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ORIGINAL ARTICLE

The Surgical Treatment of Breast Cancer in the Elderly: A Single Institution Comparative Review of 5235 Patients with 1028 Patients ≥70 years

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■ **Abstract:** As the wave of the baby boomers shifts the age demographic of patients, the current surgical management of breast cancer in elderly women (≥70 years of age) becomes relevant because deviation from standard treatment often occurs in this group. The purpose of this study was to determine the operative mortality when treated with standard surgical procedures and to investigate trends in the surgical management of breast cancer in the elderly. A total of 5,235 patients undergoing either mastectomy or breast conservation surgery (BCS) for invasive and ductal carcinoma in situ (DCIS) were identified in a retrospective review of a prospectively accrued data base between the years of 1994 and 2007 at the Moffitt Cancer Center. Of the 5,235 patients, 1,028 (20%) patients were ≥70 years of age. The 30-day and 90-day mortality in the elderly group (age ≥70 years) was 0.2% (95% CI 0.02–0.7%) and 0.7% (95% CI 0.3–1.4%), respectively. The 30-day and 90-day mortality among patients <70 years was 0 and 0.05% (2 of 4,207 patients) (95% CI 0.005–0.2), respectively. BCS rates for invasive carcinomas were the highest for patients between 40 and 70 years of age, whereas the mastectomy rates were higher among patients <40 years of age (53%). Elderly women were as likely as women <40 years to have BCS for invasive carcinoma (OR 1.1, 95% CI 0.8–1.5), but more likely to have BCS for DCIS (OR 1.9, 95% CI 1.1–3.3). Surgical mortality in elderly women treated for breast cancer was extremely low and was related to the extent of surgery performed. Breast cancer treatment differed by age groups. ■

Key Words: age, breast cancer, elderly, mortality, surgical management

Within the United States, the "age wave" of the "baby boom" has manifested itself as a current socioeconomic and political force in health care management and policy development. As the predominant patient population shifts to patients over the age of 65, new medical concerns and protocols must be examined to accommodate this change. Patients are enjoying prolonged life spans with improved physical and cognitive health. Overly aggressive care contrasted with nihilistic social and health care reform may greatly alter quality of life and mortality in this population. Given this increasing elderly population, the question remains what is the best surgical treatment of breast cancer within this population?

With continuing advances in the health care field, patients are living longer, shifting the largest group of care to the elderly populations. For most women, increasing age is the primary risk factor for breast cancer with 66% of cases arising in women 55 years of age or older (2).

Breast cancer represents a major public health problem in the world, it is the second most common

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cancer in the world and the most common cancer among women, accounting for an estimated 1,152,161 new cases each year and 411,093 cancer deaths per year (1,2). Various studies have shown that age is a major determinant of treatment independent of comorbidity and disease status (3–5).

Knowledge about possible differences in the clinical outcomes of breast cancer according to age is limited, leaving a void in the standard practice for care of the elderly. The lack of enrollment of patients 70 years old or older in clinical trials contributes to this limited knowledge. In spite of the paucity of data, physicians consider age to be an important determinant of therapy, with advanced age placing women with breast cancer at risk for receiving less than what is considered standard therapy (6–11). Compared to younger patients, elderly women with breast cancer are less likely to have surgery, less frequently undergo breast-conserving surgery (BCS) or axillary lymph node dissection (ALND), and are more likely to have radiation therapy omitted after BCS (2,8).

Studying the surgical age-related treatment of a breast cancer population may improve understanding of the expected outcomes for the elderly population. The purpose of this study was to investigate the operative mortality and the age-related trends in surgical management of breast cancer in the elderly when treated with standard surgical procedures for breast cancer.

METHODS AND MATERIALS

An Institutional Review Board (IRB)-approved Health Insurance Portability and Accountability Act (HIPPA) compliant breast cancer data base and electronic health record (IRB# 102554) was searched under separate IRB approval (IRB# 106345) for all patients with breast cancer that received their definitive surgery at H. Lee Moffitt Cancer Center between 1994 and 2007. Demographic and clinicopathologic factors were assessed for the primary tumor and included date of surgery, age at diagnosis, race, size, breast cancer stage, lymph node status, histology, presence of lymphovascular invasion, and type of surgery.

Analysis of mortality after surgical procedure was performed for the postoperative period on day 30 and 90. Postoperative clinical data were obtained among patients who died during the postoperative period, and included type of surgical procedures, patient medical history, and cause of death. To improve the accuracy of mortality in the postoperative period, our data base was checked by the Social Security Death Index on-line data base (http://ssdi.rootsweb.com). All patients were staged using standard AJCC pathology staging guidelines.

Statistical analysis was performed using Fisher's exact test, chi-squared test, and *t*-test when appropriate. Age was treated as a categorical variable and five age groups were identified: <40 years, 40–49 years, 50–59 years, 60–69 years, and ≥70 years (Fig. 1). Postmenopausal women were defined as age 55 years and older. Univariate and multivariate logistic regression analyses were used to estimate the association between demographic and clinicopathologic variables and choice of primary surgical therapy for breast cancer (mastectomy or BCS with sentinel lymph node (SLN) evaluation and ALND when the SLN was positive). Predictive factors with $p < 0.10$ in the univariate analyses were included in the multivariate analysis. A two-tailed $p < 0.05$ was considered statistically significant. All statistical analysis was performed using STATA 9 (StataCorp, College Station, TX, USA).

RESULTS

A total of 5,235 patients underwent breast cancer surgery at our institution for invasive breast cancer (ductal and lobular carcinoma) or in situ disease. The mean age at the time of diagnosis was 57 years (range 20–94 years). Forty two percent of the patients were >60 years of age, including 1,028 (20%) patients who were older than 70 years (Table 1). Age distribution of breast cancer among age groups is depicted in Fig. 1.

The majority of patients were postmenopausal (56%, $n = 2{,}932$). Of the 5,235 patients, 4,072 (78%)

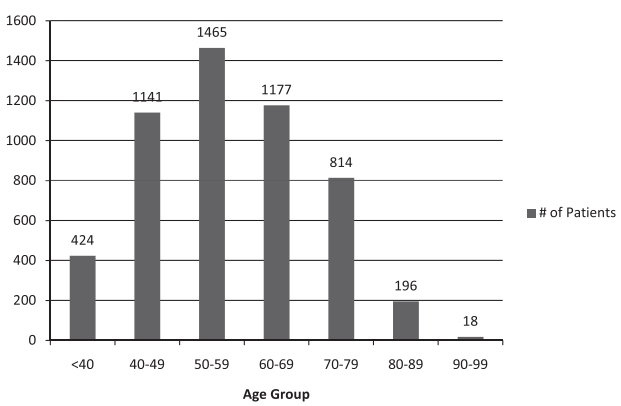

Figure 1. Age distribution of breast cancer patients.

Table 1. Clinicopathologic characteristics among 5,235 patients with breast cancer

	N (%)
Race	
White	4,585 (88)
Black	224 (4)
Hispanic	272 (5)
Others	154 (3)
Age group (years)	
<40	424 (8)
40–49	1,141 (22)
50–59	1,465 (28)
60–69	1,177 (22)
≥70	1,028 (20)
Size (cm)	
≤2	3,655 (70)
5-Feb	1,324 (25)
>5	200 (4)
Unknown	56 (1)
Histology (%)	
DCIS	1,163 (22)
ILC	442 (8)
IDC	3,630 (70)
Stage	
0	1,163 (22)
I	1,765 (34)
II	1,693 (32)
III	427 (8)
IV	51 (1)
Unknown	136 (3)
Lymph node status (invasive)	
Nx	36 (1)
N0	2,358 (58)
N1	1,345 (33)
N2	140 (3)
N3	90 (2)
Unknown	109 (3)

DCIS, ductal carcinoma in situ; IDC, invasive ductal carcinoma; ILC, invasive lobular carcinoma

Table 2. Clinicopathologic characteristics stratified by age (elderly versus nonelderly)

	Age <70 years	Age ≥70 years	p-value
Race			
White	3,630 (88)	955 (93)	<0.01
Black	23 (5)	21 (2)	
Hispanic	243 (5)	29 (3)	
Others	110 (2)	21 (2)	
Size (cm)			
≤2	2,891 (70)	764 (75)	<0.01
5-Feb	1,098 (26)	226 (22)	
>5	171 (4)	29 (3)	
Mean size (cm, ±SD)	1.9 (±1.7)	1.6 (±1.4)	<0.01
Histology (%)			
DCIS	950 (23)	213 (21)	<0.01
ILC	315 (7)	127 (12)	
IDC	2,942 (70)	688 (67)	
Surgical procedure			
BCS	2,624 (62)	666 (65)	0.16
Mastectomy	1,582 (38)	362 (35)	
Bilateral	497	48	
SLNB			
No	10 (1)	115 (16)	<0.01
Yes	3825 (99)	594 (84)	
Positive SLNB			
No	2,634 (69)	439 (74)	0.01
Yes	1,191 (31)	155 (26)	
CLND for positive SLNB			
No	184 (15)	28 (18)	0.41
Yes	1,006 (85)	127 (82)	
Stage			
I	1,351 (43)	414 (52)	<0.01
II	1,379 (44)	314 (40)	
III	373 (12)	54 (7)	
IV	42 (1)	9 (1)	
Lymphovascular invasion			
No	2,539 (64)	699 (73)	<0.01
Yes	1,421 (36)	257 (27)	
Lymph node status (invasive)			
Nx	30 (1)	6 (1)	<0.01
N0	2,767 (67)	754 (75)	
N1	1,129 (27)	216 (21)	
N2	118 (3)	22 (2)	
N3	78 (2)	12 (1)	

BCS, breast conservation surgery; CLND, completion lymph node dissection; DCIS, ductal carcinoma in situ; IDC, invasive ductal carcinoma; ILC, invasive lobular carcinoma; SLNB, sentinel lymph node biopsy.

patients had invasive breast cancer, whereas 1,163 (22%) had DCIS. The majority of patients (85%) were diagnosed with AJCC stage I (n = 1,765) and II (n = 1,693) disease; 15% had advanced disease (stage III and IV). Lymphovascular invasion was present in 40% of patients with invasive breast cancer. The mean tumor size was 2.0 cm (range 0.1–25) among patients with invasive carcinoma and 1.12 cm (range 0.1–11) among patients with DCIS. BCS was performed in 62% of patients with invasive carcinoma, and 67% of patients with DCIS.

Patients ≥70 years of age were more likely to have earlier stage (I-II) cancer (92% versus 87% $p < 0.01$), smaller tumors (1.6 cm versus 1.9 cm, $p < 0.01$), lower prevalence of lymphovascular invasion (27% versus 36%, $p < 0.01$) and a lower prevalence of a positive SLN (26% versus 31%, $p = 0.01$) (Table 2). A higher distribution of white patients was identified among elderly patients ≥70 years compared with patients <70 years (93% versus 88%, $p < 0.01$). Histologically, invasive lobular carcinoma was associated with elderly patients ≥70 years compared with patients <70 years (12% versus 7%, $p < 0.01$).

The most common procedure performed among elderly patients ≥70 years was BCS (65%), and the rate of BCS was not different from patients <70 years (62%, $p = 0.16$). However, a significant rate of bilateral mastectomy was identified in patients <70 compared to elderly patients that underwent mastectomy, 31% and 13%, respectively ($p < 0.01$). Whole breast radiotherapy was performed in 98% of all patients who underwent BCS, this did not vary with age. SLN was performed in 84% of elderly patients ≥70 years

compared with 99% of patients age <70 years with early stage breast cancer ($p < 0.01$). In contrast, the rate of complete lymph node dissection (ALND) for a positive SLN was not significantly different between groups.

Overall, BCS rates during the periods of 1994–1998, 1999–2003, and 2004–2007 were 66%, 66%, and 55%, respectively ($p < 0.01$). The rate of BCS declined with time, and an increased number of mastectomies were performed during the period of 2004–2007 (12). Mastectomy rates during the same time periods for patients <70 years were 34%, 34%, and 45%, respectively ($p < 0.01$). Likewise, mastectomy rates for patients ≥70 years were 33%, 32%, and 42%, respectively ($p = 0.02$). In particular, the rate of mastectomy in the elderly group of women ≥70 years at the beginning of the study period in 1994 was 30%, and then rose dramatically to a high of 54% in 2007 (12). We noticed a trend for older women to be more likely to undergo BCS compared to younger women with invasive carcinoma and DCIS (Fig. 2, $p < 0.01$). Among patients with invasive carcinoma, the incidence of BCS by age group was: <40 years 48%, 40–49 years 60%, 50–59 years 62%, 60–69 67% and >70 years 63% (Fig. 2). Patients with tumors >5 cm, lymphovascular invasion and advanced stage disease were more likely to have mastectomies.

On multivariate logistic regression analysis, older age, earlier stage, smaller tumor size, and absence of lymphovascular invasion were significant independent predictors of BCS among patients with invasive carcinoma (Table 3). Similarly, older age and smaller tumor size were significantly associated with BCS among patients with DCIS (Table 4). Race was not a significant predictor of BCS in both groups. Using age <40 years as the reference group, a significant preference toward BCS was observed among patients with invasive carcinoma in age groups 40–49 (OR = 1.6, 95% CI 1.2–2.1), 50–59 (OR = 1.5, 95% CI 1.1–1.9), and 60–69 (OR = 1.4, 95% CI 1.1–1.8). No significant difference was found in age group ≥70 years (OR 1.1, 95% CI 0.8–1.5). In contrast, a significant trend toward BCS was observed across all DCIS age groups: 40–49 (OR = 1.7, 95% CI 1.0–2.9), 50–59 (OR = 2.0, 95% CI 1.2–3.3), 60–69 (OR 1.8, 95% CI 1.1–3.1), and ≥70 (OR 1.9, 95% CI 1.1–3.3) when compared to the <40 years population.

Mortality associated with surgical procedure according to age was evaluated. Clinical characteristics including co-existing comorbidities of patients who died in the postoperative period are shown in Table 5. The 30-day mortality in the elderly group (age ≥70 years) was 0.2% (2 of 1,028 patients; 95% CI 0.02–0.7%). Both of these patients underwent a mastectomy. In contrast, no deaths were observed among patients <70 years in the 30-day postoperative period.

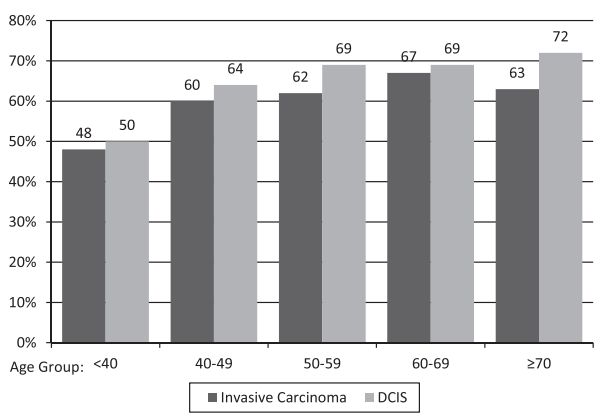

Figure 2. Distribution of breast-conserving surgery by age and histology ($p < 0.01$).

Table 3. Clinicopathologic predictors of breast-conserving surgery for invasive breast cancer

	Mastectomy *N* (%)	Breast conservation *N* (%)	Odds ratio (95%CI)	p-value
Race				
White	1,339 (86)	2,239 (90)	1.0	<0.01
African-American	70 (4)	103 (4)	0.9 (0.6–1.2)	
Hispanic	102 (7)	107 (4)	0.6 (0.5–0.8)	
Others	42 (3)	53 (2)	0.8 (0.5–1.1)	
Menopausal Status				
<55 years	756 (48)	1,010 (40)	1.0	<0.001
≥55 years	804 (52)	1,502 (60)	1.4 (1.2–1.6)	
Age group				
<40	179 (12)	161 (6)	1.0	<0.001
40–49	348 (22)	519 (21)	1.7 (1.3–2.1)	
50–59	423 (27)	704 (28)	1.9 (1.4–2.4)	
60–69	307 (20)	616 (25)	2.2 (1.7–2.9)	
≥70	303 (19)	512 (20)	1.9 (1.5–2.4)	
Plastic reconstruction				
No	1,313 (84)	2,436 (97)	1.0	<0.001
Yes	247 (16)	76 (3)	0.2 (0.1–0.2)	
Size				
≤2 cm	811 (52)	1,844 (74)	1.0	<0.001
2–5 cm	583 (38)	629 (25)	0.5 (0.4–0.5)	
>5 cm	151 (10)	32 (1)	0.1 (0.1–0.2)	
Lymphovascular invasion				
Absent	671 (46)	1,625 (68)	1.0	<0.001
Present	778 (54)	779 (32)	0.4 (0.4–0.5)	
Stage				
I	450 (30)	1,315 (53)	1.0	<0.001
II	684 (46)	1,009 (41)	0.5 (0.4–0.6)	
III	305 (21)	122 (5)	0.13 (0.1–0.2)	
IV	39 (3)	12 (1)	0.1 (0.1–0.2)	

Table 4. Clinicopathologic predictors of breast-conserving surgery for ductal carcinoma in situ

	Mastectomy *N* (%)	Breast conservation *N* (%)	Odds ratio (95%CI)	p-value
Race				
White	326 (85)	681 (88)	1.0	0.45
African- American	20 (5)	31 (4)	0.7 (0.4–1.3)	
Hispanic	23 (6)	40 (5)	0.8 (0.5–1.4)	
Others	15 (4)	21 (3)	0.7 (0.3–1.3)	
Menopausal status				
<55 years	198 (51)	339 (44)	1.0	0.01
≥55 years	187 (49)	439 (56)	1.4 (1.1–1.8)	
Age group (years)				
<40	42 (11)	42 (5)	1.0	<0.01
40–59	100 (26)	174 (22)	1.7 (1.1–2.8)	
50–59	104 (27)	234 (30)	2.2 (1.4–3.7)	
60–69	80 (21)	174 (22)	2.2 (1.3–3.6)	
≥70	59 (15)	154 (20)	2.6 (1.5–4.4)	
Plastic reconstruction				
No	296 (77)	737 (95)	1.0	<0.01
Yes	89 (23)	41 (5)	0.2 (0.1–0.3)	
Size				
≤2 cm	314 (84)	686 (91)	1.0	<0.001
2–5 cm	47 (13)	65 (8)	0.6 (0.4–0.9)	
>5 cm	12 (3)	5 (1)	0.2 (0.1–0.5)	

The 90-day mortality in the elderly group was 0.7% (7 of 1,028 patients; 95% CI 0.3–1.4%). The 90-day mortality rate among patients who underwent mastectomy was higher than those who underwent BCS in the elderly group (1.4% versus 0.3%), but this did not reach statistical significance ($p = 0.06$). Conversely, the 90-day mortality among patients <70 years was 0.05% (2 of 4,207 patients; 95% CI 0.005–0.2). Death in this group was observed equally in both procedures. Overall, although the 90-day mortality was low in both groups, the crude 90-day mortality rate was significantly higher ($p < 0.01$) among elderly patients (0.7%) compared to patients <70 years old (0.05%).

DISCUSSION

With continuing advances in the health care field, patients are living longer, shifting the largest group of care to the elderly populations. In the field of oncology in particular, approximately 66% of cases of newly diagnosed breast cancer occur in women over the age of 55 (2). However, although the subset of new patients diagnosed with breast cancer continues to average at or above 65, the majority of the current research is only available for younger populations (13). Advanced age per se has been considered a risk factor for surgical under-treatment, even if older women tolerate breast surgery well (14). Various studies have shown that age is a major determinant of treatment independent of comorbidity and disease status (3–5). Progress in anesthesiology now allows appropriate procedures for almost any woman requiring breast surgery (5).

The surgical treatment of breast cancer has evolved significantly to a multidisciplinary approach including less radical surgery, radiotherapy, chemotherapy, and hormonal therapy. Overall, 63% ($n = 3,290$) of patients treated at our institution underwent BCS, whereas BCS rates among patients with stage I and II was 59%. The results of our study suggest that BCS rates are affected by age, with an overall rate of 45% among patients <40 years of age and 65% among those ≥70 years.

In this study, elderly patients had small tumors on diagnosis, were less likely to have lymph node positivity and had early stage disease. This could be due to the fact that the elderly in this study population were largely white, affluent, and a relatively healthy population that have the resources and motivation to seek health care. A lower rate of lymphovascular invasion

Table 5. Clinical characteristics among patients who died during the 90-day postoperative period

Patient number	Age	Procedure	Comorbidities	Surgery related complications	Postoperative day of death	Cause of death
1	41	MRM	HTN, DM	ARDS, MRSA pneumonia	44	Metastatic disease
2	45	BCS + ALND	Alcoholism	None	67	Unknown
3	86	Mastectomy	HTN	Wound infection	22	Sepsis
4	74	Mastectomy	CAD, COPD, HTN	Respiratory failure	25	Pulmonary embolism
5	72	MRM	CAD, HTN	Respiratory failure, chest wall hematoma secondary to anticoagulation	69	Pulmonary embolism
6	74	MRM	HTN, COPD	None	76	Metastatic disease
7	74	BCS	Bladder cancer	None	80	Bladder cancer
8	78	BCS + ALND	Esophageal stricture	None	83	Chemotherapy related sepsis
9	71	MRM	HTN, COPD, Liver cancer	None	88	Liver cancer

ALND, axillary lymph node dissection; ARDS, acute respiratory distress syndrome; BCS, breast conservation surgery; CAD, coronary artery disease; COPD, chronic obstructive pulmonary disease; DM, diabetes mellitus; HTN, hypertension; MRM, modified radical mastectomy; MRSA, methicillin resistant *Staphylococcus aureus*.

was also seen in our population, this echoes finding by Wang *et al.* where lymphovascular invasion was found in only 23% of patients above the age of 70, in contrast to 41% of patients age less than 40 (15). Overall, however, we found a higher percentage of locally advanced tumors. This may be a bias inherent to a tertiary care facility or due to the advanced staging methodologies used at the time of study (16).

Elderly patients were less likely to undergo a SLN biopsy ($p < 0.01$), however, the completion lymph node dissection rate for a positive SLN was not significantly different ($p = 0.41$). It is unknown why these patients underwent fewer SLN biopsies. It is possible that treatment would not have been altered with the outcome of the SLN and it was omitted due to lack of clinical utility. It is also possible that SLN mapping failed more often in these patients as seen by several other authors (17–19).

Regardless of surgical procedure, the 90-day mortality rate in patients ≥70 years remains very low (0.7%), yet higher than younger patients ($p < 0.01$) and higher for elderly patients undergoing mastectomies compared with BCS (1.4% versus 0.3%, $p = 0.06$). It is encouraging to note that regardless of the surgery performed, the 30-day mortality was 0.2% for patients over 70 years of age. All mortality was due to nonsurgical factors and factors largely unrelated to advanced age. This is a unique finding and no comparable analysis has been reported in the literature thus far. This finding is in direct contrast to popular belief that elderly women are at increased surgical risk simply because of their age, regardless of comorbidities. Four patients in Table 5 (nos. 1, 6, 7, 9) underwent surgical intervention for treatment of breast cancer and with follow-up, they were found to have other incidental advanced malignancy or evidence of metastatic disease. These were all detected subsequent to treatment of the primary breast cancer. We could have elected to exclude these patients, but felt that as they were treated prior to the diagnosis of metastatic disease that their exclusion would bias the study. As mentioned previously, our patient population is more commonly white, affluent, and has fewer comordities than a cohort of similarly aged patients from other parts of the country. This may account for our exceedingly low mortality rate, but does suggest that healthy, elderly women should not be denied treatment simply because of advanced age.

Important factors that determine the type of surgery that breast cancer patients receive include geographic location (urban, rural, and state), pathologic factors (tumor size, tumor location, and histologic subtype), psychosocial factors, socioeconomic factors (marital status, employment status, and education level), racial factors, and physician factors (academic affiliation, case volume, and surgeon specialization). In contrast, wide variations in the literature exist regarding the role of age as a predictor of BCS (15,20–22). Several authors have associated older age with a low rate of BCS, whereas others have found a similar rate of BCS in this group of patients (23–25).

It is clear that the surgical management of breast cancer is currently in a state of flux. Our institutional rate of BCS for all patients, regardless of age, has fallen dramatically in the last decade (12). After establishing therapeutic equivalence, BCS enjoyed a tremendous upswing in popularity in the last decades of the 20th century (26,27). However, it appears that younger patients and ones with larger, more aggressive tumors are more frequently turning to mastectomy as their treatment of choice (12,28). There may be numerous other reasons for this change in the preferred management of breast cancer. Imaging techniques, like MRI (29–35), surgeon preference (36), and patient preference(37), whether due to popular media, socioeconomic, or regional differences may also be contributing to this dramatic change in surgical therapy.

With BCT having been the most common modality of therapy in the last 20 years, negative comments about the long-term cosmetic and oncologic outcomes are shared within peer to peer interactions with greater frequency. Further study into the influence of internet based peer to peer interactions and societal influence on decision making will be necessary to understand the ''fear factor'', which is creating this significant trend in therapeutic choice. Future research is needed to elucidate these possible hypotheses that could influence surgical treatment in relation to age as treatments for breast disease evolve.

Limitations of this study include the inability to control for confounders that could explain this treatment difference (clinical and radiologic tumor presentation, relative and absolute contraindications for BCS, patient selection versus physician recommendation, hormone receptor status); however, several hypotheses could explain this association. Observations in this study support that breast cancer in the elderly have distinct biologic and clinical characteristics. The elderly patients had smaller tumors with less aggressive characteristics that would explain why

patients with advanced age could receive less radical surgery compared with younger patients who present with more aggressive tumors requiring mastectomy. Although Florida has a significant group of elderly and is composed of a large retirement population, the elderly of Florida are in general mobile, affluent, and a relatively healthy population that have the time, resources, and motivation to seek the care they desire. These factors may introduce a bias into these results that would be significantly different from urban, inner city, or lower socioeconomic populations of the elderly. However, it may still reflect the fact that motivated, active elderly women should be given every opportunity for receiving the standard of care offered to a younger population of breast cancer patients.

With the introduction of SLN biopsy as a routine after 1994, older women were less likely to have axillary dissection (6). In the present series, SLN was the standard method for assessment of the axilla, and it is possible that this minimally invasive procedure could have affected elderly patients' attitude toward a less radical breast surgery such as BCS. On the other hand, the introduction of accelerated partial breast irradiation techniques may have an impact on older patients opting for breast conservation surgery by avoiding the inconvenience of long-term radiation.

The group of patients 70 years and older represents an ever growing proportion of the American population of the ''baby boom'', ''age wave'' of people being treated; it is the authors intent to document the care of this burgeoning group of patients within the population of all breast cancer patients. In summary, surgical management is focused on two main premises, local control and accurate staging of the disease. Whether young or old those goals should be the focus of the surgical management.

REFERENCES

1. Kamangar F, Dores GM, Anderson WF. Patterns of cancer incidence, mortality, and prevalence across five continents: defining priorities to reduce cancer disparities in different geographic regions of the world. *J Clin Oncol* 2006;24:2137–50.

2. Yancik R, Wesley MN, Ries LA, Havlik RJ, Edwards BK, Yates JW. Effect of age and comorbidity in postmenopausal breast cancer patients aged 55 years and older. *JAMA* 2001;285: 885–92.

3. Hawfield A, Lovato J, Covington D, Kimmick G. Retrospective study of the effect of comorbidity on use of adjuvant chemotherapy in older women with breast cancer in a tertiary care setting. *Crit Rev Oncol Hematol* 2006;59:250–5.

4. Evron E, Goldberg H, Kuzmin A, *et al.* Breast cancer in octogenarians. *Cancer* 2006;106:1664–8.

5. Giordano SH, Hortobagyi GN, Kau SW, Theriault RL, Bondy ML. Breast cancer treatment guidelines in older women. *J Clin Oncol* 2005;23:783–91.

6. August DA, Rea T, Sondak VK. Age-related differences in breast cancer treatment. *Ann Surg Oncol* 1994;1:45–52.

7. Hancke K, Denkinger MD, Konig J, *et al.* Standard treatment of female patients with breast cancer decreases substantially for women aged 70 years and older: a German clinical cohort study. *Ann Oncol* 2010 Apr;21(4):748–53.

8. Gajdos C, Tartter PI, Bleiweiss IJ, Lopchinsky RA, Bernstein JL. The consequence of undertreating breast cancer in the elderly. *J Am Coll Surg* 2001;192:698–707.

9. Veronesi U, Saccozzi R, Del Vecchio M, *et al.* Comparing radical mastectomy with quadrantectomy, axillary dissection, and radiotherapy in patients with small cancers of the breast. *N Engl J Med* 1981;305:6–11.

10. Fisher B, Anderson S, Redmond CK, Wolmark N, Wickerham DL, Cronin WM. Reanalysis and results after 12 years of follow-up in a randomized clinical trial comparing total mastectomy with lumpectomy with or without irradiation in the treatment of breast cancer. *N Engl J Med* 1995;333:1456–61.

11. NIH consensus conference. Treatment of early-stage breast cancer. *JAMA* 1991;265:391–5.

12. McGuire KP, Santillan AA, Kaur P, *et al.* Are mastectomies on the rise? A 13-year trend analysis of the selection of mastectomy versus breast conservation therapy in 5865 patients. *Ann Surg Oncol* 2009;16:2682–90.

13. Townsley C, Pond GR, Peloza B, *et al.* Analysis of treatment practices for elderly cancer patients in Ontario, Canada. *J Clin Oncol* 2005;23:3802–10.

14. Hughes S, Barbachano Y, Ashley S, *et al.* Outcome of elderly with breast cancer. *Breast J* 2008;14:158–63.

15. Wang J, Kollias J, Boult M, *et al.* Patterns of surgical treatment for women with breast cancer in relation to age. *Breast J* 2010 Jan-Feb;16(1):60–5.

16. Lee MC, Rogers K, Griffith K, *et al.* Determinants of breast conservation rates: reasons for mastectomy at a comprehensive cancer center. *Breast J*, 2009;15:34–40.

17. Gschwantler-Kaulich D, Riegler-Keil M, Ruecklinger E, Singer CF, Seifert M, Kubista E. Factors influencing the identification rate of the sentinel node in breast cancer. *Eur J Cancer Care* 2011 Sep; 20(5): 627–31.

18. Ng PC, Chua AC, Lannin DP, *et al.* Age and surgeon experience: the only significant factors contributing to sentinel lymph node mapping failure in breast cancer. *Breast Cancer Res Treat* 1999;57:27.

19. Cox CE, Dupont E, Whitehead GF, *et al.* Age and body mass index may increase the chance of failure in sentinel lymph node biopsy for women with breast cancer. *Breast J* 2002;8:88–91.

20. Nold RJ, Beamer RL, Helmer SD, McBoyle MF. Factors influencing a woman's choice to undergo breast-conserving surgery versus modified radical mastectomy. *Am J Surg* 2000;180:413–8.

21. Smith GL, Xu Y, Shih YC, *et al.* Breast-conserving surgery in older patients with invasive breast cancer: current patterns of treatment across the United States. *J Am Coll Surg* 2009;209:425–33.

22. Freedman RA, He Y, Winer EP, Keating NL. Trends in racial and age disparities in definitive local therapy of early-stage breast cancer. *J Clin Oncol* 2009;27:713–9.

23. Ballard-Barbash R, Potosky AL, Harlan LC, Nayfield SG, Kessler LG. Factors associated with surgical and radiation therapy for early stage breast cancer in older women. *J Natl Cancer Inst* 1996;88:716–26.

24. Jhingran A, Kim JS, Buchholz TA, *et al.* Age as a predictor of outcome for women with DCIS treated with breast-conserving

surgery and radiation: the University of Texas M. D. Anderson Cancer Center experience. *Int J Radiat Oncol Biol Phys* 2002;54: 804–9.

25. Grube BJ, Hansen NM, Ye W, Herlong T, Giuliano AE. Surgical management of breast cancer in the elderly patient. *Am J Surg* 2001;182:359–64.

26. Fisher B, Anderson S, Bryant J, *et al.* Twenty-year follow-up of a randomized trial comparing total mastectomy, lumpectomy, and lumpectomy plus irradiation for the treatment of invasive breast cancer. [see comment]. *N Engl J Med* 2002;347:1233–41.

27. Veronesi U, Cascinelli N, Mariani L, *et al.* Twenty-year follow-up of a randomized study comparing breast-conserving surgery with radical mastectomy for early breast cancer. [see comment]. *N Engl J Med* 2002;347:1227–32.

28. Hiotis K, Ye W, Sposto R, Skinner KA. Predictors of breast conservation therapy: size is not all that matters. *Cancer* 2005;103:892–9.

29. Mameri CS, Kemp C, Goldman SM, Sobral LA, Ajzen S. Impact of breast MRI on surgical treatment, axillary approach, and systemic therapy for breast cancer. *Breast J* 2008;14:236–44.

30. Bagley FH. The role of magnetic resonance imaging mammography in the surgical management of the index breast cancer. *Arch Surg* 2004;139:380–3. discussion 383.

31. Bilimoria KY, Cambic A, Hansen NM, Bethke KP. Evaluating the impact of preoperative breast magnetic resonance imaging on the surgical management of newly diagnosed breast cancers. *Arch Surg* 2007;142:441–5. discussion 445–7.

32. Bedrosian I, Mick R, Orel SG, *et al.* Changes in the surgical management of patients with breast carcinoma based on preoperative magnetic resonance imaging. *Cancer* 2003;98:468–73.

33. Furman B, Gardner MS, Romilly P, *et al.* Effect of 0.5 Tesla magnetic resonance imaging on the surgical management of breast cancer patients. *Am J Surg* 2003;186:344–7.

34. Pediconi F, Catalano C, Padula S, *et al.* Contrast-enhanced magnetic resonance mammography: does it affect surgical decision-making in patients with breast cancer? *Breast Cancer Res Treat* 2007;106:65–74.

35. Fischer U, Kopka L, Grabbe E. Breast carcinoma: effect of preoperative contrast-enhanced MR imaging on the therapeutic approach. *Radiology* 1999;213:881–8.

36. Fancher TT, Palesty JA, Thomas R, *et al.* A woman's influence to choose mastectomy as treatment for breast cancer. *J Surg Res* 2009;153:128–31.

37. Tate PS, McGee EM, Hopkins SF, Rogers EL, Page GV. Breast conservation versus mastectomy: patient preferences in a community practice in Kentucky. *J Surg Oncol* 1993;52:213–6.