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Mastectomy and immediate breast reconstruction in the elderly: Trends and outcomes

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ABSTRACT

Background: Immediate breast reconstruction after mastectomy may confer more complication rates in the elderly. Therefore, granular analysis of postmastectomy complications in women aged ≥65 years may help formulate clinical guidelines to improve patient selection and outcomes.
Methods: We identified patients undergoing mastectomy with or without immediate reconstruction from our breast surgery database (2014–2018). Complications requiring treatment were compared between patients aged ≥65 and <65 years.
Results: A total of 1,721 mastectomies were performed in 1,698 patients; 85.8% had a 30-day follow-up. Of these patients, 968 (65.6%) had immediate breast reconstruction, of whom 95 (9.8%) were aged ≥65 years. Among patients aged ≥65 years, 27.6% underwent mastectomy with immediate breast reconstruction compared with 77.1% of women aged <65 years ($P < .001$). Overall complication rates were not greater for older compared with younger mastectomy patients but were for older versus younger patients who had mastectomy with immediate breast reconstruction (12.6% vs 6.8%; $P = .04$). Hematoma requiring reoperation was more frequent in patients aged ≥65 years (5.3% vs 0.9%; $P = .006$). Necrosis (5.3% vs 2.6%; $P = .18$) and 30-day unplanned readmissions (7.4% vs 4.0%; $P = .18$) were not greater.
Conclusion: Despite low overall postoperative complication rates, we found some clinically relevant differences between older and younger patients after mastectomy with immediate breast reconstruction. Additional investigation of contributing factors may help further refine patient selection. In the interim, elderly patients should be counseled on their somewhat greater risk of postoperative complications to facilitate shared decision making.

Introduction

Breast cancer is one of the 3 most common cancers in women. In 2018, an estimated 266,120 women in the United States were diagnosed with breast cancer.[1] In the United States, the median age of breast cancer diagnosis is 62 years, and 31% of women with newly diagnosed, invasive breast cancer are aged ≥70 years.[2] As the population ages, the proportion of elderly women diagnosed with breast cancer will increase in parallel.[3] It is estimated that the proportion of women aged 70–84 years diagnosed with breast cancer will increase to 35% by 2030.[4]

Despite the benefits of immediate breast reconstruction (IBR) on improving quality of life and body image perception after mastectomy, IBR is still performed less frequently in elderly female patients for many reasons.[4,5] A recent study showed that the rate of mastectomy with IBR among all women aged ≥65 years diagnosed with breast cancer increased from 6.7% in 2004 to 18.1% in 2012, and it is expected that this rate will continue to increase in the elderly as the life expectancy of women continues to increase.[5] Yet, the complication and 30-day unplanned readmission rates have been reported to be greater in the elderly, even in the absence of substantial comorbid diseases.

There remains a paucity of empiric literature describing how to improve selection criteria for and outcomes of mastectomy with IBR in older patients. Therefore, we sought to conduct a granular

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analysis of postmastectomy short-term complications in women aged ≥65 years using our prospective institutional database as a step toward formulation of clinical guidelines that may help to further refine patient selection and outcomes.

Methods

Participants

We identified all patients undergoing mastectomy with and without IBR between 2014 and 2018 from the Mayo Clinic Breast Continuous Quality Assessment Tool. The Breast Continuous Quality Assessment Tool is a prospective, institutional breast surgery database that includes 30-day postoperative patient outcomes. Mastectomy patients with documented 30-day follow-up information available were included. Patients denying research authorization, male patients, and those aged <18 years were excluded. Rates of mastectomy with and without IBR, complications, and readmission rates were compared between patients aged ≥65 years (elderly patients) and patients aged <65 years (younger patients). Factors evaluated included indication for mastectomy, extent of breast and axillary operation, stage of breast cancer, and history of prior radiation and neoadjuvant chemotherapy. This study was approved by our Institutional Review Board.

Short-term complications studied

Complications assessed included postoperative bleeding or hematoma requiring reoperation, skin-flap necrosis requiring hyperbaric oxygen treatment (HBOT) or reoperation, cellulitis requiring intravenous antibiotics, abscess (any wound drained due to concern for infection), deep-vein thrombosis or pulmonary embolism requiring anticoagulation, and unplanned readmissions. We evaluated complications and unplanned readmissions within 30 days of the operation.

Statistical analysis

Categorical variables were reported as numbers and percentages and compared using χ^2 or Fisher exact tests and relative risks with 95% confidence intervals. Continuous variables were compared using Wilcoxon rank sum tests. All analyses were performed using SAS, version 9.4 statistical software (SAS Institute, Inc, Cary, NC). Hypothesis tests were 2 sided, and P values <0.05 were considered statistically significant.

Results

Patient characteristics

A total of 1,721 mastectomies were performed in 1,698 patients with a median age of 54 (range 18–95) years, including 408 mastectomies in patients aged ≥65 years and 1,313 in patients aged <65 years. The 30-day follow up was documented for 1,476 of 1,721 patients (85.8%) overall who form the basis of this report. Follow-up rates were similar for patients aged ≥65 and <65 years (84.3% vs 86.2%; $P = .34$) and for patients with and without IBR (86.9% vs 83.7%; $P = .07$). Mastectomy with IBR was performed in 968 of 1,476 patients, representing 65.6% of the entire study group (Fig 1). Elderly patients (aged ≥65 years) were less likely to undergo IBR compared with younger patients (aged <65 years) (27.6% vs 77.1%; $P < .001$); 95 of 968 (9.8%) of all patients aged ≥65 years had a mastectomy with IBR. Patient, tumor, and treatment variables are summarized in Table I.

Elderly patients undergoing IBR were more likely to undergo skin-sparing mastectomy (64.2%) than nipple-sparing mastectomy (27.4%) and less likely to undergo bilateral mastectomy (46.3%) compared with younger women, of whom 50.5% underwent skin-sparing mastectomy, 48.3% nipple-sparing mastectomy, and 75.1% had bilateral mastectomies (each comparison $P < .001$). Interestingly, elderly patients had a prior history of breast cancer almost

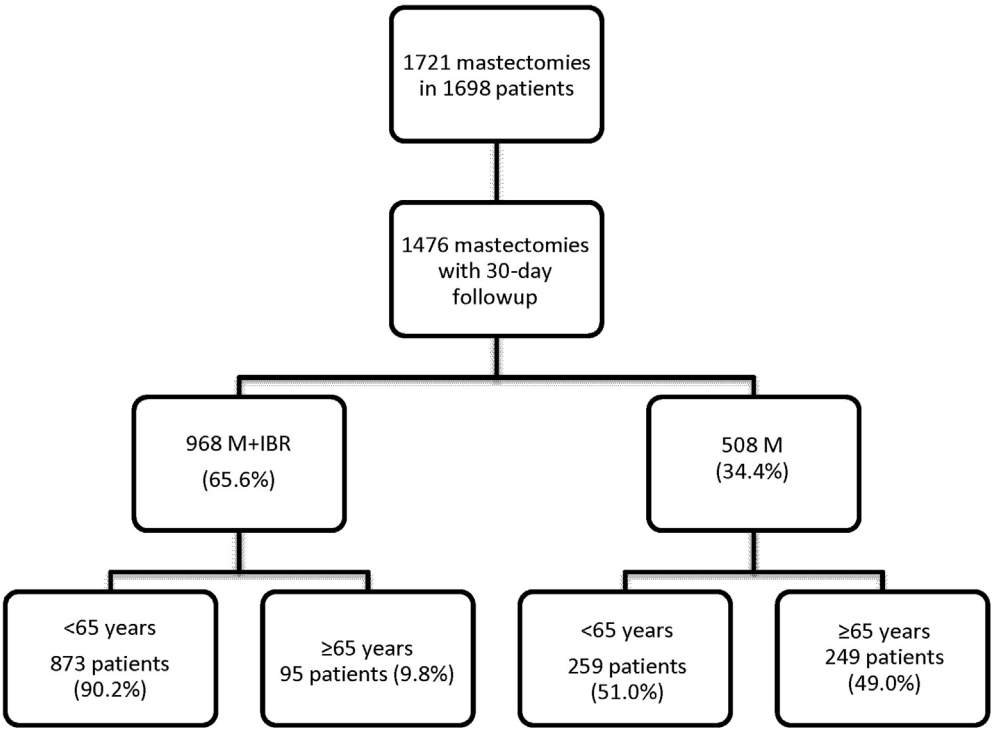

Fig 1. Patient cohort flow diagram.

Table I
Clinical and pathologic characteristics of 1,476 mastectomy patients

	Total (N = 1,476)	No Reconstruction		Reconstruction	
		Aged <65 years (N = 259)	Aged ≥65 years (N = 249)	Aged <65 years (N = 873)	Aged ≥65 years (N = 95)
Age at mastectomy (y)					
Means (±SD)	54.4 (13.0)	52.9 (8.6)	73.0 (5.9)	48.0 (9.3)	69.1 (3.8)
Median	54.0	54.0	72.0	49.0	68.0
Interquartile range (Q1–Q3)	45.0–64.0	47.0–60.0	68.0–7.0	41.0–55.0	66.0–72.0
Range	(18.0–95.0)	(24.0–64.0)	(65.0–95.0)	(18.0–64.0)	(65.0–83.0)
Prior history of breast cancer*					
No	1,208 (81.8%)	209 (80.7%)	160 (64.3%)	766 (87.7%)	73 (76.8%)
Yes	268 (18.2%)	50 (19.3%)	89 (35.7%)	107 (12.3%)	22 (23.2%)
Prior ipsilateral breast surgery*					
No	1,075 (72.8%)	198 (76.4%)	169 (67.9%)	652 (74.7%)	56 (58.9%)
Yes	401 (27.2%)	61 (23.6%)	80 (32.1%)	221 (25.3%)	39 (41.1%)
Prior ipsilateral axillary surgery*					
No	1,301 (88.1%)	223 (86.1%)	202 (81.1%)	797 (91.3%)	79 (83.2%)
Yes	175 (11.9%)	36 (13.9%)	47 (18.9%)	76 (8.7%)	16 (16.8%)
Indication*					
Risk reduction	198 (13.4%)	18 (6.9%)	5 (2.0%)	168 (19.2%)	7 (7.4%)
Cancer	1,278 (86.6%)	241 (93.1%)	244 (98.0%)	705 (80.8%)	88 (92.6%)
Neoadjuvant chemotherapy					
No	1,089 (73.8%)	153 (59.1%)	208 (83.5%)	643 (73.7%)	85 (89.5%)
Yes	387 (26.2%)	106 (40.9%)	41 (16.5%)	230 (26.3%)	10 (10.5%)
Prior radiation*					
No	1,319 (89.4%)	226 (87.3%)	204 (81.9%)	810 (92.8%)	79 (83.2%)
Yes	157 (10.6%)	33 (12.7%)	45 (18.1%)	63 (7.2%)	16 (16.8%)
Laterality					
Unilateral mastectomy	585 (39.6%)	134 (51.7%)	183 (73.5%)	217 (24.9%)	51 (53.7%)
Bilateral mastectomy	891 (60.4%)	125 (48.3%)	66 (26.5%)	656 (75.1%)	44 (46.3%)
Type of mastectomy*					
Simple	475 (32.2%)	221 (85.3%)	236 (94.8%)	10 (1.1%)	8 (8.4%)
Skin-sparing mastectomy/areolar-sparing mastectomy	542 (36.7%)	28 (10.8%)	12 (4.8%)	441 (50.5%)	61 (64.2%)
NSM	459 (31.1%)	10 (3.9%)	1 (0.4%)	422 (48.3%)	26 (27.4%)
Axillary surgery*					
No axillary surgery	270 (18.3%)	39 (15.1%)	20 (8.0%)	196 (22.5%)	15 (15.8%)
Sentinel lymph node surgery only	877 (59.4%)	133 (51.4%)	164 (65.9%)	515 (59.0%)	65 (68.4%)
Axillary lymph node dissection surgery only	166 (11.2%)	54 (20.8%)	40 (16.1%)	69 (7.9%)	3 (3.2%)
Sentinel lymph node and axillary lymph node dissection surgery	163 (11.0%)	33 (12.7%)	25 (10.0%)	93 (10.7%)	12 (12.6%)
Clinical stage* (among cancer patients)					
Missing	41	8	10	18	5
Stage 0	232 (18.8%)	32 (13.7%)	34 (14.5%)	148 (21.5%)	18 (21.7%)
Stage I	406 (32.8%)	52 (22.3%)	92 (39.3%)	230 (33.5%)	32 (38.6%)
Stage II	439 (35.5%)	89 (38.2%)	76 (32.5%)	246 (35.8%)	28 (33.7%)
Stage III	145 (11.7%)	51 (21.9%)	31 (13.2%)	58 (8.4%)	5 (6.0%)
Stage IV	15 (1.2%)	9 (3.9%)	1 (0.4%)	5 (0.7%)	0 (0.0%)
Positive nodes* (among cancer patients)					
Missing	12	4	2	3	3
No	826 (65.2%)	128 (54.0%)	160 (66.1%)	473 (67.4%)	65 (76.5%)
Yes	440 (34.8%)	109 (46.0%)	82 (33.9%)	229 (32.6%)	20 (23.5%)
Type of reconstruction* (among reconstruction patients)					
Immediate implant or tissue expander	–	–	–	828 (94.8%)	81 (85.3%)
Flap reconstruction	–	–	–	45 (5.2%)	14 (14.7%)
Type of flap reconstruction* (among flap reconstruction patients)					
Deep inferior epigastric perforator	–	–	–	25 (55.6%)	3 (21.4%)
Latissimus dorsi	–	–	–	6 (13.3%)	3 (21.4%)
Goldilocks	–	–	–	10 (22.2%)	6 (42.9%)
Transverse rectus abdominis myocutaneous	–	–	–	4 (8.9%)	2 (14.3%)

Data are *n* (%), unless otherwise indicated.
* Patients who underwent synchronous bilateral mastectomy were classified according to the most severe clinical or extensive surgical features of the 2 sides.

twice as often as younger patients (23.2% vs 12.3%; $P = .003$) and, thus, also were more likely to have prior ipsilateral breast surgery, prior axillary surgery, and prior radiation. The indication for mastectomy was cancer in 92.6% of elderly IBR patients compared with 80.8% of younger IBR patients ($P = .004$).

While implant-based reconstruction with tissue expanders or immediate implant was the most common type of reconstruction in both age groups, flap reconstruction was performed more commonly in older than younger patients (14.7% vs 5.2%; $P < .001$); this was commonly a Goldilocks inferior pedicle dermal flap in older patients (6 of 14 [42.9%]) and the deep inferior epigastric perforator flap in younger patients (25 of 45 [55.6%]). There was no difference in complication rates for patients who underwent flap reconstruction between elderly (1 of 14 [7.1%]) and younger (4 of 45 [8.9%]; $P > .99$) patients. Among patients who underwent a Goldilocks flap reconstruction, complications occurred in 1 of 6 elderly patients versus 0 of 10 younger patients ($P = .38$).

When comparing elderly patients selected for IBR with elderly patients undergoing mastectomy without IBR, the patients who underwent mastectomy with IBR were somewhat younger (median age 68 vs 72 years; $P < .001$) and more frequently underwent mastectomy for risk reduction as the indication for operation (7.4%

vs 2.0%; $P = .02$). In the elderly cohort, those opting for IBR were more likely to undergo bilateral mastectomy (46.3%) than those treated with mastectomy alone (26.5%; $P < .001$).

Complications within 30 days

In the cohort that underwent mastectomy alone, the percentage of patients with any complication was 6.4% for elderly and 3.9% for younger patients (relative risk 1.7 [95% confidence interval 0.8–3.6]; $P = .18$). The overall complication rate for patients aged ≥65 years undergoing IBR was 12 of 95 (12.6%) versus 59 of 873 (6.8%) for younger patients (relative risk 1.9 [95% confidence interval 1.04–3.4]; $P = .04$) (Fig 2). The relative risk for elderly versus younger age did not differ between mastectomy alone and mastectomy with IBR ($P = .77$). Within the cohort that underwent mastectomy with IBR, hematoma requiring reoperation was more frequent in patients aged ≥65 years (5 of 95 [5.3%] vs 8 of 873 [0.9%]; $P = .006$). Two of 5 patients aged ≥65 years with a postoperative hematoma were taking low-dose aspirin daily and 1 omega 3 fish oil pill, while none of the younger patients with a postoperative hematoma were on medications known to affect coagulation.

Among patients who underwent mastectomy with IBR, skin-flap necrosis requiring HBOT or reoperation tended ($P = .18$) to occur more frequently in elderly compared with younger patients (5 of 95 [5.3%] patients: 1 required HBOT, 4 required reoperation, versus 23 of 873 [2.6%] patients: 6 required HBOT, 17 required reoperation). HBOT regimens utilized 2–2.4 atmospheres absolute for approximately 90-minute sessions, with a range of 5–20 treatment sessions per patient. Women who received HBOT all experienced some degree of tissue rescue, which was judged to decrease or eliminate the amount of ischemic and/or necrotic tissue.

Skin necrosis in the elderly patients followed skin-sparing mastectomy in all cases. In patients aged <65 years with skin necrosis, 11 of 23 followed skin-sparing mastectomy and 12 of 23 nipple-sparing mastectomy. Skin-flap necrosis resulting in loss of reconstruction occurred in 1 elderly patient (1.1%) and 4 younger patients (0.5%).

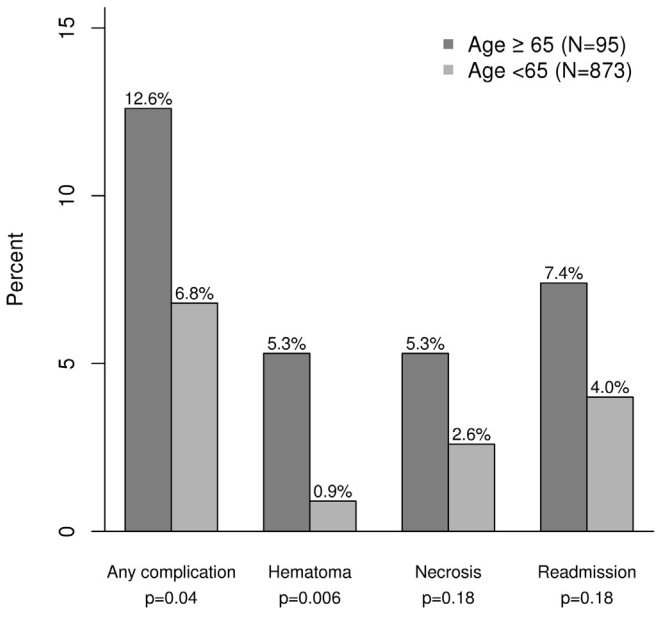

Fig 2. Complications requiring treatment among 968 patients undergoing mastectomy with immediate breast reconstruction.

Surgical-site infection, defined as cellulitis requiring intravenous antibiotics or abscess, occurred in 0 of 95 elderly patients who underwent mastectomy with IBR and in 16 of 573 (1.8%) (8 patients had cellulitis treated with intravenous antibiotics and 8 patients developed an abscess) younger patients who underwent mastectomy with IBR ($P = .39$). The number of patients with deep vein thrombosis or pulmonary embolism was also very low, with 0 of 95 among the elderly patients and 3 of 873 (0.3%) among younger patients (>.99).

30-Day unplanned readmission

The 30-day unplanned readmission rate was 3.6% overall: 4.3% for mastectomy with IBR and 2.2% for patients who underwent mastectomy alone. In the cohort who underwent mastectomy alone, 6 of 249 (2.4%) of elderly and 5 of 259 (1.9%) of younger patients had an unplanned readmission ($P = .71$). For patients who underwent mastectomy with IBR, 7 of 95 (7.4%) of elderly and 35 of 873 (4.0%) of younger patients had an unplanned readmission ($P = .18$). Skin-flap necrosis was the most common indication for readmission after mastectomy with IBR in both age groups (5 patients in the elderly group and 14 in the younger group). Hematoma was the reason for readmission in 2 elderly patients and 4 patients aged <65 years. Other reasons for readmission in the group aged <65 years were cellulitis requiring intravenous antibiotic treatment ($n = 8$), sterile seroma ($n = 3$), and abscess ($n = 3$).

Discussion

While mastectomy with IBR has a low complication rate, our study shows that elderly patients do have more overall complications compared with younger patients. This difference was driven mainly by an increased rate of postoperative bleeding requiring reoperation that was statistically greater in patients aged ≥65 years. To a lesser extent, this difference was driven by skin-flap necrosis and 30-day unplanned readmission rates that tended to be greater when assessed individually. These data highlight the need for better understanding of the factors contributing to postoperative complications in older women treated with mastectomy with IBR; this need is despite data suggesting selection criteria are already applied to these older women, because we found they were significantly younger and less frequently underwent axillary dissection than their counterparts treated without IBR.

Not surprisingly, we observed that mastectomy with IBR was performed more frequently in younger patients. While the proportion of elderly patients who underwent IBR is low in our study, it is within the range reported in prior investigations. One recent study of National Cancer Database data showed that 10.3% of patients who underwent mastectomy with IBR were elderly; it also showed a trend over time for increasing rates of IBR in this age cohort.[5] Potential explanations for the relatively low rate of IBR among elderly mastectomy patients include selection bias based on age, access to reconstructive surgeons, and type of facility.[6] Across different studies, chronological age alone has been identified as one of the most common reasons to either not offer or not perform IBR.[7,8] Access to reconstructive surgeons or centers where reconstruction is performed along with other institutional factors have been reported as contributing factors to an unequal access to IBR in the elderly.[9] Presence of comorbid diseases and other risk factors may also preclude offering IBR to older patients.[10] A change in perception of body image with aging might explain why some elderly women are less likely to undergo reconstruction compared with younger women.[6] Interestingly, while some studies suggest that a role for bias in surgeon perception that older women do not want reconstruction influences the choice for IBR, other studies

show that it is the patients' perception of the surgeon's preference or fear of complications that impacts this decision.[11,12] While it is clear that elderly patients are less likely than younger patients to undergo IBR, it is not clear how much of this phenomenon is driven by patients and how much is driven by providers. Nevertheless, chronological age alone should not be a contraindication to IBR because outcomes are remarkably comparable between older and younger patients.

Our data show overall low and acceptable short-term complication rates after mastectomy with or without IBR. That we found no difference between older and younger women in overall complication rates with mastectomy alone but only with mastectomy with IBR illustrates the potential influence of factors other than chronological age. In contrast, we found no difference in the magnitude of relative risk associated with elderly versus younger age between patients who underwent mastectomy alone and those who underwent mastectomy with IBR. This observation suggests that age seems to increase risk (regardless of IBR), and IBR increases risk (regardless of age), which confer an additive effect leading to the greatest event rate (12.6%) in elderly patients undergoing mastectomy with IBR. Awareness of these observations is important for both patients and providers.

The greater rate of comorbid diseases in the elderly can contribute to increased complication rates, but a study of National Cancer Database data showed that IBR complications remain greater in elderly women even in the absence of substantial comorbid diseases.[5] Obesity and active smoking are known to increase IBR complications across different studies; a study using the American College of Surgeons National Surgical Quality Improvement Program database showed that obesity, active smoking, and presence of comorbid diseases, regardless of chronologic age were associated with an increased risk of complications.[13] In our patient sample, the proportion with prior radiation therapy was greater among older compared with younger patients, which may explain the increased risk of wound complications in older women. Several studies have shown that prior radiation therapy increases the risk of complications with mastectomy with IBR, specifically infection risk and flap necrosis.[14–16] But radiation therapy does not explain the increased rate of hematoma in the elderly, which was the main contributing factor for the greater number of complications that we observed. In contrast, and supporting our findings, a separate study suggested that age is an independent risk factor for IBR complications.[5]

We found that postoperative bleeding requiring reoperation occurred more frequently in elderly compared with younger patients. In a study of 3,474 patients, the incidence of hematoma after a prosthesis-based breast augmentation or IBR was 1.65% and did not correlate with patient age.[17] To our knowledge, there are no other studies comparing differences in hematoma rates after IBR between elderly and younger patients. Potential explanations for our observation include decreased overall physiologic reserve in the elderly.[18] Anticoagulant and antiplatelet medications taken more frequently by elderly patients may increase the risk of bleeding, although we did not find any comorbid diseases, risk factors, or medications to explain their greater risk of hematoma.[19] Review of the operative reports indicated that 1 elderly patient had bleeding from a medial perforator, whereas no discrete site was identified among the other patients. Further studies may identify risk factors for hematoma formation and guide appropriate preventative strategies to decrease this risk.

The unplanned readmission rate seemed to be somewhat greater in elderly compared with younger patients undergoing mastectomy with IBR in our study but did not achieve statistical significance. Both higher readmission and reoperation rates in the elderly have been reported previously.[20] An analysis of American College of Surgeons National Surgical Quality Improvement Program data showed that unplanned readmission rates were greater in elderly patients undergoing mastectomy with or without IBR, and the risk remained high even in the absence of comorbid diseases.[5] Another study showed that the risk of unplanned reoperation and rehospitalization after mastectomy with IBR increases with age.[21] Whether discernible risk factors other than age might be identified to better stratify risk for older patients and to develop strategies to mitigate risk remains unexplored.

Limitations of our study include those inherent to a retrospective review of a prospectively maintained database, selection bias for IBR (although without this bias the differences in complication rates by age might be even greater), and the low overall complication rate limiting the statistical power to detect differences in individual complications. The low event rate also precluded us from performing multivariable analysis to adjust for confounding factors or identifying specific risk factors among elderly patients. Additionally, data on some known risk factors for complications, such as smoking, were not available. As a tertiary referral center, there is also a potential referral bias in our patient population. Another limitation of our work is the 30-day time point for assessing complications. Despite these imitations, the strengths of our study include granular data on specific complications requiring treatment verified by individual case review and the high capture rate of 30-day outcomes.

In conclusion, despite the low overall 30-day complication rates we observed, we did find differences in postoperative complication rates after mastectomy with IBR for older versus younger patients. Further investigation of other contributing factors may help further refine patient selection for IBR and help design strategies to further lower risk. In the interim, elderly patients should be counseled on their somewhat greater risk of postoperative complications to facilitate informed shared decision making.

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Conflict of interest/Disclosure

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