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ORIGINAL ARTICLE – BREAST ONCOLOGY

Perioperative Complications of Breast Cancer Surgery in Elderly Women (≥80 Years)

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ABSTRACT

Purpose. There has been much controversy regarding the optimal management of breast cancer in very elderly women. Some clinicians are reluctant to offer surgical treatment for women older than aged 80 years because of the assumed higher operative risk associated with advanced age. This study was designed to investigate the perioperative complications of breast cancer surgery in women of this age group.

Methods. Data were reviewed of all women ≥80 years of age who underwent breast cancer surgery at a university clinic during the period 1990–2005. Symptoms, comorbidities, preoperative risk assessment, type of operation, postoperative histological diagnosis, hospital stay, morbidity, and mortality were documented and analyzed.

Results. During this 16-year period, 140 operations for breast cancer were performed in 129 women. The majority of the patients (37.9%) underwent a modified radical mastectomy, 32.1% underwent a simple mastectomy, 24.3% underwent breast-conserving therapy, and 5.7% underwent an axillary lymph node dissection. Complications occurred in 37.1% of the cohort: 31.4% were minor complications and only 5.7% were major. Intraoperative morbidity was 18.6% and postoperative morbidity was 20%. Late complications occurred in 5% of patients. The most common complications were associated with the wound region (50%). The perioperative mortality in this group of elderly women was zero.

Conclusions. Breast cancer surgery has acceptable perioperative morbidity and mortality in women aged ≥80 years. Surgery is the cornerstone of breast cancer treatment and should be offered as first-line treatment for all patients regardless of their age.

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Breast cancer is the most common malignancy in women of western countries.[1,2] In the United States, breast cancer among women is expected to account for 27% (192,370 women) of all new cancer cases in 2009 and for 15% (40,170 women) of all cancer deaths. Breast cancer is more common in older women, and the number of older women with breast cancer is expected to increase in coming years.[3] In 2009, 1 in 16 women aged 70 years and older is expected to develop breast cancer compared with 1 in 29 women aged 60–69 years.[2] The group comprising elderly breast cancer patients is less extensively investigated, and it is believed that elderly patients receive less treatment compared with younger patients.[4–6]

There has been much controversy regarding the ideal treatment of breast cancer in elderly women.[3,4,7] The major issues regarding this age group are based on questions related to screening mammography, extent of treatment necessary to achieve a longer survival, and whether breast cancer is inherently more indolent in elderly patients.[7–12] However, little data exist concerning the complications of breast cancer surgery in the very elderly female population (≥80 years of age), especially because an adequate surgical approach is the cornerstone of breast cancer treatment.[13–17] Therefore, the purpose of this analysis was to evaluate the perioperative morbidity and mortality of a group of women with a minimum age of 80 years who underwent surgery for breast cancer.

MATERIALS AND METHODS

We conducted a retrospective study of all women aged 80 years and older who were treated surgically for breast

cancer at the Department of Obstetrics and Gynecology of the University of Rostock in Germany during the period 1990–2005. The data were obtained from the archive of the Department of Obstetrics and Gynecology and were processed and analyzed completely anonymously.

The preoperative symptomatology, coexistent diseases, and preoperative risk assessment were investigated. The comorbidities were divided into eight groups as shown in Table 1.

An experienced anesthesiologist was assigned to assess the operative risk for each patient. Since 1993, the American Society of Anesthesiologists (ASA) classification of physical status was used for the preoperative risk assessment, in place of the previously used Loskant-scheme.[18,19] These criteria are widely used to assess the general operability of patients, reflecting the general health status of each patient. Briefly, the ASA classifications were: I = healthy patient; II = patient with mild systemic disease and no functional limitation; III = patient with severe systemic disease and some functional limitation; IV = patient with severe systemic disease that is a constant threat to life; and ASA V = moribund patient unlikely to survive 24 h with or without operation.

The operations were divided into four groups: modified radical mastectomy (MRM), simple mastectomy (ME), breast-conserving therapy (BCT), and axillary lymph node dissection (ALND). The type of anesthesia (general or local) and the postoperative histological diagnosis also were documented. The extent of the disease was staged according to the classification system of the International Union Against Cancer (UICC) with regard to the tumor size (T) and lymph nodes (N) and metastases (M) status. Bilateral carcinomas were staged according to the most advanced carcinoma.

TABLE 1 Comorbidities

Category	Diseases
Cardiovascular	Hypertension
	Coronary heart disease
	Myocardial infarction
	Cardiac failure
	Valvular heart disease
	Cardiac arrhythmias
Pulmonary	COPD (chronic obstructive pulmonary disease)
	Asthma
Diabetes	Insulin-dependent diabetes
	Non-insulin-dependent diabetes
Overweight/obesity	Overweight: $25 < BMI < 30$
	Obesity: $BMI > 30$
Vascular	Deep vein thrombosis
	Pulmonary embolism
	Cerebrovascular disease (including transient ischemic attack)
Neurological	Stroke
	Dementia
	Depression
Renal	Renal insufficiency
	Pyelonephritis
Malignancies	Previous breast cancer and other malignancies

Complications were divided into intraoperative, postoperative, and late. "Late" complications were those considered to have occurred after the patient was discharged from hospital, but which were closely related to the operative procedure. Complications also were classified as major or minor. Deep vein thrombosis and stroke were considered as major systemic complications, wound infection and serious bleeding requiring wound revision as major local complications, and the remainder were considered as minor complications. Wound infections were defined as infiltrates of variable location with or without fever (>38°C) or the formation of an abscess.[20]

The perioperative mortality and length of hospital stay also were documented. For analysis of the data, four subgroups of postoperative stay (0–4 days, 5–9 days, 10–14 days, and >14 days) were used. The perioperative administration of antibiotics for antimicrobial prophylaxis and the administration of low molecular weight heparin (LMWH) or heparin for the prevention of thromboembolic events also were documented.

Statistical analyses were performed using the SPSS® statistical software (version 16.0, SPSS Inc., Chicago, IL). The chi-square test and the Fisher's exact test were used for the comparisons of categorical variables between the groups. $P < 0.05$ was considered statistically significant.

RESULTS

A total of 140 breast cancer operations in 129 women (some patients underwent more than one surgical procedure), aged 80 years or older, was performed during the period January 1, 1990 to December 31, 2005. The median age of the patients was 82.84 years (minimum: 80.06, maximum: 95.51). The majority of the patients (37.9%) underwent MRM, 32.1% underwent BCT, 24.3% underwent ME, and 5.7% underwent ALND.

The preoperative parameters of these women divided into the four surgical groups are given in Table 2. The most common presenting symptom (53.6%) was swelling in the breast. A high percentage (32.1%) of patients was asymptomatic at initial presentation and the suspicious lesion was detected by routine clinical examination or by screening mammography. Only two patients (1.4%) had no serious comorbidities at the time of preoperative

TABLE 2 Preoperative parameters of women at least 80 years old, divided into the four surgical groups

Preoperative parameters	MRM (53)	ME (34)	BCT (45)	ALND (8)	Total (140)
Symptomatology					
Swelling in breast	31 (58.5)	22 (64.7)	21 (46.7)	1 (12.5)	75 (53.6)
Mammillae secretion	4 (7.5)	2 (5.9)	2 (4.4)	0 (0)	8 (5.7)
Pain	2 (3.8)	1 (2.9)	3 (6.7)	0 (0)	6 (4.3)
Swelling in axilla	1 (1.9)	0 (0)	0 (0)	3 (37.5)	4 (2.9)
Breast exulceration	0 (0)	0 (0)	1 (1.9)	0 (0)	1 (0.7)
Weight loss	1 (1.9)	0 (0)	0 (0)	0 (0)	1 (0.7)
None	14 (26.4)	9 (26.5)	18 (40)	4 (50)	45 (32.1)
Comorbidities					
Cardiovascular disease	48 (90.6)	29 (85.3)	41 (91.1)	7 (87.5)	125 (89.3)
Pulmonary disease	7 (13.2)	3 (8.8)	8 (17.8)	0 (0)	18 (12.9)
Vascular disease	8 (15.1)	5 (14.7)	10 (22.2)	2 (25)	25 (17.9)
Neurological disease	7 (13.2)	4 (11.8)	8 (17.8)	0 (0)	19 (13.6)
Diabetes mellitus	16 (30.2)	15 (44.1)	18 (40)	2 (25)	51 (36.4)
Overweight/obesity	15 (28.3)	10 (29.4)	15 (33.3)	1 (12.5)	41 (29.3)
Nephrological disease	3 (5.7)	3 (8.8)	1 (2.2)	0 (0)	7 (5)
Malignant disease	8 (15.1)	6 (17.6)	8 (17.8)	6 (75)	28 (20)
ASA classification					
ASA II	8 (15.1)	5 (19.2)	6 (14)	1 (12.5)	20 (15.4)
ASA III	37 (69.8)	18 (69.2)	26 (60.5)	6 (75)	87 (66.9)
ASA IV	4 (7.5)	2 (7.7)	3 (7)	0 (0)	9 (6.9)
Unknown	4 (7.5)	1 (3.8)	8 (18.6)	1 (12.5)	14 (10.8)
Loskant classification					
Stage 2	0 (0)	2 (25)	0 (0)	0 (0)	2 (20)
Stage 3	0 (0)	6 (75)	0 (0)	0 (0)	6 (60)
Unknown	0 (0)	0 (0)	2 (100)	0 (0)	2 (20)

Data are absolute numbers (*n*) with percentages (%) in parentheses

ALND axillary lymph node dissection, *ASA* American Society of Anesthesiologists classification of physical status, *BCT* breast-conserving therapy, *ME* simple mastectomy, *MRM* modified radical mastectomy

assessment, whereas the majority of the patients (62.1%) had two or three serious comorbidities. Approximately 89% of the patients had cardiovascular disease, diabetes mellitus was seen in 36.4% (insulin-dependent in 6.4%), and 29.3% of the patients were overweight/obese (body mass index (BMI) >25; BMI >30 in 18.6%; and BMI >30 in 10.7%). Twenty percent of the patients already had a malignant diagnosis in their past medical history—the most common of which was breast cancer (75%)—whereas other malignancies included two colon cancers, two cervical cancers, one thyroid cancer, one ovarian cancer, and one uterus carcinoma. Most of the patients (66.4%) were preoperatively staged as representing a moderate operative risk (after 1993: 66.9% ASA 3; and before 1993: 60% stage 3 according to the Loskant scheme).

Intraoperative and postoperative parameters are shown in Table 3. General anesthesia was used in 89.3% of the operations, and local anesthesia was used in 9.3%. Patients who underwent BCT were more likely to have local anesthesia (26.7 vs. 1.1%: $P < 0.001$). Antimicrobial prophylaxis was used in 74.3% of the operations, whereas thromboembolism prophylaxis was administered in 92.1% of the operations (LMWH in 82.9% and heparin in 9.3%). Postoperative histological examination revealed that at the time of diagnosis, 80% of the tumors were primary invasive carcinomas, 12.1% were breast carcinoma relapses, whereas in situ carcinomas were found in five patients (3.6%), and six patients (4.3%) had bilateral breast carcinomas. Analytic the histological characteristics of the tumors are given in Table 4. The majority of the tumors (56.4%) were invasive ductal carcinomas: grade 2 was seen most commonly (51.1%) and 73.3% of the carcinomas were estrogen-receptor positive. The most common TNM stage of these tumors was stage II (45.7%).

Complications occurred in 37.1% of cases, in which 5.7% were major and 31.4% minor (Table 5).

TABLE 3 Intraoperative and postoperative parameters of women at least 80 years old, divided into the four surgical groups

Intraoperative/postoperative parameters	MRM (53)	ME (34)	BCT (45)	ALND (8)	Total (140)
Anesthesia					
General anesthesia	53 (100)	33 (97.1)	33 (73.3)	6 (75)	125 (89.3)
Local anesthesia	0 (0)	1 (2.9)	12 (26.7)	0 (0)	13 (9.3)
Unknown	0 (0)	0 (0)	0 (0)	2 (25)	2 (1.4)
Thromboembolism prophylaxis					
Yes	52 (98.1)	32 (94.1)	37 (82.2)	8 (100)	129 (92.1)
No	0 (0)	0 (0)	2 (4.4)	0 (0)	2 (1.4)
Unknown	1 (1.9)	2 (5.9)	6 (13.3)	0 (0)	9 (6.4)
Antimicrobial prophylaxis					
Yes	48 (90.6)	25 (73.5)	24 (53.3)	7 (87.5)	104 (74.3)
No	2 (3.8)	3 (8.8)	13 (28.9)	1 (12.5)	19 (13.6)
Unknown	3 (5.7)	6 (17.6)	8 (17.8)	0 (0)	17 (12.1)
Postoperative diagnosis					
Primary invasive breast carcinoma	46 (86.8)	28 (82.4)	36 (80)	2 (25)	112 (80)
Bilateral breast carcinoma	4 (7.5)	2 (5.9)	0 (0)	0 (0)	6 (4.3)
Breast carcinoma relapses	2 (3.8)	4 (11.8)	5 (11.1)	6 (75)	17 (12.1)
In situ breast carcinoma	1 (1.9)	0 (0)	4 (8.9)	0 (0)	5 (3.6)
Postoperative stay (days)					
0–4	3 (5.7)	4 (11.8)	18 (40)	3 (37.5)	28 (20)
5–9	30 (56.6)	15 (44.1)	20 (44.4)	4 (50)	69 (49.3)
10–14	17 (32.1)	10 (29.4)	5 (11.1)	1 (12.5)	33 (23.6)
>14	3 (5.7)	5 (14.7)	2 (4.4)	0 (0)	10 (7.1)

Data are provided as absolute numbers (*n*) with percentages (%) in parentheses

ALND axillary lymph node dissection, *BCT* breast-conserving therapy, *ME* simple mastectomy, *MRM* modified radical mastectomy

Intraoperative complications were documented in 18.6% of procedures, postoperative complications in 20%, and late complications occurred in 5%. Half of the complications that occurred were related to the operative wound. There were four cases of wound infection, all occurring after a modified radical mastectomy. The incidence of seromas was 3.6%, whereas that of hematomas was 9.3%. There were two cases of serious bleeding: one intraoperative bleeding (MRM group) that required a wound revision and transfusions postoperatively, and one diffuse postoperative bleeding that required wound revision after a simple mastectomy. Only two major systemic complications occurred: a stroke after ME and deep vein thrombosis after BCT. The perioperative mortality in our study was zero.

Analysis of complications according to comorbidity groups or preoperative risk assessment (ASA or Loskant scheme) revealed only two statistically significant correlations. First, the subgroup of patients with a BMI >30 were at higher risk of developing major complications (20 vs. 4%, $P = 0.041$) and postoperative wound complications (33.3 vs. 12%, $P = 0.042$). Second, major complications occurred significantly more often in patients preoperatively staged as ASA 4 (33.3 vs. 4.1%, $P = 0.011$).

The mean hospital stay was 9.41 days (minimum stay: 1 day, maximum stay: 24 days), whereas the mean preoperative stay was 1.49 days (min: 0 days, max: 8 days), and the mean postoperative stay was 7.92 days (min: 0 days, max: 20 days). Patients who underwent BCT had statistically shorter postoperative stays. 40% of those with BCT stayed 0–4 days compared with 10.5% in the other groups ($P < 0.001$). As anticipated, there was a significant correlation between complications and postoperative stay. Patients who stayed 10–14 days postoperatively or more than 14 days postoperatively experienced complications in 60.6 and 100% of cases, respectively ($P < 0.002$).

DISCUSSION

The major controversies regarding patients aged 80 years and older are primarily based on issues related to screening mammography, extent of treatment necessary to achieve prolonged survival (balanced against expected longevity), and whether breast cancer is inherently more indolent in elderly patients.[7–12] Although many studies have shown that older age is associated with favorable pathological and biological features of breast cancer, other studies have demonstrated that breast cancer mortality

TABLE 4 Histological characteristics of the tumors

Histological parameters	MRM (53)	ME (34)	BCT (45)	ALND (8)	Total (140)
Histology					
Invasive ductal carcinoma	32 (60.4)	27 (79.4)	30 (66.7)	7 (87.5)	96 (68.6)
Mixed ductal and lobular carcinoma	6 (11.3)	1 (2.9)	2 (4.4)	0 (0)	9 (6.4)
Invasive lobular carcinoma	4 (7.5)	1 (2.9)	1 (2.2)	0 (0)	6 (4.3)
Invasive mucinous carcinoma	3 (5.7)	2 (5.9)	2 (4.4)	1 (12.5)	8 (5.7)
Invasive papillary carcinoma	4 (7.5)	0 (0)	2 (4.4)	0 (0)	6 (4.3)
Mixed ductal and special type	0 (0)	1 (2.9)	4 (8.9)	0 (0)	5 (3.6)
Invasive medullary carcinoma	3 (5.7)	0 (0)	0 (0)	0 (0)	3 (2.1)
Invasive cribiform carcinoma	0 (0)	1 (2.9)	0 (0)	0 (0)	1 (0.7)
Invasive tubular carcinoma	0 (0)	1 (2.9)	0 (0)	0 (0)	1 (0.7)
Carcinoma in situ	1 (1.9)	0 (0)	4 (8.9)	0 (0)	5 (3.6)
Grading					
G1	8 (15.1)	13 (38.2)	14 (31.1)	1 (12.5)	36 (25.7)
G2	28 (52.8)	16 (47.1)	23 (51.1)	3 (37.5)	70 (50)
G3	14 (26.4)	4 (11.8)	5 (11.1)	0 (0)	23 (16.4)
Unknown	3 (5.7)	1 (2.9)	3 (6.7)	4 (50)	11 (7.9)
ER					
Positive	38 (71.7)	25 (73.5)	33 (73.3)	4 (50)	24 (17.1)
Negative	9 (17)	4 (11.8)	3 (6.7)	0 (0)	100 (71.4)
Unknown	6 (11.3)	5 (14.7)	9 (20)	4 (50)	16 (11.4)
PR					
Positive	31 (58.5)	17 (50)	27 (60)	3 (37.5)	78 (55.7)
Negative	16 (30.2)	11 (32.4)	8 (17.8)	1 (12.5)	36 (25.7)
Unknown	6 (11.3)	6 (17.6)	10 (22.2)	4 (50)	26 (18.6)
TNM stages					
Tumor (T)					
T0	2 (3.8)	0 (0)	4 (8.9)	1 (12.5)	7 (5.0)
T1	15 (28.3)	10 (29.4)	19 (42.2)	3 (37.5)	47 (33.6)
T2	21 (39.6)	15 (44.1)	11 (24.4)	1 (12.5)	48 (34.3)
T3	2 (3.8)	1 (2.9)	1 (2.2)	0 (0)	4 (2.9)
T4	12 (22.6)	7 (20.6)	3 (6.7)	0 (0)	22 (15.7)
TX	1 (1.9)	1 (2.9)	7 (15.6)	3 (37.5)	12 (8.6)
Nodes (N)					
N0	27 (50.9)	14 (41.2)	20 (44.4)	1 (12.5)	62 (44.3)
N1	24 (45.3)	5 (14.7)	3 (6.7)	4 (50)	36 (25.7)
N2	0 (0)	1 (2.9)	0 (0)	0 (0)	1 (0.7)
N3	2 (3.8)	0 (0)	0 (0)	0 (0)	2 (1.4)
NX	0 (0)	14 (41.2)	22 (48.9)	3 (37.5)	39 (27.9)
Metastases (M)					
M0	40 (75.5)	15 (44.1)	23 (51.1)	3 (37.5)	81 (57.9)
M1	2 (3.8)	0 (0)	1 (2.2)	0 (0)	3 (2.1)
MX	11 (20.8)	19 (55.9)	21 (46.7)	5 (62.5)	56 (40)
Stages					
0	1 (1.9)	0 (0)	4 (8.9)	0 (0)	5 (3.6)
I	8 (15.1)	8 (23.5)	19 (42.2)	1 (12.5)	36 (25.7)
II	30 (56.6)	18 (52.9)	12 (26.7)	4 (50)	64 (45.7)
III	11 (20.8)	7 (20.6)	2 (4.4)	0 (0)	20 (14.3)
IV	2 (3.8)	0 (0)	1 (2.2)	0 (0)	3 (2.1)
Unknown	1 (1.9)	1 (2.9)	7 (15.6)	3 (37.5)	12 (8.6)

Bilateral tumors are analyzed according to the most advanced carcinoma

Data are provided in absolute numbers (*n*) and percentages (%) in parenthesis

ALND axillary lymph node dissection, *BCT* breast-conserving therapy, *ER* estrogen receptor status, *ME* simple mastectomy, *MRM* modified radical mastectomy, *PR* progesterone receptor status

TABLE 5 Complications in the women ≥80 years old, divided into the four surgical groups

Complications	MRM (53)	Significance (χ^2)	ME (34)	Significance (χ^2)	BCT (45)	Significance (χ^2)	ALND (8)	Significance (χ^2)	Total (140)	Significance (χ^2)
Intraoperative										
Cardiovascular										
Bradycardia	3 (5.7)		12 (35.3)		4 (8.9)		2 (25)		21 (15)	
Hypertension	2 (3.8)		1 (2.9)		0 (0)		0 (0)		3 (2.1)	
Hypotension	0 (0)		1 (2.9)		0 (0)		0 (0)		1 (0.7)	
Serious bleeding	1 (1.9)		0 (0)		0 (0)		0 (0)		1 (0.7)	
Total										
Yes	**6 (11.3)**	$P < 0.001$	**14 (41.2)**	n.s.	**4 (8.9)**	$P < 0.001$	**2 (25.0)**	n.s.	**26 (18.6)**	$P < 0.001$
No	**47 (88.7)**		**20 (58.8)**		**41 (91.1)**		**6 (75.0)**		**114 (81.4)**	
Postoperative										
Cardiovascular										
Circulatory dysregulation	1 (1.9)		0 (0)		0 (0)		0 (0)		1 (0.7)	
Hypertension	1 (1.9)		0 (0)		0 (0)		0 (0)		1 (0.7)	
Vascular										
Deep vein thrombosis	0		0 (0)		1 (2.2)		0 (0)		1 (0.7)	
Thrombophlebitis	1 (1.9)		0 (0)		0 (0)		0 (0)		1 (0.7)	
Nervous system										
Stroke	0		1 (2.9)		0 (0)		0 (0)		1 (0.7)	
Urinary system										
Urinary tract infection	1 (1.9)		0 (0)		0 (0)		0 (0)		1 (0.7)	
Wound region										
Wound infection	2 (3.8)		0 (0)		0 (0)		0 (0)		2 (1.4)	
Diffuse bleeding requiring wound revision	0		1 (2.9)		0 (0)		0 (0)		1 (0.7)	
Seroma	1 (1.9)		1 (2.9)		0 (0)		0 (0)		2 (1.4)	
Hematoma	2 (3.8)		1 (2.9)		7 (15.6)		0 (0)		10 (7.1)	
Persistent lymph secretion	0 (0)		1 (2.9)		0 (0)		0 (0)		1 (0.7)	
Minor wound healing problems	1 (1.9)		0 (0)		2 (4.4)		1 (12.5)		4 (2.9)	
Other										
Antibiotics administration	0 (0)		0 (0)		1 (2.2)		0 (0)		1 (0.7)	
Rash	1 (1.9)		0 (0)		0 (0)		0 (0)		1 (0.7)	
Total										
Yes	**11 (20.8)**	$P < 0.001$	**5 (14.7)**	$P < 0.001$	**11 (24.4)**	$P < 0.001$	**1 (12.5)**	$P = 0.034$	**28 (20)**	$P < 0.001$
No	**42 (79.2)**		**29 (85.3)**		**34 (75.6)**		**7 (87.5)**		**112 (80)**	
Late complications										
Wound region										
Wound infection	2 (3.8)		0 (0)		0 (0)		0 (0)		2 (1.4)	
Seroma	1 (1.9)		1 (2.9)		1 (2.2)		0 (0)		3 (2.1)	
Hematoma	0 (0)		0 (0)		2 (4.4)		0 (0)		2 (1.4)	
Total										
Yes	**3 (5.7)**	$P < 0.001$	**1 (2.9)**	$P < 0.001$	**3 (6.7)**	$P < 0.001$	**0**	n.c.	**7 (5)**	$P < 0.001$
No	**50 (94.3)**		**33 (97.1)**		**42 (93.3)**		**8 (100)**		**133 (95)**	
Overall complications										
Major	5 (31.3)	n.s.	2 (11.1)	$P < 0.001$	1 (6.7)	$P < 0.001$	0 (0)	n.c.	8 (15.4)	$P < 0.001$
Minor	11 (68.7)		16 (88.9)		14 (93.3)		3 (100)		44 (84.6)	

TABLE 5 continued

Complications	MRM (53)	Significance (χ^2)	ME (34)	Significance (χ^2)	BCT (45)	Significance (χ^2)	ALND (8)	Significance (χ^2)	Total (140)	Significance (χ^2)
Total										
Yes	**16 (30.2)**	$P = 0.004$	**18 (52.9)**	n.s.	**15 (33.3)**	$P = 0.025$	**3 (37.5)**	n.s.	**52 (37.1)**	$P = 0.002$
No	**37 (69.8)**		**16 (47.1)**		**30 (66.7)**		**5 (62.5)**		**88 (62.9)**	

Data are provided as absolute numbers (*n*) with percentages (%) in parentheses

ALND axillary lymph node dissection, *BCT* breast-conserving therapy, *ME* simple mastectomy, *MRM* modified radical mastectomy, *n.s.* not significant, *n.c.* not calculable

increases with age.[3,7,12,21–26] However, little data exist concerning the complications of breast cancer surgery in this age group, although it is generally believed that breast cancer surgery is associated with a low perioperative morbidity and mortality.[16,17] This analysis focuses on the assessment of operative risk in very elderly breast cancer patients.

Our data demonstrate that even in very elderly women (≥80 years), the rate of early complications from breast cancer surgery is low. Although complications occurred in 37.1% of our cohort, most of these were minor, with serious complications occurring in only 5.7% of cases. Other authors also have found acceptable perioperative morbidity associated with breast cancer surgery in elderly patients.[11,14,27] In this analysis, only one major complication was seen after BCT, whereas the remaining seven were seen after MRM ($n = 5$) or ME ($n = 2$). El-Tamer et al. have shown that mastectomy has a higher rate of complications compared with BCT.[16] The majority of our patients (62.2%) underwent a mastectomy (37.9% MRM and 24.3% ME), whereas 32% underwent BCT. Although the incidence of BCT in younger patients is steadily rising, in elderly patients mastectomy is still the most frequent type of breast surgery.[28]

The perioperative mortality was zero in our series of 140 breast cancer surgeries in patients at least 80 years old. Mortality rates of 0% in breast cancer surgery in elderly patients also have been reported previously in the literature.[11,29,30] Other authors give a mortality rate of 1–2% for older patients, whereas Davis et al. found a slightly higher operative mortality (3%) in their study of 96 patients aged at least 80 years with breast cancer.[13,14,27,31–33]

Half of the patients in the present study experienced a complication associated with the wound region, and many studies have demonstrated that the most common complications after breast cancer surgery are wound-related.[11,14,16,32,34] Four cases of wound infections were identified: two during the postoperative period and two as late complications, all occurring after a MRM. This makes the incidence of wound infection in the MRM group 7.5 and 2.8% for the whole group. The reported incidence of wound infection after breast cancer surgery varies from <1% to nearly 20%.[17] This variation is in contrast with the fact that the breast is a "clean" organ, with no direct connection to any major body cavity or visceral structures. Factors that have been associated with increased incidence of infection after breast surgery are older age, mastectomy, obesity, and diabetes.[16,17,35] A higher incidence of wound infection after mastectomy (4.34%) compared with lumpectomy (1.97%) has been reported by El-Tamer et al.[16] The use of perioperative antimicrobial prophylaxis in breast surgery has been controversially discussed,[17] and although some authors believe that it is unnecessary,[36,37] a recent meta-analysis of the Cochrane Database has demonstrated that prophylactic antibiotics significantly reduce the incidence of wound infection after breast surgery.[38] In our study, although prophylactic antibiotics were administered to 90.6% of patients in the MRM group, compared with 73.5 and 53.3% of the ME and BCT group, respectively, all wound infections were documented in the MRM group.

Seroma formation, one of the most frequent complications of breast surgery, was documented in only 3.6% of cases in our study. This frequency is less than the incidence of seromas reported in the literature, which ranges from 5 to 60%.[11,13,31,32,34] Lack of documentation of the late formation of seromas could help to explain the low frequency of seromas detected in our analysis. The incidence of hematomas in our study was 9.3%, which is within the incidence range of 2–10% given in the literature.[17] In a study of breast cancer surgery by Friis et al., an 18.7% incidence of hematomas was reported when LMWH was administered compared with 6.8% when only compression stockings were used.[39] In 92.1% of cases, the patients in the present study received LMWH or heparin in combination with the use of compression stockings. Friis et al. found that the administration of LMWH in breast cancer surgery, compared with the use of compression stockings, increases the postoperative incidence of hematomas threefold, whereas there was no benefit related to the incidence of thromboembolic events.[39] In our study, we documented one deep vein thrombosis after BCT; therefore, the incidence of thrombosis for the entire group was 0.7%. It is notable that this patient had a past medical history of deep vein thrombosis, which is an important risk

factor for new thromboembolic events. Svastics et al. also reported a low incidence (0.4%) of thromboembolic events in breast cancer patients >70 years old,[31] whereas a higher incidence (2%) of pulmonary embolism was reported by Swanson et al. in their study of 103 mastectomies in women at least 80 years old.[14]

In our study, a second major systemic complication was documented in the form of a stroke after ME, meaning the incidence of postoperative stroke for the group was 0.7%. El-Tamer et al. also report a very low incidence (0.1%) of postoperative stroke after breast cancer surgery.[16] It is notable that this patient, an 83-year-old woman, was obese (BMI = 31), suffered from diabetes (noninsulin-dependent), and had a transient ischemic attack (TIA) in her previous medical history—three factors that all significantly increase the risk of stroke.[40]

Comorbid conditions are well known to be highly important risk factors for perioperative morbidity and mortality, and as major determinants in decision-making regarding the operability of older patients.[4,25,41–43] In the present study, although the majority of the patients (62.1%) had two or three serious comorbidities (most commonly cardiovascular diseases: 89.3%), the perioperative morbidity was low. Only obesity was found to be linked to a higher incidence of major complications (20 vs. 4%, $P = 0.041$). Obese patients also had a higher incidence of postoperative wound complications compared with nonobese patients (24.4 vs. 10.1%, $P = 0.036$). As mentioned earlier, obesity is linked to a higher incidence of wound complications, especially wound infection, after breast surgery.[16,35] The preoperative risk assessment using the ASA classification has been shown to be useful in predicting postoperative complications after surgery; however, studies of breast cancer surgery are sparse.[41,44,45] Additionally, these criteria are widely used to assess the general operability of patients, reflecting the general health status of each patient. In this analysis, the majority of the patients were classified as ASA group 3 (66.9%). However, we demonstrated a significant correlation between ASA group 4 and the occurrence of major complications (33.3 vs. 4.1%, $P = 0.011$).

The mean hospital stay in the present study was 9.41 days; the majority of patients (49.3%) had a postoperative stay of 5–9 days. In their study of 385 patients with breast cancer, Tejler and Aspergren recorded a mean hospital stay of 7.2 days (8.3 days for MRM and 4.3 days for BCT).[46] We also demonstrated a significantly shorter postoperative stay for BCT patients. It is known that perioperative complications have an adverse effect on the postoperative stay of patients who undergo surgery; however, studies addressing this correlation for breast cancer surgery are sparse.[43,46] As suspected, we showed that the more complications, the longer the postoperative stay. All women staying more than 14 days postoperatively in the hospital experienced serious complications compared with 32.3% of those staying less than 14 days.

In conclusion, we demonstrated in this analysis that breast cancer surgery in women aged ≥80 years is associated with low perioperative morbidity and zero mortality. Therefore, age alone does not constitute a contraindication for adequate surgical treatment of breast cancer. Although this is one of the largest studies undertaken that has investigated the perioperative morbidity and mortality of breast cancer surgery in women at least 80 years of age, it is limited by its retrospective design, the relatively small number of patients in the various subsets, and the lack of an adequate control group of younger patients with which to compare surgical outcomes.

As life expectancy in western populations steadily increases, during the coming years more women older than aged 80 years will be diagnosed with breast cancer.[12] Therefore, in the near future, further studies (especially prospective ones) and clinical trials that include women older than aged 80 years should be conducted to provide accurate guidelines for the risks and benefits associated with breast cancer surgery in this specific age group.

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