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The safety of same-day breast reconstructive surgery: An analysis of short-term outcomes

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ABSTRACT

Background: We sought to examine the safety of same-day breast reconstructive (BR) surgery.
Methods: An analysis of the American College of Surgeons, National Surgical Quality Improvement Program (ACS-NSQIP) files was performed. Patients undergoing BR for breast cancer were examined, excluding those with high-risk co-morbidities or concurrent surgery. A propensity score was calculated and a multivariable logistic regression analysis was used to calculate the difference in 30-day complications between those undergoing SDS versus longer hospital stay.
Results: The study consisted of 21,539 patients; 17,449 had implant and 4090 had autologous breast reconstruction. 1195 (5.5%) underwent SDS, whereas 20,344 (94.5%) were admitted at least overnight. On unadjusted analysis, the rate of post-operative complications was nearly three times higher in those admitted compared to those undergoing SDS (6.7% vs. 2.5%; $p < 0.001$). On propensity score adjusted multivariable regression there was no significant difference in complications amongst those undergoing SDS versus staying in hospital (OR 1.4 (95%CI: 0.9, 2.2)).
Conclusions: These results suggest that admitting BR patients does not prevent short-term complications and same day BR surgery is safe when co-morbidities are accounted for.

1. Introduction

Breast cancer is the most common cancer diagnosed in women today, with an estimated 250,000 women diagnosed each year in North America.[1] Of women undergoing breast cancer surgery, 25–30% will undergo a mastectomy and of those, approximately 50% will undergo a breast reconstructive (BR) procedure within 24 months of their cancer surgery.[2] BR is an important component of breast cancer management and has been shown to significantly improve women's psychosocial and body image perceptions following cancer treatment.[3–6] Recently, there has been a trend towards more frequent performance of implant-based reconstruction, with rates of autologous reconstruction slightly decreasing both in the United States and Canada.[2,7]

Currently, the majority of women undergoing a BR procedure (either immediate or delayed) are admitted to hospital post-operatively for at least one night.[8,9] The reasons for this include: monitoring for post-operative complications, pain control and psychosocial reasons (no strong social supports at home, desire to stay in hospital, etc.).[10,11] Women who are felt to be at higher risk for post-operative complications may be preferentially admitted to hospital for monitoring as well. However, there has been a push from both governmental agencies as well as patients to perform more surgeries on a same-day surgery (SDS) basis.[12] Women undergoing lumpectomies and sentinel lymph node biopsies are routinely discharged home on the same day; however, the vast majority of women undergoing a BR procedure are still being kept in hospital at least overnight.[8,9] Our group recently demonstrated that SDS is safe for selected patients undergoing major breast cancer surgery;[13] however, this study did not examine women undergoing BR, which could significantly increase the rate of post-operative complications.

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The objective of this study was to examine the safety of same-day BR surgery in patients with breast cancer. Women undergoing either immediate or delayed, implant or autologous, BR following a diagnosis of breast cancer were included. The primary outcome of interest was overall 30-day postoperative complications. Secondary outcomes included system specific complications such as wound, graft/prosthesis/flap, infectious and thromboembolic complications.

2. Methods

2.1. Patients

An analysis of the American College of Surgeons National Surgical Quality Improvement Program (ACS NSQIP) participant user files from 2005 to 2012 was performed. ACS NSQIP is a validated, outcome based database incorporating all 30-day post-operative complications occurring both in and out of hospital.[14–17] Records were searched for patients with an ICD-9 code of invasive breast cancer (174.0–9), ductal carcinoma in situ (233) or a 'personal history of breast cancer' (V10.3). Patients undergoing a BR procedure were then selected based on the current procedural terminology (CPT) codes; implant-based BR (19340, 19342, 19357), non-free flap autologous BR (19361, 19367, 19368, 19369) and free flap autologous BR (19364). Patients with the following severe comorbidities were excluded: dialysis, esophageal varices, hemi/para/quadriplegic, ascites, pre-operative pneumonia, undergoing emergency surgery, ventilator dependent pre-operatively and American Society of Anaesthesiology (ASA) class 5 patients. Male patients were excluded as well. All surgical procedure codes were then reviewed and patients undergoing any non-breast, morbid concurrent surgery were excluded.

2.2. Outcomes

The final cohort consisted of 21,539 women undergoing BR following a breast cancer diagnosis. The primary study outcome was 30-day overall complications; this is a composite outcome incorporating all of the NSQIP defined post-operative complications. Secondary outcomes included wound, graft/prosthesis/flap, respiratory, thromboembolic, infectious, bleeding, renal and cardiac complications. Wound complications were defined as either a superficial incisional surgical site infection (SSI) and/or a deep incisional SSI. Graft/prosthesis/flap failure is defined as a failure of a graft or prosthesis including myocutaneous flaps and skin grafts requiring return to the operating room or interventional radiology within 30-days of an operation. Respiratory complications included either a diagnosis of pneumonia and/or unplanned re-intubation. Thromboembolic complications included either a pulmonary embolism and/or a deep venous thrombosis requiring therapy. Infectious complications included an organ/space SSI, urinary tract infection and/or sepsis and septic shock. Bleeding complication was defined using the standard ACS NSQIP definition of the requirement of an intraoperative or postoperative blood transfusion. Renal complications were defined using the standard ACS NSQIP definition of the development of post-operative renal failure. Cardiac complications were defined as the occurrence of either a cardiac arrest requiring cardiopulmonary resuscitation and/or a myocardial infarction in the post-operative period.

Patients were dichotomized based on their post-operative hospital length of stay into two categories: those discharged home the same day (same-day surgery group) and those staying in hospital overnight or longer (based on the days from operation to discharge variable). Patients were categorized as undergoing an immediate reconstruction if they underwent a concurrent mastectomy during the same operative procedure as their reconstruction. Bilateral surgery was defined as a patient undergoing either two concurrent mastectomies or a mastectomy and a lumpectomy at the same operative procedure (this variable could only be defined for immediate reconstruction patients).

2.3. Statistical analysis

Univariable analysis was performed to compare patient characteristics in both groups and bivariate analysis was performed to identify predictors of post-operative complications. Chi-square test or Fisher's exact test was used to compare categorical variables. A two sample *t*-test or Wilcoxon rank sum test were used to examine continuous variables (normally and non-normally distributed, respectively). An *a priori* defined subgroup analysis was performed comparing complications between the SDS versus in-hospital patients among those undergoing implant reconstruction as well as the subgroup of autologous and combination type reconstruction. Multivariable logistic regression, utilizing a propensity score adjustment was used to determine the independent effect of same-day surgery on overall complications. Propensity score was calculated based on the probability of SDS versus stay $\geq$ overnight. Variables were included based in the propensity score based on a p-value of $\geq$0.1 in the univariate and bivariate analysis. The final variables included in the propensity score were: age, body mass index (BMI), pre-operative chemotherapy, immediate (versus delayed) reconstruction, bilateral surgery, smoking status, operative year, receipt of an axillary lymph node dissection and hypertension. The area under the receiver operator curve (c-statistic) was 0.87, indicating good discrimination between patients who underwent SDS versus staying in hospital. The predictors in our final multivariable model included both the propensity score as well as those variables determined by clinical significance *a priori* to be potential predictors of post-operative complications (diabetes, ASA class 3 or 4, receiving neoadjuvant radiation, reconstruction type and presence of a bleeding disorder). Hosmer-Lemenshow and c-statistics were used to assess model calibration and discrimination. Results were considered significant at the $p \leq 0.05$ level. All statistical analyses were performed using SAS 9.3 (SAS Institute Inc., Cary, NC, USA).

3. Results

Our final study cohort consisted of 21,539 women undergoing a BR procedure. Of those, 1195 (5.5%) underwent same-day surgery (SDS) while 20,344 (94.5%) stayed in hospital at least overnight. The mean length of stay for the latter group was 2.13 days with a range of 1–77 days. The baseline characteristics of the patients are shown in Table 1. Those undergoing SDS were more likely to be older, smokers, undergoing implant-based reconstruction, undergoing a delayed reconstruction, having unilateral breast surgery and having a shorter operative time.

The overall 30-day complication rate for the entire cohort was 6.5%. On unadjusted analysis the overall 30-day complication rate was significantly lower in the SDS group (2.5% vs. 6.7%, $p < 0.001$). Overall all-cause 30-day mortality was 0.01% (2 patients), both of which occurred in autologous reconstruction patients. When examining system specific complications, there were significantly fewer complications in the SDS group with respect to wound complications ($p = 0.002$), graft/prosthesis/flap failure ($p = 0.039$) bleeding complications ($p = 0.0002$) and thromboembolic complications ($p = 0.016$). There were no differences seen with respect to respiratory, infectious, renal or cardiac complications; although there were only a total of 4 renal and 5 cardiac complications (Table 2).