery for the Treatment of Early-Stage Breast Cancer

		Rates per 1000 ESBC Cases	
Year	ESBC	BCS	Mastectomy*
1998	122,178	540.8	459.2
1999	127,460	557.7	442.3
2000	129,240	574.1	425.9
2001	131,900	580.3	419.7
2002	132,758	598.6	401.4
2003	124,646	630.5	369.5
2004	122,815	635.3	364.7
2005	125,789	639.5	360.5
2006	131,545	637.4	362.6
2007	136,021	619.7	380.3
2008	141,313	604.8	395.2
2009	146,468	593.0	407.0
2010	140,553	587.3	412.7
2011	144,016	597.1	402.9
Total	1,856,702		

ESBC, early-stage breast cancer; BCS, breast-conserving surgery.
*Includes both unilateral mastectomy and contralateral prophylactic mastectomy.

peers who had unilateral mastectomy. Immediate reconstruction rates after unilateral mastectomy increased from 10 percent in 1998 to 27 percent in 2011, and reconstruction after contralateral prophylactic mastectomy increased from 37 percent to 57 percent.

Independent predictors of the use of contralateral prophylactic mastectomy compared to breast-conserving surgery were identified using a multinomial logistic regression model (Table 4). After adjustment for other factors, multivariable analysis demonstrated a significant association between the decision to pursue a contralateral prophylactic mastectomy and breast reconstruction rates (relative risk ratio, 1.07; 95 percent CI, 1.05 to 1.07; $p < 0.01$). Young age, race other than African American, lower education level, rural area of residency, facility location, presence of comorbidities, large tumor size (>5 cm), positive lymph nodes, ductal carcinoma in situ, higher grade, and lobular histology were also significantly associated with a woman's decision to undergo contralateral prophylactic mastectomy. The relative contribution of each factor to the likelihood of contralateral prophylactic mastectomy is shown in Table 5. The three factors most associated with contralateral prophylactic mastectomy were young age (32.2 percent), breast reconstruction (28.6 percent), and stage 0 (ductal carcinoma in situ) (4.6 percent).

Independent predictors for the use of unilateral mastectomy compared to breast-conserving surgery were also examined in the multinomial

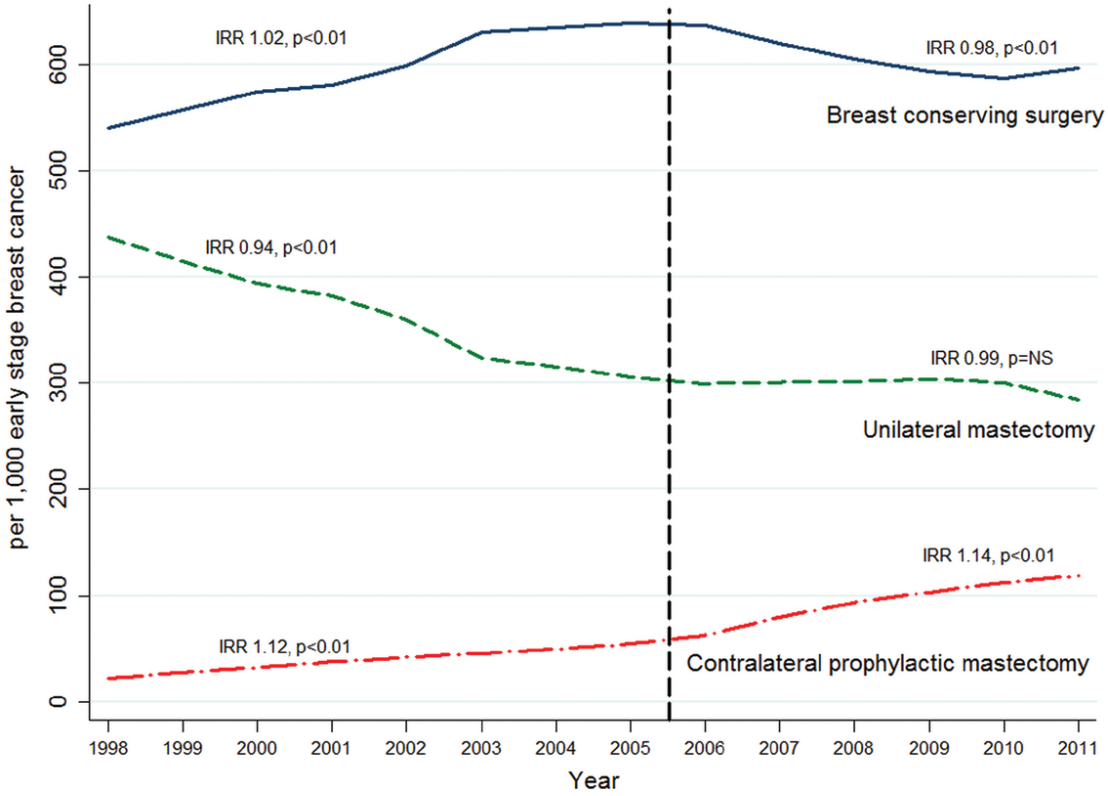

Fig. 2. Trends in surgery for early-stage breast cancer, 1998 to 2011. *NS*, not significant; IRR, incidence rate ratio.

Table 3. Immediate Reconstruction Rates by Type of Mastectomy, 1998 to 2011

	UM		CPM	
Year	No.	Reconstruction Rate (%)	No.	Reconstruction Rate (%)
1998	53,411	10.3	2690	37.1
1999	52,870	13.1	3510	44.0
2000	50,874	14.2	4164	45.2
2001	50,385	14.8	4969	44.6
2002	47,734	14.5	5556	43.8
2003	40,357	14.9	5704	42.8
2004	38,724	15.6	6069	45.4
2005	38,483	16.6	6862	46.8
2006	39,419	17.5	8274	48.8
2007	40,910	19.8	10,822	50.5
2008	42,601	21.7	13,241	51.8
2009	44,521	25.0	15,088	53.1
2010	42,215	26.1	15,787	55.5
2011	40,928	27.4	17,090	56.7

UM, unilateral mastectomy; CPM, contralateral prophylactic mastectomy.

logistic regression model (Table 4). Factors significantly associated with unilateral mastectomy were older age; all races compared to African Americans; comorbidities; lower income; lower education status; rural area of residency; facility location; Medicaid, Medicare, and other governmental insurances compared to private insurance; large tumors (>5 cm); positive lymph nodes; higher tumor grade; stage 0 (ductal carcinoma in situ); and lobular histology. Breast reconstruction was negatively associated with unilateral mastectomy (relative risk ratio, 0.98; $p < 0.01$). The relative contribution of each factor to the likelihood to undergo unilateral mastectomy is shown in Table 6. The most relevant factors were tumor size (43.4 percent), presence of ductal carcinoma in situ (24.2 percent), and positive lymph nodes (13.5 percent).

DISCUSSION

Most women with early-stage breast cancer can be treated safely with breast-conserving surgery with the added benefit of preserving the native breast. However, surgical treatment for early-stage breast cancer is a "preference-sensitive" decision that should be made together by the patient and her breast surgeon considering individual clinical factors in conjunction with the patient's values and preferences. The current study confirms, in a large, diverse patient sample, that after several years of decreasing use, rates of mastectomy for early-stage breast cancer have risen since 2005. The trend of increased mastectomy rates identified in the current study is in agreement with a recent report from the Surveillance,

Table 4. Impact of Breast Reconstruction Availability on Odds of Unilateral Mastectomy and Contralateral Prophylactic Mastectomy (Compared to Breast-Conserving Surgery), Adjusted by Patient, Disease, and Geographic Characteristics*

	CPM			UM		
	Adjusted RRR	95% CI	*p*	Adjusted RRR	95% CI	*p*
Breast reconstruction rates	1.07	1.05–1.07	<0.01	0.98	0.97–0.98	<0.01
Age	0.94	0.94–0.95	<0.01	1.01	1.00–1.01	<0.01
Race			<0.01			<0.01
African American	1.00			1.00		
Caucasian	2.04	1.99–2.10		1.09	1.08–1.11	
Asian	1.00	0.95–1.06		1.66	1.62–1.70	
Hispanic	1.80	1.75–1.86		1.14	1.12–1.16	
Other	1.55	1.45–1.66		1.21	1.17–1.25	
Charlson comorbidity score			<0.01			<0.01
0	1.00			1.00		
≥1	1.36	1.33–1.40		1.34	1.32–1.35	
Zip code median income			<0.01			<0.01
<$30,000	1.00			1.00		
$31,000–$34,999	1.06	1.03–1.09		0.95	0.93–0.96	
$35,000–$45,999	0.99	0.96–1.02		0.91	0.89–0.92	
≥$46,000	0.97	0.94–1.00		0.85	0.84–0.87	
Zip code population without high school diploma			<0.01			<0.01
≥29%	1.00			1.00		
20.0–28.9%	1.14	1.11–1.17		0.94	0.93–0.95	
14.0–19.9%	1.17	1.14–1.20		0.91	0.89–0.92	
<14.0%	1.33	1.29–1.36		0.89	0.88–0.90	
Health insurance			<0.01			<0.01
Private	1.00			1.00		
Medicaid	0.69	0.66–0.71		1.26	1.24–1.29	
Medicare	0.98	0.96–1.00		1.25	1.23–1.26	
Other public	0.98	0.92–1.04		1.09	1.05–1.13	
Uninsured	0.73	0.68–0.76		1.26	1.18–1.24	
Residence			<0.01			<0.01
Urban	1.00			1.00		
Rural	1.24	1.18–1.31		1.18	1.15–1.21	
Facility location			<0.01			<0.01
Northeast	1.00			1.00		
South	1.90	1.87–1.94		1.49	1.48–1.51	
Midwest	1.55	1.52–1.58		1.35	1.34–1.37	
West	1.60	1.57–1.64		1.14	1.12–1.15	
Tumor size (T)			<0.01			<0.01
T0 (DCIS)	1.00			1.00		
T1 (<2 cm)	0.47	0.44–0.51		0.48	0.46–0.50	
T2 (2–4.9 cm)	0.72	0.66–0.78		1.01	0.96–1.04	
T3 (>5 cm)	2.48	2.25–2.72		4.39	4.15–4.65	
Positive lymph nodes			<0.01			<0.01
N0 (none)	1.00			1.00		
N1 (1–3)	1.42	1.40–1.44		1.67	1.66–1.69	
Tumor grade			<0.01			<0.01
Well differentiated	1.00			1.00		
Moderately differentiated	1.18	1.16–1.20		1.24	1.23–1.26	
Poorly differentiated	1.33	1.31–1.36		1.40	1.38–1.41	
Undifferentiated	1.48	1.40–1.57		1.56	1.52–1.61	
Carcinoma invasion			<0.01			<0.01
DCIS	1.00			1.00		
Invasive	1.38	1.26–1.47		1.46	1.39–1.52	
Lobular histology			<0.01			<0.01
No	1.00			1.00		
Yes	1.83	1.80–1.86		1.30	1.29–1.31	

RRR, relative risk ratio; DCIS, ductal carcinoma in situ.
*Relative risk ratios were estimated in multinomial regression, with all characteristics included as predictors.

Epidemiology, and End Results database.[4] In that study, the choice for mastectomy was associated with a variety of sociodemographic and oncologic variables; however, there was no evaluation of mastectomy type (contralateral prophylactic mastectomy versus unilateral mastectomy) or breast reconstruction. The current report is novel in that it demonstrates a decrease of breast-conserving

Table 5. Variability in Contralateral Prophylactic Mastectomy Use (Compared to Breast-Conserving Surgery) Explained by Patient, Disease, and Area Characteristics*

Characteristic	% of Variation Explained
Young age	32
Breast reconstruction	29
Stage 0 (DCIS)	5
Lobular histology	4
Race	4
Tumor size	4
Facility location	3

DCIS, ductal carcinoma in situ.
*Percentage of variation explained by each characteristic based on change in logistic regression pseudo-R^2, with and without each characteristic. Only variables that changed the pseudo-R^2 by ≥2% are shown here. The full model included all characteristics shown in Table 5, and had a pseudo-R^2 of 0.1274; C statistic, 0.75; n = 1,149,395.

Table 6. Variability in Unilateral Mastectomy Use (Compared to Breast-Conserving Surgery) Explained by Patient, Disease, and Area Characteristics*

Variable	% of Variation Explained
Tumor size	43
Stage 0 (DCIS)	24
Positive lymph nodes	14
Breast reconstruction rates	5
Health insurance	3
Comorbidities	2

DCIS, ductal carcinoma in situ.
*Percentage of variation explained by each characteristic based on change in logistic regression pseudo-R^2, with and without each characteristic. Only variables that changed the pseudo-R^2 by ≥2% are shown here. The full model included all characteristics shown in Table 5, and had a pseudo-R^2 of 0.0495; C statistic, 0.64; n = 1,651,924.

surgery, but without a corresponding increase in unilateral mastectomy. Instead, patients may be deciding between breast-conserving surgery and removal of both breasts (contralateral prophylactic mastectomy) when diagnosed with early-stage breast cancer (Fig. 2).

Why more women are choosing an aggressive surgical treatment for early-stage breast cancer when less invasive alternatives are available is unclear.[15] Most bilateral mastectomies with contralateral prophylactic mastectomy are performed in patients who are at low risk of developing contralateral cancer.[7] Although the 10-year risk of contralateral cancer is approximately 5 percent, newly diagnosed patients tend to overestimate their level of risk.[16,17] Other reasons patients cite for choosing contralateral prophylactic mastectomy include achieving "peace of mind," avoidance of ongoing surveillance and diagnostic procedures, and desire for breast symmetry following reconstruction.[18,19] Although in the past access to breast reconstruction was limited, breast reconstruction is now more available, with coverage mandated through federal and state legislation. Furthermore, improvements in both mastectomy (e.g., skin-sparing and nipple-sparing) and reconstructive (e.g., silicone implant safety and shape) techniques may make contralateral prophylactic mastectomy an increasingly attractive option for women. Other reasons that could partially explain the decision to undergo contralateral prophylactic mastectomy over breast-conserving surgery are avoidance of radiotherapy and chance of recurrence.

Although a variety of sociodemographic and oncologic factors impact decision-making for the surgical treatment of early-stage breast cancer, breast reconstruction needs to be considered. In this study, breast reconstruction rates were the second most important factor associated with undergoing contralateral prophylactic mastectomy compared with breast-conserving surgery (explaining 29 percent of the variability). Only patient age was more strongly associated with the use of bilateral mastectomies with contralateral prophylactic mastectomy. Interestingly, breast reconstruction was negatively associated with the decision to undergo unilateral mastectomy compared with breast-conserving surgery. The choice for unilateral mastectomy for early-stage breast cancer is better explained by oncologic factors (e.g., tumor size, ductal carcinoma in situ, and positive lymph nodes). The strength of the relationship between mastectomy type and breast reconstruction is evidenced by the reconstructive rates for contralateral prophylactic mastectomy, which are more than double those for unilateral mastectomy. Breast reconstruction appears to substantially influence patient choice of bilateral mastectomy for early-stage breast cancer. In a study of 206 patients who underwent contralateral prophylactic mastectomy, 59 percent of them indicated that the availability of breast reconstruction was an influencing factor in the decision.[20] A population-based survey of 1178 women from two major metropolitan areas showed that patients who discussed breast reconstruction with their general surgeon were two times more likely to consider mastectomy and four times more likely to undergo mastectomy.[21] Greenberg et al., using a patient sample from the National Comprehensive Cancer Network, found that greater numbers of plastic surgeons and a shorter waiting time to mastectomy with reconstruction were significantly associated with the use of mastectomy rather than breast-conserving surgery, although they did not analyze unilateral mastectomy and contralateral prophylactic mastectomy separately.[14] Along with cancer fear, "desire to have both breasts appear

the same after surgery" (57 percent) and "desire to make breasts appear better" (27 percent) are considerations for contralateral prophylactic mastectomy cited by women when asked about important reasons for undergoing this procedure.[15,18]

In breast cancer surgery, the quality of the decisions can be estimated by the extent to which patients are informed, involved in decision-making, and undergo treatments that reflect their values.[22] Greater patient involvement has been associated with increased likelihood of mastectomy; however, greater involvement is separate from health literacy.[23] Approximately 35 to 40 percent of early-stage breast cancer patients have adequate knowledge about survival or recurrence rates following breast-conserving surgery and mastectomy.[22] Furthermore, the risk of developing contralateral cancer is overestimated by women.[17] Patients may also have unrealistic expectations about the reconstructive benefits of contralateral prophylactic mastectomy. A multicenter study showed that 21 to 33 percent of patients who underwent contralateral prophylactic mastectomy felt that the number of surgical procedures, cosmetic results, complications, and recovery from reconstructive surgery were worse than expected.[15] Patients should be aware of the increased complication rates following bilateral mastectomies, 7.6 percent compared with 4.2 percent in unilateral procedures.[24] Improved preoperative education is needed to ensure that high-quality decisions are made and that realistic expectations are set.

It seems counterintuitive that, in an era of minimally invasive surgery, many women with early-stage breast cancer are choosing more extensive treatment. The current patient-centered health care model has empowered patients to become active participants in their care decisions undergoing services based on individual needs/preferences.[25] A possible explanation for the evolution in women's surgical choice from breast-conserving surgery to bilateral mastectomy is that both treatments share the property of theoretical symmetry. Although not all patients who have breast-conserving surgery or bilateral mastectomy end up with symmetry, patients who are deciding about surgery likely consider these options as maximizing symmetry (and unilateral mastectomy as not preserving symmetry). Another possible explanation for reframing of the surgical choice may be a form of decision momentum.[26] Once the patient knows she will not have breast-conserving surgery, either by choice or medical necessity, she may begin to put less value on the importance of preserving her contralateral breast, consciously or unconsciously. People are known to respond to adverse circumstances or loss of choice by reducing their cognitive dissonance through adaptation or even preference reversal.[27–30]

The current study has limitations. The National Cancer Data Base is not a population-based registry, although the large numbers of early-stage breast cancer patients included in the current analysis may confer generalizability. The trends reported in this article are also concordant with findings using the Surveillance, Epidemiology, and End Results database, further supporting their validity.[4] Other limitations include a lack of information on previous attempts at breast-conserving surgery, incidence of multicentricity, *BRCA* mutation status, high familiar/genetic risk, and preoperative magnetic resonance imaging use, all factors that influence the decision for mastectomy. The information presented here demonstrates an association between breast reconstruction rates and surgical treatment for early-stage breast cancer, but does not imply causality. Further insight about the role of breast reconstruction on the decision-making process for contralateral prophylactic mastectomy needs to be obtained through qualitative interviews with patients. Another limitation is that the National Cancer Data Base has no information on delayed reconstruction. The association between reconstruction and contralateral prophylactic mastectomy may be stronger if delayed reconstructions were included.

CONCLUSIONS

Since 2005, an increasing proportion of patients with early-stage breast cancer have been choosing mastectomy for their surgical treatment. The observed increase in mastectomy rates is attributable to a shift toward bilateral mastectomy with contralateral prophylactic mastectomy, not unilateral mastectomy. Although a variety of oncologic factors influence decision-making, wider breast reconstruction access and acceptance may facilitate the option for more radical surgery. Evolution of the surgical treatment for early-stage breast cancer has important implications for patient care, the design of decision support tools, and health care policy.

Evan Matros, M.D., M.M.Sc.
Memorial Sloan Kettering Cancer Center
1275 York Avenue, Suite MRI 1036
New York, N.Y. 10065
matrose@mskcc.org

DISCLAIMER

The data used in the study are derived from a deidentified National Cancer Data Base file. The American College of Surgeons and the Commission on Cancer have not verified and are not responsible for the analytic or statistical methodology used, or the conclusions drawn from these data by the investigators.

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