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Breast

The Rates of Postmastectomy Immediate Breast Reconstruction during the Initial Months of the COVID-19 Pandemic

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Background: Coronavirus disease 2019 (COVID-19) pandemic-related changes may have led to changes in immediate breast reconstruction (IBR) rates. We aimed to evaluate these changes before, during, and after the initial wave of COVID-19.
Methods: We retrospectively reviewed women who underwent mastectomy with or without IBR from January 1 to September 30, 2019 and from January 1 to September 30, 2020, and compared demographic, clinical, and surgical variables between defined time periods.
Results: A total of 202 mastectomies were included. Fewer patients underwent IBR during the initial surge of COVID-19 (surge period) compared with the months before (presurge period; 38.46% versus 70.97%, $P = 0.0433$). When comparing the postsurge period with a year before (postsurge control), fewer patients underwent reconstruction even after the initial surge had passed (53.13% versus 81.25%, $P = 0.0007$). Those who underwent IBR were older than the year before (59.34 versus 53.06, $P = 0.0181$). The median number of postoperative visits in the postsurge period was 8.50 (interquartile range: 6–12) compared with 14 (interquartile range: 8–20.50) in the year before ($P = 0.0017$). The overall incidences of complications and unanticipated resource utilization were also significantly lower in the postsurge period compared with the year before [5.88% versus 30.77% ($P = 0.0055$), and 14.71% versus 28.85% ($P = 0.0103$), respectively].
Conclusions: IBR rates were lower even after the initial surge than at the year before. Furthermore, during the pandemic, IBR patients were older, had fewer follow-up visits, and fewer reported complications. *(Plast Reconstr Surg Glob Open 2023; 11:e5193; doi: 10.1097/GOX.0000000000005193; Published online 16 August 2023.)*

INTRODUCTION

Coronavirus disease 2019 (COVID-19) has had an unprecedented impact on the healthcare system, causing a major shift in reallocation of resources during the pandemic. Many elective surgeries were delayed to free up resources and to limit unnecessary exposure to the virus. Furthermore, fear and anxiety during the pandemic have played an important role in patients' decision to seek medical care during these times. Even those with biopsy-proven breast cancer have been reluctant to pursue surgical treatments during the COVID-19 pandemic.[1] This inherently leads to delayed diagnoses, treatments, and worse overall outcomes for these patients. Furthermore, patients who undergo mastectomy are often given the option of reconstruction as well. This could be performed at the time of the mastectomy in the form of a single-staged immediate breast reconstruction (IBR) or a two-staged procedure using tissue-expanders, or it could be delayed for months or years later.[2] Although breast reconstruction is not considered life-prolonging, benefits of postmastectomy breast reconstruction have been well-documented and include improved psychosocial well-being and improved quality of life.[3]

During the initial wave of the pandemic, on March 17, 2020 our institution implemented a triage system for elective cases, postponing those that could be safely deferred in accordance with the state-mandated response. This included many plastic and reconstructive surgeries. By April 27, 2020, as the number of COVID-19 cases were down-trending, our institution began resuming elective surgery under certain precautions. Since then, COVID-19

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has appeared in multiple waves, and future peaks of this disease or other pandemics are inevitable. It is imperative to examine pandemic-related changes in the rates of IBR and to be cognizant of how they can be affected by the socioeconomic fluctuations, policy shifts by the governing bodies and healthcare institutions, and the current trends in provider or patient preferences regarding these procedures in such challenging times. Failure to appropriately respond to these changes, whether on a systemic or individual level, may lead to fewer patients receiving breast reconstruction, and subsequently result in decreased quality of life, reduced patient satisfaction, and a potential backlog of patients who may ultimately require the procedure at a later date.

The aim of this study was to evaluate the impact of the COVID-19 pandemic by collecting and analyzing data for those who underwent mastectomy during certain defined periods before, during, and after the initial wave of the pandemic. We will examine all relevant data, including patient demographics, diagnostic data, the rates of breast reconstruction, and complications.

METHODS

Study Design

This was a retrospective, observational study that received our internal institutional review board (IRB) approval (Study # 002547). Data were abstracted from the medical record and entered into a REDCap (Research Electronic Data Capture) database. REDCap is a secure, web-based electronic data capture tool and is hosted at our institution.[4,5] We identified all adult (≥18 years old) female patients who underwent total mastectomy or modified radical mastectomy with or without reconstructive breast surgery for breast cancer, either as a treatment or as prophylaxis, from March 1, 2019 to September 30, 2019 and also January 1, 2020 to September 30, 2020. We collected data on all who underwent IBR, which included implant-based or autologous reconstructions. We excluded any cosmetic procedures, gender re-affirmation surgery, and all revisions. Given the retrospective nature of our study, we also excluded any delayed reconstructions because some patients may still elect to undergo reconstruction even after our study periods. We then divided all patients into six time periods as defined below. For the purposes of this study, "surge" refers specifically to the initial surge of the pandemic, although at the time of writing this article, many more surges have occurred. We chose these periods according to our institution's policy changes in response to the pandemic: On March 17, 2020, a triage-based system was implemented for elective procedures to minimize exposure and redistribute resources. By April 27, 2020, normal scheduling procedures were reinstated under certain precautions. We chose the exact months a year before as the control to account for any seasonal changes in our case loads. Follow-up data extended until the day before the date of submission of the study protocol to the IRB, which was January 1, 2021. Throughout the study, no plastic surgeons joined or left our health network. The following cohorts were included in our study and are defined as follows:

- January 1, 2020 to March 17, 2020: presurge
- January 1, 2019 to March 17, 2019: presurge control
- March 18, 2020 to April 28, 2020: surge
- March 18, 2019 to April 28, 2019: surge control
- April 29, 2020 to September 30, 2020: postsurge
- April 29, 2019 to September 30, 2019: postsurge control

> **Takeaways**
>
> **Question:** How did coronavirus 2019 (COVID-19) affect the rates of IBR in the initial months of the pandemic?
>
> **Findings:** The rates of IBR remained low even after the initial wave of COVID-19 was over and elective surgery was resumed. Those who underwent IBR were older, and had fewer follow-up visits and fewer recorded complications.
>
> **Meaning:** COVID-19 had a negative impact on the rates of IBR, which continued even after the initial wave of the pandemic.

Statistical Design

Descriptive statistics were generated for the entire sample, as well as separately by time period. Normally distributed continuous variables are presented as the mean ± SD (SD). Nonnormally distributed continuous variables are presented as the median and interquartile range (IQR). Normality was assessed using the skewness statistic, standard error of skew, and/or visual inspection of histograms. Categorical variables are presented as frequencies and percentages.

Bivariate analyses were conducted to compare different time periods with each other: specifically, surge versus presurge, surge versus surge control, postsurge versus presurge, and postsurge versus postsurge control. The independent samples *t* test was computed for normally distributed continuous variables, whereas the Mann-Whitney U test was used if they were nonnormally distributed. The chi-square test of independence was calculated for categorical variables unless more than 20% of the expected counter were less than five, in which case the Fisher exact test was used. All statistical tests were two-tailed, and a P value of less than 0.05 was considered statistically significant. The analysis was conducted using SAS software (version 9.4. SAS Institute Inc., Cary, N.C.).

RESULTS

A total of 202 mastectomies, of which 134 underwent IBR, were included and broken down into the defined time periods (Fig. 1). Both implant-based (n = 122) and autologous (n = 12) reconstructions were grouped as IBR if they occurred at the time of mastectomy. Fewer patients underwent IBR during the surge period compared with the few months prior, the presurge period (38.46% versus 70.97%; $P = 0.0433$). When comparing the few months

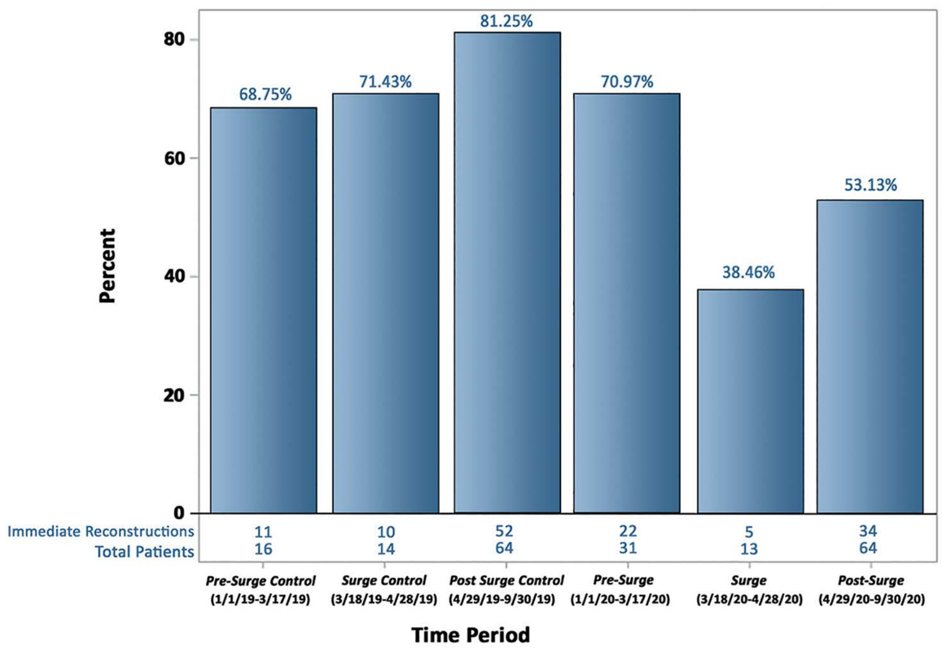

Fig. 1. Percentage of postmastectomy patients who underwent IBR during each time period.

after the initial wave of pandemic subsided (postsurge) to the same months one year before (postsurge control), fewer patients underwent IBR during the postsurge period (53.13% versus 81.25%; $P = 0.0007$).

Fewer patients also underwent IBR during the surge period compared with at the same period one year before, surge control (38.46% versus 71.43%, $P = 0.0850$), which trended toward significance. Furthermore, fewer patients underwent IBR during the postsurge period compared with the presurge period (53.13% versus 70.97%), but this difference was also not statistically significant ($P = 0.0974$).

None of the demographic or prior medical history, or diagnostic variables (Table 1) were statistically significantly different when comparing different time periods, except for age (Table 2). On average, those in the postsurge period were older (mean: 59.34, SD: 16.04) than those in the postcontrol period (mean: 53.06, SD: 13.53; $P = 0.0181$).

The overall complication rate after IBR was 22.39%; Overall 10.45% had an unplanned emergency room (ER) visit, 10.45% had an unplanned hospital admission, and 6.72% had an unplanned return to operating room (OR). (Table 3). The number of postoperative visits with the plastic surgeon was significantly lower ($P = 0.0017$) in the postsurge (median: 8.50, IQR: 6–12) compared with postsurge control (median: 14, IQR: 8–20.50). The postoperative visits for each patient were recorded as an aggregate of all visits, irrespective of the number of operations they required. This number also encompassed visits made for injections into the tissue expander. The proportion of patients diagnosed with a complication after IBR was lower in the postsurge period compared with the postsurge control period (5.88% versus 30.77%; $P = 0.0055$). Also, the incidence of unanticipated resource utilization was lower in the postsurge period compared with the postsurge control period (14.71% versus 28.85%; $P = 0.0103$) (Table 4).

DISCUSSION

In response to the initial COVID-19 wave, our institution devised a procedural priority list to minimize exposure and redistribute resources. As the COVID-19 trajectory was rapidly escalating in our hospital, many oncologic breast procedures were deferred with a few exceptions. Delayed reconstructions or revisions were postponed, and immediate reconstructions were evaluated on a case-by-case basis. This triage system was developed in accordance with state-mandated restrictions as well as guidelines released by the American College of Surgeons and American Society of Plastic Surgeons at the time.[6,7] Our study found that fewer patients underwent IBR during the surge period than the period immediately preceding it. Interestingly, when the postsurge period was compared with 1 year before (postsurge control), there were still significantly fewer patients who underwent IBR during the postsurge period even after the first wave of the pandemic was over and normal operations had resumed.

This finding is likely to be multifaceted and involve a broad range of factors, including socioeconomic changes, government and institutional policies, and provider or patient preferences. Following the resumption of elective procedures in our institution at the end of April 2020, surgeons across various specialties were faced with a backlog of cases. This, coupled with limited OR resources and staff, may have played a role in the continued lower rates of IBR that were observed in the subsequent months. Furthermore, in our institution, we perform the majority

Table 1. Demographic, Diagnostic, and Surgical Information, Overall and by Group Based on Time Period (n = 202)

		COVID-19 Period (2020)			Control Period (2019)		
	Entire Sample (n = 202)	Presurge (n = 31)	Surge (n = 13)	Postsurge (n = 64)	Presurge Control (n = 16)	Surge Control (n = 14)	Postsurge Control (n = 64)
Age, mean ± SD	56.07 ± 15.19	55.77 ± 16.17	57.92 ± 17.47	59.34 ± 16.04	52.69 ± 15.94	57.64 ± 11.65	53.06 ± 13.53
Marital status, n (%)							
Single	36 (17.82)	8 (25.81)	2 (15.38)	12 (18.75)	2 (12.50)	4 (28.57)	8 (12.50)
Married	117 (57.92)	17 (54.84)	8 (61.54)	35 (54.69)	9 (56.25)	9 (64.29)	39 (60.94)
Divorced	24 (11.88)	2 (6.45)	1 (7.69)	11 (17.19)	2 (12.50)	0	8 (12.50)
Separated	20 (9.90)	4 (12.90)	2 (15.38)	5 (7.81)	3 (18.75)	0	6 (9.38)
In relationship	4 (1.98)	0	0	1 (1.56)	0	0	3 (4.69)
Unknown	1 (0.50)	0	0	0	0	1 (7.14)	0
Personal history of breast cancer, n (%)							
Yes	57 (28.22)	9 (29.03)	3 (23.08)	19 (29.69)	6 (37.50)	6 (42.86)	14 (21.88)
No	144 (71.29)	22 (70.97)	10 (76.92)	44 (68.75)	10 (62.50)	8 (57.14)	50 (78.13)
Unknown	1 (0.50)	0	0	1 (1.56)	0	0	0
Diagnosis, n (%)							
Invasive ductal carcinoma	123 (60.89)	14 (45.16)	8 (61.54)	45 (70.31)	9 (56.25)	7 (50)	40 (62.50)
Invasive lobular carcinoma	30 (14.85)	5 (16.13)	2 (15.38)	9 (14.06)	2 (12.50)	3 (21.43)	9 (14.06)
Ductal carcinoma in situ	60 (29.70)	8 (25.81)	1 (7.69)	7 (10.94)	9 (56.25)	4 (28.57)	31 (48.44)
Infiltrating lobular mixed	1 (0.50)	0	0	1 (1.56)	0	0	0
Lobular carcinoma in situ	13 (6.44)	2 (6.45)	0	0	2 (12.50)	2 (14.29)	7 (10.94)
Metaplastic carcinoma	2 (0.99)	0	1 (7.69)	1 (1.56)	0	0	0
Phyllodes	1 (0.50)	0	0	0	0	0	1 (1.56)
BRCA mutation	13 (6.44)	3 (9.68)	0	4 (6.25)	1 (6.25)	1 (7.14)	4 (6.25)
Other	8 (3.96)	2 (6.45)	1 (7.69)	1 (1.56)	0	1 (7.14)	3 (4.69)
Type of oncologic surgery, n (%)							
Unilateral mastectomy (total or MRM)	21 (15.67)	3 (13.64)	1 (20)	4 (11.76)	3 (27.27)	2 (20)	8 (15.38)
Bilateral mastectomy (total or modified radical mastectomy)	113 (84.33)	19 (86.36)	4 (80)	30 (88.24)	8 (72.73)	8 (80)	44 (84.62)
Immediate breast reconstruction, n (%)							
Yes	134 (66.34)	22 (70.97)	5 (38.46)	34 (53.13)	11 (68.75)	10 (71.43)	52 (81.25)
No	68 (33.66)	9 (29.03)	8 (61.54)	30 (46.88)	5 (31.25)	4 (28.57)	12 (18.75)
Category of reconstruction (N = 134), n (%)							
Single-staged IBR	60 (44.78)	11 (50)	2 (40)	16 (47.06)	4 (36.36)	4 (40)	23 (44.23)
Two-staged (ie, with tissue-expander)	74 (55.22)	11 (50)	3 (60)	19 (55.88)	7 (63.63)	6 (60)	29 (55.77)
Prosthetic or autologous, n (%)							
Prosthetic	122 (91.04)	20 (90.91)	5 (100)	33 (97.06)	10 (90.91)	10 (100)	44 (84.62)
Autologous	12 (8.96)	2 (9.09)	0	1 (2.94)	1 (9.09)	0	8 (15.38)
Location (N = 134), n (%)							
Inpatient setting	47 (35.07)	9 (40.91)	5 (100)	11 (32.35)	5 (45.45)	4 (40)	13 (25)
Outpatient setting	87 (64.93)	13 (59.09)	0	23 (67.65)	6 (54.54)	6 (60)	39 (75)
Reason no reconstruction (N = 68), n (%)							
Patient refused/undecided	33 (48.53)	4 (44.44)	5 (62.50)	16 (53.33)	0	1 (25)	7 (58.33)
Not offered	6 (8.82)	0	0	3 (10)	1 (20)	2 (50)	0
Unknown	29 (42.65)	5 (55.56)	3 (37.50)	11 (36.67)	4 (80)	1 (25)	5 (41.67)

BRCA, breast cancer gene (BRCA) mutation.

of our reconstructions in an outpatient hospital that can provide overnight stay for observation and pain management, and the majority of IBRs are kept overnight—a practice that may have deterred some providers or patients from pursuing a procedure that would put them at an increased risk of exposure to the virus.

Lastly, economic changes caused by COVID-19 may have also played a role in our finding. A cross-sectional study of data from the US Census Bureau's Household Pulse Survey found that health insurance coverage decreased in the spring and summer of 2020. Over 2.7 million people became newly uninsured as a result of rising unemployment rates.[8] Socioeconomic disparities, including insurance coverage, have been shown to influence breast reconstruction rates, with uninsured and publicly insured women less likely to undergo reconstruction than those with private insurance,[9] a finding that predates the pandemic and is likely exacerbated by it.

Another interesting finding was the median age of those who underwent IBR after the initial wave of the pandemic. When comparing demographics for the postsurge group with its control group exactly a year before,

Table 2. Comparison of Demographic and Surgical Information between Postsurge vs Presurge Periods and Postsurge versus Postsurge Control Periods

	Postsurge (n = 64)	Presurge (n = 31)	*P*	Postsurge Control (n = 64)	*P*
Age, mean ± SD	59.34 ± 16.04	55.77 ± 16.17	0.3130*	53.06 ± 13.53	**0.0181***
Marital status, n (%)			0.5127†		0.6302‡
Single	12 (18.75)	8 (25.81)		8 (12.50)	
Married	35 (54.69)	17 (54.84)		39 (60.94)	
Divorced	11 (17.19)	2 (6.45)		8 (12.50)	
Separated	5 (7.81)	4 (12.90)		6 (9.38)	
In relationship	1 (1.56)	0		3 (4.69)	
Personal history of breast cancer n(%)			1.0000†		0.3170†
Yes	19 (29.69)	9 (29.03)		14 (21.88)	
No	44 (68.75)	22 (70.97)		50 (78.13)	
Unknown	1 (1.56)	0		0	
Type of oncologic surgery, n (%)			0.1578‡		**<0.0372‡**
Unilateral mastectomy (total or modified radical)	26 (40.63)	8 (25.81)		15 (23.44)	
Bilateral mastectomy (total or modified radical)	38 (59.38)	23 (74.19)		49 (76.56)	
Immediate breast reconstruction n(%)			0.0974‡		**0.0007‡**
Yes	34 (53.13)	22 (70.97)		52 (81.25)	
No	30 (46.88)	9 (29.03)		12 (18.75)	
Category of reconstruction n(%) (n = 134)			0.6664‡		0.9918‡
Single-staged IBR	15 (44.12)	11 (50)		23 (44.23)	
Two-staged (ie, with tissue-expander)	19 (55.88)	11 (50)		29 (55.77)	
Location (N = 134), n (%)			0.5140‡		0.4573‡
Inpatient setting	11 (32.35)	9 (40.91)		13 (25)	
Outpatient setting	23 (67.65)	13 (59.09)		39 (75)	
Reason for no reconstruction n(%) (n = 68)			0.5166†		0.7593†
Patient refused/undecided	16 (53.33)	4 (44.44)		7 (58.33)	
Not offered	3 (10)	0		0	
Unknown	11 (36.67)	5 (55.56)		5 (41.67)	

Results in this table represent column totals unless otherwise stated next to the variable name. The first set of *P* values represents the comparison between the postsurge and presurge time periods. The second set of *P* values represents the comparison between the postsurge and postsurge control time periods. *P* values shown in bold are statistically significant.
**P* value generated using the independent samples *t* test.
†*P* value generated using the Fisher exact test.
‡*P* value generated using the chi-square test of independence.

age was the only statistically significant finding, with those in the postsurge group being older. One plausible explanation could be the socioeconomic status of different age groups. A study examining the impact of the pandemic on employment during the month of April 2020 showed that the younger adults (ages 25–44) experienced the largest employment displacement as a result of the pandemic. Loss of employment decreased with increasing age.[10] This may explain the observation that older patients were more likely to undergo IBR in the postsurge period, as the younger population was more likely to be struggling with socioeconomic factors during the pandemic.

Moreover, another possible explanation for the difference in age could be that prophylactic mastectomies for genetic mutations such as breast cancer gene (BRCA) mutations were more likely to be postponed during the pandemic and these patients are typically younger and more likely to seek out reconstruction.[11] As such, a smaller cohort of this patient population in the postsurge period could contribute to the lower proportion of IBR seen in our study. Nonetheless, we must acknowledge that having an older cohort in the postsurge period may inadvertently have an impact on our postsurge IBR rates, as prior studies have shown that older women are less likely to undergo IBR, which may contribute to our finding of an overall lower IBR rate in the postsurge cohort.[12,13]

Lastly, the anxiety stemming from the pandemic has not only impacted the proportion of patients seeking reconstruction, but has also impacted the follow-up practices of those patients who have pursued reconstruction during these times. As demonstrated in our study, the number of postoperative visits in the postsurge group is significantly lower than that of its control group a year before. In addition, our study found that the incidences of postoperative complications as well as unanticipated resource utilization were significantly lower for those who underwent IBR in the postsurge period compared with its control group a year before. These findings are likely multifactorial but can perhaps be explained by the hesitancy of the patients to follow up and a higher threshold to present to a hospital during the pandemic, ultimately leading to a falsely lowered complication rate, as more complications go undetected. A similar finding was observed in another study where the authors found a clear reduction in non-COVID-19 emergency department visits and hospitalizations during the pandemic and an increase in non-COVID-19 related out-of-hospital deaths.[14]

These findings are therefore of great clinical significance. The operative surgeon must be cognizant of these

Table 3. Reconstruction Outcomes and Complications Overall and by Group Based on Time Period (n = 134)

		COVID-19 Period (2020)			Control Period (2019)		
	Entire Sample (n = 134)	Presurge (n = 22)	Surge (n = 5)	Postsurge (n = 34)	Presurge Control (n = 11)	Surge Control (n = 10)	Postsurge Control (n = 52)
Procedure complication, n (%)							
Yes	30 (22.39)	5 (22.73)	2 (40)	2 (5.88)	3 (27.27)	2 (20)	16 (30.77)
No	104 (77.61)	17 (77.27)	3 (60)	32 (94.12)	8 (72.73)	8 (80)	36 (69.23)
Type of complication, n (%)							
Seroma requiring drainage	10 (7.46)	2 (9.09)	1 (20)	1 (2.94)	0	1 (10)	5 (9.62)
Hematoma requiring drainage	2 (1.49)	1 (4.55)	0	0	0	0	1 (1.92)
Superficial wound disrupt	12 (8.96)	0	0	1 (2.94)	3 (27.27)	1 (10)	7 (13.46)
Superficial incisional SSI	6 (4.48)	1 (4.55)	1 (20)	0	0	1 (10)	3 (5.77)
Deep incisional SSI	2 (1.49)	0	0	0	0	1 (10)	1 (1.92)
Organ/space surgery site	1 (0.75)	0	0	0	0	0	1 (1.92)
Partial flap loss (10 %–90%)	1 (0.75)	1 (4.55)	0	0	0	0	0
Implant/prosthesis loss	2 (1.49)	0	0	0	0	0	2 (3.85)
Unanticipated resource utilization, n (%)							
Yes	30 (22.39)	5 (22.73)	1 (20)	5 (14.71)	1 (9.09)	3 (30)	15 (28.85)
No	94 (70.15)	16 (72.73)	4 (80)	29 (85.29)	9 (81.82)	6 (60)	30 (57.69)
Unknown	10 (7.46)	1 (4.55)	0	0	1 (9.09)	1 (10)	7 (13.46)
Type of resource, n (%)							
Unplanned ER	14 (10.45)	3 (13.64)	1 (20)	4 (11.76)	1 (9.09)	1 (10)	4 (7.69)
Unplanned hospital admission	14 (10.45)	1 (4.55)	1 (20)	2 (5.88)	0	3 (30)	7 (13.46)
Unplanned OR	9 (6.72)	2 (9.09)	0	1 (2.94)	0	0	6 (11.54)
No. plastic surgeon postoperative visits (N = 102), median (IQR)	12 (7–16)	9 (9–14)	8.50 (6–16)	8.50 (6–12)	12 (9–18)	11.5 (8.5–24.5)	14 (8–20.50)

Results in this table represent column totals unless otherwise stated next to the variable name. The specific types of procedure complications or type of unanticipated resource utilization were check all that apply fields so column totals may not add up to 100%. The total sample size for this table is only 134, which comprises only those who had reconstruction.

Table 4. Comparison of Reconstruction Outcome and Complications between Postsurge versus Presurge Periods and Postsurge versus Postsurge Control Periods

	Postsurge (n = 34)	Presurge (n = 22)	*P*	Postsurge Control (n = 52)	*P*
Procedure complication, n (%)			0.0986*		**0.0055**†
Yes	2 (5.88)	5 (22.73)		16 (30.77)	
No	32 (94.12)	17 (77.27)		36 (69.23)	
Complication type, n (%)					
Seroma requiring drainage	1 (2.94)	2 (9.09)		5 (9.62)	
Hematoma requiring drainage	0	1 (4.55)		1 (1.92)	
Superficial wound disrupt	1 (2.94)	0		7 (13.46)	
Superficial incisional SSI	0	1 (4.55)		3 (5.77)	
Deep incisional SSI	0	0		1 (1.92)	
Organ/space surgery site	0	0		1 (1.92)	
Partial flap loss (10%–90%)	0	1 (4.55)		0	
Implant/prosthesis loss	0	0		2 (3.85)	
Unanticipated resource utilization, n (%)			0.3613*		**0.0103***
Yes	5 (14.71)	5 (22.73)		15 (28.85)	
No	29 (85.29)	16 (72.73)		30 (57.69)	
Unknown	0	1 (4.55)		7 (13.46)	
Type of resource, n (%)					
Unplanned ER	4 (11.76)	3 (13.64)		4 (7.69)	
Unplanned hospital admission	2 (5.88)	1 (4.55)		7 (13.46)	
Unplanned OR	1 (2.94)	2 (9.09)		6 (11.54)	
No. plastic surgeon postoperative visits, median (IQR) (n = 102)	8.50 (6–12)	9 (9–14)	0.2212‡	14 (8–20.50)	**0.0017**‡

The variables under "complication type" and "type of resource" were "check all that apply" fields, so column totals may not add up to 100%. The total sample size for this table is only 134, which comprises only those who had reconstruction. The second set of *P* values represents the comparison between the postsurge and postsurge control time periods. *P* values shown in bold are statistically significant.

**P* value generated using the Fisher exact test.

†*P* value generated using the chi-square test of independence.

‡*P* value generated using the Mann-Whitney U test.

Table 5. Comparison of Reconstruction Information between Surge versus Presurge Periods and Surge versus Surge Control Periods

	Surge (n = 13)	Presurge (n = 31)	*P*	Surge Control (n = 14)	*P*
Reconstruction, n (%)					
Yes	5 (38.46)	22 (70.97)	0.0433*	10 (71.43)	0.0850*
No	8 (61.54)	9 (29.03)		4 (28.57)	
Category of reconstruction (N = 134), n (%)			1.0000†		1.0000†
Single-staged IBR	2 (40)	11 (50)		4 (40)	
Two-staged (ie, with tissue-expander)	3 (60)	11 (50)		6 (60)	
Location (N = 134), n (%)					
Inpatient setting	5 (100)	9 (40.91)	0.0169*	4 (40)	**0.0253***
Outpatient setting	0	13 (59.09)		6 (60)	
Reason no reconstruction (N = 68), n (%)			0.6371†		0.1879†
Patient refused/undecided	5 (62.50)	4 (44.44)		1 (25)	
Not offered	0	0		2 (50)	
Unknown	3 (37.50)	5 (55.56)		1 (25)	

Results in the table above represent column totals unless otherwise stated next to the variable name. The first set of *P* values represents the comparison between the surge and presurge time periods. The second set of *P* values represents the comparison between the surge and surge control time periods. *P* values shown in bold are statistically significant.
**P* value generated using the chi-square test of independence.
†*P* value generated using the Fisher exact test.

trends during the pandemic. Influencing factors are multifaceted and may stem from both systemic and individual levels. Therefore, it is imperative to develop plans to optimize limited resources, educate patients, address fears, and ensure adequate follow-up and communication between the surgeon and the patient. It is important to stay vigilant especially during the postoperative period, as patients who do undergo reconstruction during these times may be less likely to follow-up in office or present to the hospital for a postoperative concern; although further studies are necessary to support these associations.

This study is not without its limitations, including those inherent to a small, retrospective design. To start, we used data from the medical record, which was entered for clinical rather than research purposes and may have some inherent bias based on the intended use of the data. The retrospective nature of this study also made it subject to selection bias and loss to follow-up. There could have been socioeconomic factors that we did not account for when comparing the groups to their respective control time periods. Furthermore, there was a lack of consistency in documenting a reason why a patient did not receive IBR (Table 5). Additionally, the study did not account for delayed reconstructions, as they may occur outside our study's timeframe or with a plastic surgeon outside our health network. Although the divisions of surgical oncology and plastic surgery at our institution work closely together to provide education and discuss breast reconstruction options before mastectomy, and referral to plastic surgery is routinely made, our study did not specifically examine whether a plastic surgery referral was made at the time mastectomy was decided due to limitations of our electronic medical records.

Due to the small sample size within a few of the cohorts, statistical power was not reached for some of the analyses, even though potentially clinically meaningful differences were observed. To achieve greater power, one could expand this study to include other institutions within the region, as presumably they experienced a similar impact of COVID-19, given the state regulations during the pandemic. By expanding this study to a multi-institutional analysis, greater generalizability would also be achieved. Future studies may also want to capture the reasoning behind why a patient does not receive breast reconstruction.

Despite its limitations, our study provides a snapshot of the impact that COVID-19 had on immediate reconstructive breast surgery and breast cancer patients within our health network. Although the initial waves of COVID-19 have passed, we have continued to see waves of this pandemic, and future peaks of this disease or other pandemics are inevitable. Therefore, it is imperative to understand the current trends regarding these procedures in such difficult times, and to take additional steps to minimize the negative impacts of COVID-19 or any other similar pandemic in the future.

CONCLUSIONS

In summary, when compared with a year before the pandemic, our study demonstrated that significantly fewer patients underwent breast reconstruction even after the initial surge of the pandemic had ended. We also found that patients who underwent IBR after the initial surge of the pandemic was over had an older age mean, fewer postoperative follow-ups, fewer recorded complications, and fewer unanticipated resource utilization, such as emergency department visits. As a result, it is possible that complications still occurred at their prepandemic rates but were more likely to go undiagnosed.

According to our findings, we recommend that surgeons remain cognizant of the potential changes in breast reconstruction rates during a pandemic and take into account both systemic and individual factors when addressing these changes. Furthermore, we recommend remaining hypervigilant, especially in the postoperative period, as these patients may be less likely to follow up and more likely to have undiagnosed complications. Providing education, addressing fears, and providing resources to ensure adequate follow-up and communication between the surgeon and the patient are some of the ways that may lead to better outcomes. Further studies are necessary to evaluate long-term effects of these steps on patient outcomes during the postpandemic era.

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DISCLOSURE

None of the authors has a financial interest in any of the products, devices, or drugs mentioned in this article.

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