Original Article

# Safety of Simultaneous Contralateral Breast Symmetry Procedure in Unilateral Free Flap Breast Reconstruction

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## ABSTRACT

**Background:** Contralateral breast symmetry procedure is often required to achieve symmetry following unilateral breast reconstruction. No consensus exists regarding timing of contralateral symmetry procedure. We investigated frequency and safety of simultaneous contralateral breast symmetry procedure in unilateral free flap breast reconstruction using a large nationwide database.

**Methods:** Using the American College of Surgeons National Surgery Quality Improvement Project database, we examined clinical data of patients who underwent immediate or delayed unilateral free flap breast reconstruction from 2016 to 2020 in the United States. Patients were divided in two groups: with or without simultaneous contralateral reduction mammoplasty or mastopexy.

**Results:** Overall, 5.429 patients underwent unilateral free flap-based breast reconstruction. Simultaneous symmetrization was reported in only 8% of these patients. There was no significant difference in overall complication rate (without: 15.9% vs. with: 15.2%), unplanned return to the operating room rate (without: 10.9% vs. with: 8.3%), mean length of hospital stay (without: 3.8 vs. with: 3.5 day) and unplanned re-admission rate (without: 5.5% vs. with: 4.1%) between two groups. Additionally, multivariate regression analyses showed simultaneous symmetrization was not associated with higher complication rate, higher unplanned return to the operating room rate, higher readmission rate, nor longer length of hospital stay after adjusting for patient's characteristics, comorbidities and immediate versus delayed breast reconstruction.

**Conclusion:** Simultaneous symmetrization was performed infrequently with unilateral free flap breast reconstruction. Our study showed simultaneous symmetrization is safe and associated with a comparable perioperative outcome. Consideration in appropriate patients will likely reduce the number of revisions for those undergoing unilateral free flap breast reconstruction.

**KEYWORDS**
Symmetry procedure; Autologous breast Reconstruction; Outcomes

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## INTRODUCTION

Free flap breast reconstruction is becoming the gold standard in breast reconstruction for appropriate patients. Studies have shown advantages of free flap breast reconstruction over implant-based reconstruction. This includes a more natural and cosmetically appealing appearance contributing to higher patient satisfaction[1]. Another advantage is more durability requiring less revisions[2]. Furthermore, it not associated with complications related to implant-based breast reconstruction (e.g. capsular contractures).

After mastectomy, one of the concerns is lack of symmetry to breasts. Breast symmetry is important to patient satisfaction. It is also a valuable measure of breast reconstruction outcomes[3]. Contralateral symmetry procedure can address this and includes either augmentation, reduction mammoplasty, or mastopexy[4]. Symmetry can be done after free flap breast reconstruction; however, it can either be performed simultaneously or delayed[5]. Simultaneous contralateral symmetrization during unilateral breast reconstruction has been evaluated with the Modified Breast-Q, demonstrating patient-reported improvements in breast satisfaction, psychosocial function, and sexual well-being[6]. The rates of simultaneous contralateral symmetry procedure being performed with unilateral free flap breast reconstruction have been reported to range from 14% to 42%[7,8].

The common belief is that the contralateral breast should not be symmetrised at the time of reconstruction as the flap should be given time to "settle" before the surgeon attempts to match the native breast[9]. Reported advantages of immediate over delayed symmetry procedure include overall lower cost and lower rates of revision surgeries[9,10]. However, disadvantages can include potentially longer hospital stays, prolonged surgery times, or delayed cancer treatments due to need for more revisions[11].

Single institutional studies have evaluated the outcomes of simultaneous contralateral breast symmetry (SCBS) procedure. The purpose of this study was to investigate frequency and safety of simultaneous contralateral breast symmetry procedure in unilateral free flap breast reconstruction using a large nationwide database. The specific database we are using is the American College of Surgeons- National Surgical Quality Improvement Program (ACS-NSQIP). From this study, we aim to provide evidence to help guide physicians, in partnership with patients, in finding a more optimal timing of SCBS after unilateral free flap breast reconstruction.

## MATERIALS AND METHODS

**Database:** The American College of Surgeons-National Surgical Quality Improvement Program (ACS-NSQIP) database is a risk adjusted, surgical outcomes-based program designed to measure and improve the quality of surgical care. Trained clinical reviewers prospectively collect the ACS-NSQIP data and validated data from medical records on preoperative risk factors, preoperative laboratory values, intraoperative variables, 30-day postoperative mortality, and 30-day morbidity on all patients undergoing major surgeries at participant institutions. For example, in 2020, the ACS-NSQIP database contained 902,968 cases submitted from 706 NSQIP-participating sites. The ACS-NSQIP database provides prospective national data with a large sample size making it ideal for identifying important differences in patient risk.

Using the NSQIP database, we analyzed discharge data for female breast cancer patients with no age limitation who underwent free flap autologous breast reconstruction surgery from 2016 to 2020.

We included patients who underwent free flap breast reconstruction with immediate or delayed unilateral breast reconstruction with contralateral symmetry procedure (reduction mammoplasty or mastopexy). We used Current Procedural Terminology (CPT) codes of 19364 (Breast reconstruction with free flap) to identify our patient population. Then we divided these patients in two groups: 1) With contralateral symmetry procedure group which had either reduction mammoplasty (CPT code: 19318) or mastopexy: (CPT code: 19316) and 2) without contralateral symmetry procedure group. We excluded patients who had bilateral breast reconstruction or patient with other types of breast reconstruction (e.g., implant-based reconstruction or other types of autologous breast reconstruction).

The overall frequency of SCBS was evaluated. Then, perioperative outcomes were compared between these two groups. Perioperative factors that were analyzed included patient characteristics, patient

comorbidities, smoking status, steroid use, body mass index (BMI), immediate versus delayed reconstruction and length of hospital stay. Moreover, postoperative complications including urinary tract infection (UTI), wound complications, pneumonia, venous thromboembolism (VTE), blood transfusion, sepsis, *Clostridium difficile* infection, unplanned return to the operating room, unplanned re-admission within the 30-day after surgery were evaluated. We were unable to evaluate the effect of chemotherapy and radiation as the majority of data were missing.

### *Statistical Analysis*

Univariate and Multivariate regression analysis were performed to identify the effect of simultaneous symmetry procedure in perioperative outcomes in this patient population. All statistical analyses for the ACS-NSQIP were conducted using SPSS version 26 statistical software (IBM Corp., Armonk, NY, USA). Statistical significance was set at *P*-values <0.05 and odds ratio with the 95% confidence interval (CI) does not include the value of one. Adjusted odds ratio (AOR)> 1 was considered the risk factor for any evaluated factor (e.g., complication rate).

## RESULTS

Overall, 5.429 patients underwent unilateral free flap-based breast reconstruction in this database from 2016 to 2020. SCBS were reported only in 434 of these patients (8%). A majority of the free flap reconstruction was performed as delayed reconstruction (63.3%).

When examining patient characteristics (Table 1), the mean age was significantly higher in with symmetry group compared with no symmetry procedure (54.2 yr old vs 51.5 yr old, *P*<0.001). However, there was no significant difference in comorbidities between two groups.

Table 2 compares the postoperative outcomes in patients with and without SCBS. There was no significant difference in overall surgical site

**Table 1.** The Characteristics of Patients who Underwent Unilateral free flap breast reconstruction with or without simultaneous contralateral breast symmetry (SCBS) procedure

| *Characteristics* | Without SCBS | With SCBS | P-value |
|---|---|---|---|
| ***Frequency:*** | **4,994 (92%)** | **435 (8.0%)** | |
| **Age** | | | |
| Age older than 65 | 9.7% | 14.5% | 0.001 |
| Mean age | 51.5 +/- 9.7 (Median: 51) | 54.2 +/- 8.9 (Median: 54) | <0.001 |
| **Body mass index (BMI)** | | | |
| >35 | 15.4% | 16.6% | 0.525 |
| **Race** | | | <0.001 |
| White | 60.5% | 35.2% | |
| African-American | 16.2% | 10.1% | |
| Asian | 4.8% | 0.2% | |
| Not reported and low frequency race | 19.5% | 56.7% | |
| **ASA* Classification** | | | 0.037 |
| I- No disturb | 2.4% | 4.1% | |
| II-Mild disturb | 61.7% | 61.4% | |
| III-Sever disturb | 35.5% | 33.3% | |
| IV- Life threat | 0.4% | 0.9% | |
| ***Comorbidity*** | | | |
| Hypertension | 24.9% | 26.4% | 0.489 |
| Diabetes Mellitus | 7.3% | 7.8% | 0.674 |
| Smoker | 5.8% | 4.4% | 0.226 |
| Sever COPD** | 0.4% | 0.0% | 0.175 |
| Sever Liver Disease | 0.0% | 0.0% | 0.000 |
| Congestive heart failure | 0.1% | 0.0% | 0.609 |
| Chronic kidney disease on Dialysis | 0.0% | 0.02% | 0.106 |
| Chronic Steroid use | 1.3% | 1.6% | 0.538 |

*American Society of Anesthesiologists Physical Status Classification System

** Chronic obstructive pulmonary disease

**Table 2.** Outcomes in Patients who Underwent Unilateral free flap breast reconstruction with or without simultaneous contralateral breast symmetry (SCBS) procedure

| | Without SCBS | With SCBS | P-value |
|---|---|---|---|
| ***Postop complications*** | | | |
| **Wound complications** | | | |
| I-Superficial surgical site infection | 4.1% | 7.8% | <0.001 |
| II-Deep surgical site infection | 1.2% | 0.7% | 0.339 |
| III-Organ space surgical site infection | 1.0% | 0.7% | 0.526 |
| IV-Wound delicense | 2.1% | 1.1% | 0.000 |
| Overall Surgical site complication rate | 7.7% | 9.7% | 0.144 |
| Pneumonia | 0.5% | 0.5% | 0.865 |
| Venous thromboembolism (VTE) | 1.3% | 0.5% | 0.127 |
| -Deep vein thrombosis (DVT) | 0.8% | 0.0% | 0.055 |
| -Pulmonary embolism (PE | 0.6% | 0.5% | 0.713 |
| Urinary tract infection (UTI) | 0.4% | 0.7% | 0.462 |
| Blood transfusion | 7.4% | 4.4% | 0.018 |
| Sepsis | 0.6% | 1.1% | 0.130 |
| Renal Insufficiency | 0.1% | 0.0 | 0.509 |
| Clostridium diff colitis | 0.1% | 0.0 | 0.435 |
| **Total complication rate** | 15.9% | 15.2% | 0.683 |
| **Unplanned return to operating room** | 10.9% | 8.3% | 0.090 |
| **Unplanned readmission within 30 days** | 5.5% | 4.1% | 0.232 |
| **Mean Length of Hospital Stay (Days)** | 3.76 +/- 3.31 (Median: 4) | 3.51 +/- 1.73 (Median: 3.0) | 0.064 |
| **Length of hospital; stay >4 days** | 21.4% | 22.3% | 0.673 |

**Table 3.** Univariate regression analysis evaluating the effect of postoperative outcomes in simultaneous contralateral breast symmetry (SCBS) procedure versus no SCBS

| | Odds Ratio | 95% Confidence Interval | P-value |
|---|---|---|---|
| ***Postop complications*** | | | |
| **Wound complications** | | | |
| I-Superficial surgical site infection | 2.00 | 1.37 – 2.92 | <0.001 |
| II-Deep surgical site infection | 1.75 | 0.55 – 5.60 | 0.345 |
| III-Organ space surgical site infection | 0.69 | 0.21 – 2.21 | 0.529 |
| IV-Wound delicense | 0.53 | 0.21 – 1.31 | 0.17 |
| Overall Surgical site complication rate | 1.28 | 0.92 – 1.79 | 0.145 |
| Pneumonia | 0.88 | 0.21 – 3.73 | 0.865 |
| Venous thromboembolism (VTE) | 0.35 | 0.08 – 1.43 | 0.145 |
| -Deep vein thrombosis (DVT) | NS | NS | NS |
| -Pulmonary embolism (PE | 0.76 | 0.18 – 3.21 | 0.713 |
| Urinary tract infection (UTI) | 1.57 | 0.47 – 5.26 | 0.465 |
| Blood transfusion | 0.57 | 0.36 – 0.91 | 0.020 |
| Sepsis | 2.06 | 0.79 – 5.37 | 0.138 |
| **Total complication rate** | 0.95 | 0.72 – 1.24 | 0.683 |
| **Unplanned return to operating room** | 1.18 | 0.95 – 1.46 | 0.124 |
| **Unplanned readmission within 30 days** | 0.74 | 0.46 – 1.21 | 0.233 |
| **Length of stay >4 day** | 1.05 | 0.83 -1.33 | 0.678 |

*Adjusted factors were age, BMI, comorbidities (hypertension, DM and smoking) and Immediate vs. delayed reconstruction

*P value<0.05 is considered to be statistically significant

*NS: Non-significant

complication rate (without: 7.7% vs. with: 9.7%; *P*: 0.14), overall complications rate (without: 15.9% vs. with: 15.2%; *P*: 0.68), unplanned return to the operating room rate (without: 10.9% vs. with: 8.3%; *P*: 0.09), mean length of hospital stay (without: 3.8 day vs. with: 3.5 day; *P*:0.64) and unplanned re-admission rate (without: 5.5% vs. with: 4.1%; *P*:0.23) between two groups.

**Table 4.** Multivariate regression analyses evaluating the effect of postoperative outcomes in Immediate simultaneous contralateral breast symmetry (SCBS) versus no SCBS

| | Adjusted Odds Ratio | 95% Confidence Interval | P-value |
|---|---|---|---|
| ***Postop complications*** | | | |
| **Wound complications** | | | |
| I-Superficial surgical site infection | 1.96 | 1.34 – 2.87 | <0.001 |
| II-Deep surgical site infection | 1.82 | 0.57 – 5.83 | 0.316 |
| III-Organ space surgical site infection | 0.71 | 0.22 – 2.28 | 0.560 |
| IV-Wound delicense | 0.52 | 0.21 – 1.30 | 0.162 |
| Overall Surgical site complication rate | 1.27 | 0.90 – 1.78 | 0.168 |
| Pneumonia | 0.89 | 0.21 – 3.78 | 0.877 |
| Venous thromboembolism (VTE) | 0.35 | 0.08 – 1.42 | 0.142 |
| -Deep vein thrombosis (DVT) | NS | NS | NS |
| -Pulmonary embolism (PE | 0.77 | 0.18 – 3.23 | 0.72 |
| Urinary tract infection (UTI) | 1.51 | 0.45 – 5.09 | 0.505 |
| Blood transfusion | 0.57 | 0.36 – 0.92 | 0.022 |
| Sepsis | 2.04 | 0.78 – 5.35 | 0.145 |
| **Total complication rate** | 0.94 | 0.71 – 1.24 | 0.666 |
| **Unplanned return to operating room** | 0.72 | 0.52 – 1.6 | 0.098 |
| **Unplanned readmission within 30 days** | 0.74 | 0.45 – 1.20 | 0.229 |
| **Length of stay >4 day** | 1.04 | 0.82 – 1.31 | 0.770 |

*Included factors were age, BMI, comorbidities (hypertension, DM and smoking) and Immediate vs. delayed reconstruction

*P value<0.05 is considered to be statistically significant

*NS: Non-significant

Univariate (Table 3) and multivariate (Table 4) regression analyses were performed to identify the effect of simultaneous symmetry procedure in postoperative outcomes in this patient population. Using multivariate regression analysis, simultaneous symmetry procedure was only associated with a higher superficial surgical site infection (AOR, 1.96; CI: 1.34 -2.87; *P*<0.001).

Additionally, multivariate regression analyses showed that simultaneous symmetry procedure was not associated with a higher complication rate, higher unplanned return to the operating room, higher readmission rate, nor longer length of hospital stay after adjusting for patient's characteristics, comorbidities, and immediate versus delayed breast reconstruction.

## DISCUSSION

Breast cancer is the most common cancer in the United States[12]. Rates of postmastectomy breast reconstruction are increasing according to a report published by the Agency for Healthcare Research and Quality[13]. After unilateral breast reconstruction, patients can undergo contralateral breast symmetry procedure.

Our study revealed 8% simultaneous contralateral breast symmetrization rate within the ACS-NSQIP database. Previous studies have reported SCBS rates ranging from up to 42%[7,8]. The wide range may be attributed to a need for more research and widespread acceptance of its safety. Reported concerns include flap failure, complications potentially delaying adjuvant therapy, or uncertain achievement of symmetry due to prior damage from radiation[6,14]. Some argue that achieving symmetry requires adequate time to achieve a properly healed reconstructed breast[15]. Given the lack of consensus for the most optimal timing of symmetrization, understanding the risks and benefits is relevant.

Concerns persist regarding higher complications rates with SCBS compared to a delayed approach. Reported SCBS complication rates in the literature vary widely from 9.7%-41.6%.[7,11]. Our study found no significant difference in overall complications rates between SCBS and delayed groups, aligning with findings from Huang et al and others who similarly report no difference[6,8,9]. Wade et al further demonstrated the safety of SBCS despite the discrepancy between mastectomy and flap weight[8]. Smith et al highlighted potential concerns of increased blood loss with higher transfusion rates in SCBS, particularly in patients with BMI>30 or those requiring more reduction[5]. However, they found no correlation between BMI, specimen weight, and transfusion rate. Similarly, Huang et al

and Giordiano et al found no increase in blood loss in the simultaneous group, nor significant difference when compared to the delayed group[6,9]. Laporta et al found surgeon experience, rather than staging, to be more related to complications[16]. In contrast to these findings, Chang et al observed a significantly higher complication rate in their SCBS (9.7%) compared to delayed cohort (4.0%), underscoring the ongoing variability in outcomes reported across studies[7].

In the current study, SCBS was not an independent risk factor for unplanned return to operation room (AOR, 0.72; CI: 0.52 – 1.6; *P*=0.098) nor re-admission (AOR: 0.74; CI: 0.45 – 1.20; *P*=0.0229). This aligns with several other studies[8,10]. Takeback incidence increased if different plastic surgeons were involved with multiple procedures being done across several sessions[16].

Our study also found no significant difference in length of hospital stay between delayed and SCBS. This is also similar to the findings from other studies[9,10,16].

Furthermore, we assessed other postoperative complications, finding that SCBS was not an independent risk factor associated with immediate worse outcomes. Such outcomes analyzed included pneumonia, venous thromboembolism, and urinary tract infection. However, SCBS was associated with a higher superficial surgical site infection (7.8% vs. 4.1%; *P*<0.001) (Table 2). This contrasts with the study which had no significant difference in superficial infection rate between delayed versus SCBS[9]. Superficial surgical site infections occur within 30 d after surgery and do not require antibiotics if systemic symptoms are absent[17].

Given the NSQIP data limited to 30 d, we were unable to evaluate long-term revision rates and additional surgeries beyond the time frame. However, multiple studies have assessed such outcomes over a longer period. Wade et al found a statistically significant higher rate of all-cause revision surgeries in their delayed symmetrization group[8]. They noted this being due to higher lipomodelling, scar revision, and revision reduction/mastopexy procedure rates. In contrast, Chang et al noted higher revision rates for SCBS involving augmentation and mastopexy, but not reduction[7]. Giordano et al had median follow-up of 35 months and found a significantly higher rate of revision surgery in patients undergoing delayed contralateral symmetrisation and in fact most patients with SCBS (76%) did not need more revision/symmetry surgeries[9]. They acknowledged this potentially be due to higher patient satisfaction with pre-operative care and post-operative outcome in patients with SCBS.

Cost is another consideration for SCBS which we were unable to capture with the data. Giordano et al found SCBS to result in less financial burden to the hospital[9]. Multiple surgeries expected with delayed symmetrization, there may be more fees incurred by the patient from hospital resource utilization, anesthesia services, and follow-up care.

Lastly, we were unable to gather patient satisfaction scores. Patient-reported outcomes can be useful to capture in future studies. They can further inform surgeons on pre-operative counseling and discussions on what patients can expect after SCBS. Despite the limitations listed, to our knowledge, this study provides more insight to the safety of SCBS.

## CONCLUSION

SCBS was performed infrequently in unilateral free flap breast reconstruction. SCBS is safe and associated with comparable perioperative outcomes. One of the concerns with simultaneous symmetry procedure is delaying any adjuvant treatments with any unfortunate postoperative complications (e.g., open wounds); however, similarity of overall surgical site complications as well as overall complication rate and this should not discourage plastic surgeons from considering simultaneous symmetrization procedure. Simultaneous symmetrization should be considered in appropriate patients and this will likely eliminate or reduce revision surgery in patients undergoing unilateral free flap breast reconstruction. In addition, this is expected to improve cosmetic outcomes, self-esteem, quality of life, and patient satisfaction. However, future prospective studies with a longer follow up would be required to confirm these findings.

## ETHICAL APPROVAL

This study was presented as a poster presentation at the California Society of Plastic Surgeons Annual Meeting, May 9-12, 2024 at Carlsbad, California.

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## CONFLICT OF INTEREST

The authors declare that there is no conflict of interests.

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