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Gender-Affirming Surgery

Gender-affirming Mastectomy: Comparison of Periareolar and Double Incision Patterns

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Background: Gender-affirming mastectomy has become one of the most frequently performed procedures for transgender and nonbinary patients. Although there are a variety of potential surgical approaches available, the impact of technique on outcomes remains unclear. Here we present our experience performing periareolar and double incision mastectomies, with a focus on comparing patient demographics, preoperative risk factors, and surgical outcomes and complication rates between techniques.

Methods: Retrospective review identified patients undergoing gender-affirming mastectomy by the senior author between 2017 and 2020. Patients were stratified according to surgical technique, with demographics and postoperative outcomes compared between groups.

Results: In total, 490 patients underwent gender-affirming mastectomy during the study period. An estimated 96 patients underwent periareolar mastectomy, whereas 390 underwent double incision mastectomy. Demographics were similar between groups, and there were no differences in rates of hematoma (3.1% versus 5.6%, respectively; $P = 0.90$), seroma (33.3% versus 36.4%; $P = 0.52$), or revision procedures (14.6% versus 15.8% $P = 0.84$) based on technique.

Conclusions: Our results demonstrate no difference in the rates of postoperative complications or revision procedures based on surgical technique. These results also suggest that with an experienced surgeon and proper patient selection, both techniques of gender-affirming mastectomy can be performed safely and with comparable outcomes. *(Plast Reconstr Surg Glob Open 2022;10:e4356; doi: 10.1097/GOX.0000000000004356; Published online 25 May 2022.)*

INTRODUCTION

Gender-affirming surgery is a rapidly expanding subspecialty within plastic surgery, which lends itself to evolution of procedures and expansion of various techniques. Often the initial, and most frequently performed procedure is gender-affirming mastectomy.[1]

Given the marked increase in volume of procedures performed over the last 5 years, critical evaluation of aesthetic and reconstructive results is paramount to strive for continual quality improvement for patients. Many have published their experiences with gender-affirming mastectomies, including unique technical approaches to achieve aesthetic results while minimizing complications. Risk factors for revision surgery (such as hematoma, seroma, nipple necrosis, incorrect choice of technique, and excess tissue) have also been evaluated.[2] Research has focused on identifying pre- and perioperative predictors for developing these complications to guide patient selection and optimize patients for surgery. In addition, risk for complications among the most common techniques for gender-affirming mastectomy, the periareolar and double incision mastectomy with free nipple grafts, has also been assessed. Although studies have compared the two techniques, a clear consensus regarding the risk of each type of complication as well as need for revision for each approach has yet to be established.[1,3,4] In an attempt to resolve these discrepancies, we present the largest series to date comparing patients undergoing gender-affirming mastectomy using either the periareolar or double incision with free nipple graft technique.

METHODS

Following institutional review board approval, a retrospective chart review was performed to identify all patients

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who underwent primary gender-affirming mastectomy by the senior author (R.B.L.) between 2017 and 2020. All patients over 18 years of age who underwent primary gender-affirming mastectomy using either the periareolar or double incision with free nipple graft technique were included. Patients undergoing revision procedures from another surgeon and patients with less than 6 weeks of follow-up or incomplete data were excluded from analysis. Patient preoperative demographics, clinical factors, medical comorbidities, and perioperative outcomes were collected and analyzed.

Demographic data collected included age, body mass index (BMI), Fischer grade, testosterone use/duration, and smoking status. All patients were instructed to cease nicotine use preoperatively and was verified by cotinine laboratory testing. Patients who tested positive for cotinine were rescheduled pending nicotine cessation and laboratory confirmation. Accordingly, patients with a remote history of nicotine use were classified as "former smokers," whereas those with active nicotine use who ceased immediately before surgery were categorized in the "recent nicotine use" group. Additional preoperative risk factors assessed included diabetes mellitus, coagulopathy, and cardiovascular risk factors. "Coagulopathy" was defined as a history of either deep vein thrombosis, pulmonary embolus, transient ischemic attack, cerebrovascular accident, malignancy, autoimmune disease, or primary coagulopathy. Cardiovascular comorbidity was defined as the presence of either hypertension, hyperlipidemia, coronary artery disease, arrhythmia, cardiomyopathy, or heart failure.

The primary outcomes assessed in the study included hematoma requiring operative intervention, hematoma managed expectantly, seroma requiring intervention, seroma managed expectantly, surgical site infection, nipple-areolar complex (NAC) necrosis, need for revision procedures, and the number of revision procedures performed. Hematoma or seroma requiring intervention were defined as those requiring evacuation in the operating room or drainage by interventional radiology. Any patients with follow-up of less than 30 days and those undergoing revision following a different surgeon's primary mastectomy were excluded from analysis.

Surgical Technique

Gender-affirming mastectomy was performed by one of two surgical techniques, either a "double incision" mastectomy with free nipple grafts or a periareolar mastectomy. The choice of surgical technique was determined using the Fischer grading scale, based on patient-specific anatomical parameters, as previously described.[1,5] Briefly, Fischer grade 1 consists of minimal glandular tissue, no skin laxity, and a NAC above the inframammary fold; Fischer grade 2A consists of moderate glandular tissue, little to no skin laxity, and the NAC above the inframammary fold while Fischer grade 2B has moderate glandular tissue, increased skin laxity, and the NAC at or below the inframammary fold; Fischer grade 3 consists of significant glandular tissue, irrespective of skin laxity, with a NAC below the inframammary fold; and lastly, Fischer grade 4 has a deflated breast with significant skin laxity and a NAC below the inframammary fold. Patients with Fischer grades 1, 2A, and 2B were offered periareolar mastectomy (with the option of a double incision mastectomy with free nipple grafts per patient preference), whereas Fischer grades 3 and 4 were exclusively offered double incision with free nipple grafting. However, patients with a nipple-to-IMF distance greater than 7 cm were not offered periareolar mastectomy regardless of Fischer grade.

Takeaways

Question: How do the outcomes compare for periareolar and double incision techniques in gender-affirming mastectomy?

Findings: There was no difference between periareolar and double incision techniques in rates of hematoma, seroma, or revision procedures.

Meaning: Our results demonstrate no difference in the rates of postoperative complications or revision procedures based on surgical technique. With an experienced surgeon and proper patient selection, both techniques of gender-affirming mastectomy can be performed safely and with comparable outcomes.

Although each surgical technique has been described previously, the differences should be reviewed.[1,5] First, in the periareolar technique, the incision is marked by a 1-cm crescent shape along the inferior edge of the areola, beginning at the 3 o'clock and terminating at the 9 o'clock position. The crescent is de-epithelialized, and a full-thickness incision is then made in the inferior aspect from the 3 o' clock to 9 o'clock position. The plane between the breast capsule and the subcutaneous tissue is developed inferiorly and laterally, with 1.5 cm of breast tissue preserved in the sub-areolar space to preserve the blood supply and prevent a saucer deformity. The superior breast flap is then elevated in the plane between the breast capsule and the subcutaneous tissue and circumferential dissection is completed. With the flaps elevated in the plane between the breast capsule and the subcutaneous tissue, the glandular tissue is then freed from the chest wall and removed. A 19-French drain is placed in the subcutaneous pocket bilaterally, and the incisions are closed in a multilayer fashion.

For the double incision mastectomy, the patient is marked in the standing position with arms raised to help accentuate the inferior and lateral borders of the pectoralis muscle. The superior incision is marked straight across the inferior border of the pectoralis major and is angled superiorly toward the axilla to follow the inferolateral border of the pectoralis muscle (Fig. 1). The inferior incision is designed in the inferior pectoral shadow and not the inframammary fold, which is often lower than the pectoral shadow, however, this is marked intraoperatively while pulling the breast parenchyma and skin flap superiorly on tension to estimate the closure (Fig. 2). Beginning the operation, the nipples are first excised as full-thickness grafts. Next, the markings along the pectoral border are incised, and dissection is carried to the plane between the

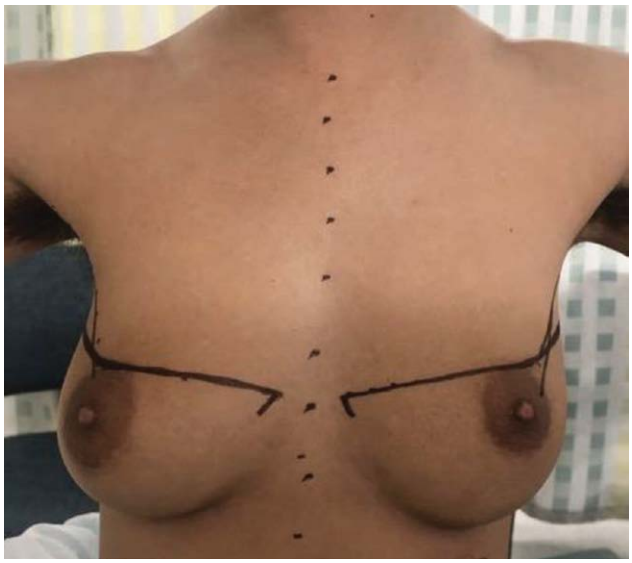

Fig. 1. Preoperative markings for double-incision mastectomy. The patient is marked in the standing position, with arms raised to help accentuate the inferior and lateral borders of the pectoralis muscle. The superior incision is marked straight across the inferior border of the pectoralis major and is angled superiorly toward the axilla to follow the inferolateral border of the pectoralis muscle. Reprinted with permission from *Plast Reconstr Surg* 2021;147:1288–1296.

Fig. 2. The inferior incision is placed in the inferior pectoral shadow and not in the inframammary fold, which is often lower than the pectoral shadow. This is marked intraoperatively while pulling the breast parenchyma and skin flap superiorly on tension to estimate the closure. Reprinted with permission from *Plast Reconstr Surg* 2021;147:1288–1296.

breast parenchyma and the subcutaneous fat. The superior mastectomy flap is created first through cephalad and lateral dissection. Posteriorly, the breast tissue is elevated off of the pectoralis muscle to the level of the inframammary fold, where attention is then turned to the inferior skin incision. In creation of the inferior flap, the dissection is performed in a caudad, medial, and lateral fashion until all breast tissue is freed and removed. In a seated position, the new nipple is positioned at a site 1 cm above the incision, and 3 cm from the pectoral border. Drains are placed bilaterally, and the incisions closed in a multi-layer fashion. A 2.2×2.2 cm circle on the superior mastectomy flap is de-epithelialized on both the right and left sides, the nipples are thinned and sutured into place using 5-0 fast-absorbing plain gut, and lastly, the grafts are secured with xeroform and tegaderm bolsters while the incisions are dressed with steri-strips. Representative pre- and postoperative clinical photographs of each technique are shown in Figures 3 and 4. Preoperatively, all patients are counseled extensively regarding risks of the procedure, including loss of nipple sensation, loss of nipple pigmentation potentially requiring tattooing, widened scars, hematoma, seroma, and need for revision procedures.

Statistical Analysis

Univariate analysis was performed using the Chi-square or Fisher exact test ($n < 5$) for categorical variables and Student's *t* test for continuous variables. To control for potential confounding variables, multivariate regression analysis was also performed. Variables included in our regression model consisted of case number in our series, age, BMI, diabetes, operative time, smoking status, cardiovascular comorbidities, and mastectomy type. Statistical significance was defined as a *P* value less than 0.05. All data analyses were performed using SPSS version 25.0 (IBM Corp., Armonk, N.Y.).

RESULTS

Five-hundred twenty-five patients underwent gender-affirming mastectomy by the senior author between February 2017 and December 2020, and after application of our exclusion criteria, a total of 486 patients were included in the study with a mean follow-up time of 360 days (range 32–1289). Fourteen patients were excluded, as they were undergoing revision mastectomies from other surgeons and 25 were excluded due to inadequate follow-up. Of the included patients, 96 underwent a periareolar approach, whereas 390 patients underwent double incision mastectomy with free nipple grafts (Table 1). Patients undergoing periareolar mastectomy had a lower mean age (22.6 versus 26.3 years; $P < 0.001$) and BMI (22.1 versus 26.6; $P < 0.001$) compared with the double incision group. Mean operative time was also significantly longer in the periareolar group compared with the double incision group (130 versus 106 minutes, $P < 0.001$). Although there was no significant difference between groups in terms of time since transitioning, testosterone use was significantly more prevalent in patients undergoing periareolar mastectomy than in patients undergoing double incision mastectomy with free nipple grafts (96.9% versus 75.8%, $P < 0.001$).

Fig. 3. Preoperative (A) and postoperative (B) photographs of a patient who underwent gender-affirming mastectomy with a periareolar technique.

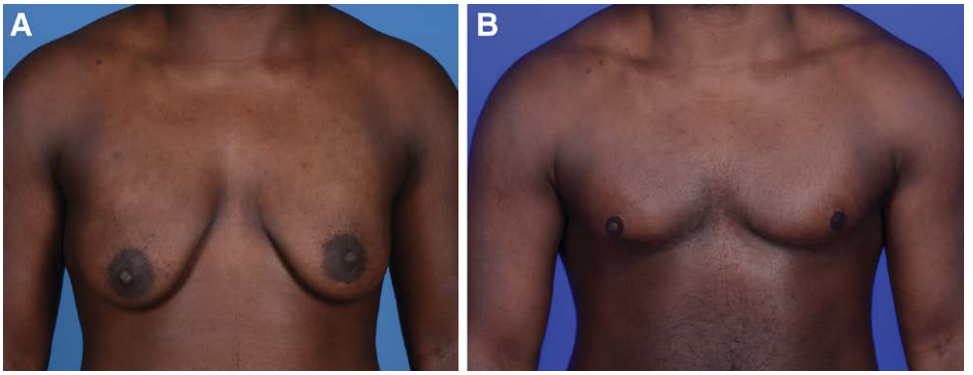

Fig. 4. Preoperative (A) and postoperative (B) photographs of a patient who underwent gender-affirming mastectomy with a double incision and free nipple graft technique.

There was a significant difference between groups in terms of distribution of Fischer grading ($P < 0.001$). Among patients undergoing periareolar mastectomy, 3.1% were Fischer grade 1, 58.3% were Fischer 2A, and 38.5% were Fischer 2B, with an overall mean nipple-to-IMF distance of 5.9 cm. Among patients undergoing double incision mastectomy with free nipple grafts, two patients (0.5%) were Fischer grade 2A, 19% were Fischer 2B, 79% were Fischer grade 3, and 1.6% were Fischer grade 4, with an overall mean nipple-to-IMF distance of 10.4 cm. Of the Fischer 2A patients who underwent double incision mastectomy, one patient specifically requested the double incision pattern, whereas the other patient requested no nipple reconstruction which necessitated a double incision pattern. Average mastectomy specimen weights were also significantly higher in patients undergoing double incision mastectomy (639.6 g, 644.6 g) compared with patients undergoing periareolar mastectomy (151.7 g, 157.5 g) ($P < 0.001$).

Table 1. Patient Demographics and Preoperative Risk Factors

	Periareolar	Double Incision	*P*
Patients	96	390	
Mean age, y	22.6	26.3	**<0.001**
Mean BMI, kg/m^2	22.1	26.6	**<0.001**
Mean OR time, min	130	106	**<0.001**
Mean transition time, mo	47.4	56.5	0.20
Testosterone use (%)	93 (96.9)	295 (75.8)	**<0.001**
Mean testosterone duration, mo	26.8	24.5	0.27
Fischer grade (%)			**<0.001**
1	3 (3.1)	0 (0)	
2A	56 (58.3)	2 (0.5)	
2B	37 (38.5)	73 (19.0)	
3	0 (0)	304 (79.0)	
4	0 (0)	6 (1.6)	
Mean specimen weight, g	154.6	642.1	**<0.001**
Preoperative risk factors (%)			
Diabetes	0 (0)	7 (1.8)	0.19
Coagulopathy*	1 (1)	6 (1.5)	0.71
Cardiovascular comorbidity‡	4 (4.2)	16 (4.1)	0.99
Recent nicotine use	6 (6.3)	41 (10.5)	0.21
Former smoker	8 (8.3)	67 (17.2)	**0.03**

Bold values indicate statistical significance.
*Includes history of venous thromboembolism, pulmonary embolus, transient ischemic attack, cerebrovascular accident, malignancy, autoimmune disease, and primary coagulopathy.
‡Includes hypertension, hyperlipidemia, coronary artery disease, arrhythmia, cardiomyopathy, and heart failure.

Table 2. Postoperative Complications and Management

	Periareolar	Double Incision	*P*
Hematoma (%)	3 (3.1)	22 (5.6)	0.90
Hematoma requiring intervention	1 (1)	13 (3.3)	0.32
Seroma (%)	32 (33.3)	142 (36.4)	0.51
Seroma requiring intervention	1 (1)	2 (0.5)	0.48
Surgical site infection (%)	1 (1)	5 (1.3)	0.99
NAC necrosis (%)	0 (0)	0 (0)	0.99
Revision procedure performed (%)	14 (14.6)	62 (15.8)	0.83
Mean no. of revision procedures	1.3	1.2	0.47

Demographics and preoperative risk factors were similar between groups, with no differences in rates of diabetes ($P = 0.19$), coagulopathy ($P = 0.71$), cardiovascular comorbidity ($P = 0.99$), or recent nicotine use ($P = 0.21$). However, a significantly higher percentage of patients undergoing double incision mastectomy were former smokers when compared with the periareolar group (17.2% versus 8.3%, $P = 0.03$).

Patients who underwent periareolar or double incision mastectomy demonstrated no differences in overall rates of hematoma (3.1% versus 5.6%, respectively; $P = 0.90$), or hematoma requiring operative intervention (1% versus 3.3%, $P = 0.32$) (Table 2). Similarly, there were no differences in overall rates of seroma (33.3% versus 36.4%, $P = 0.51$) or seroma requiring operative intervention (1% versus 0.5%, $P = 0.48$). Rates of NAC necrosis (0% versus 0%; $P = 0.99$) and surgical site infection (1% versus 1.3%; $P = 0.99$) were similar between patients who underwent periareolar and double incision mastectomy, respectively. All surgical site infections were treated and resolved with oral antibiotics alone. Rates of revision procedures were statistically similar between groups (14.6% versus 15.8%; $P = 0.83$), and there was no difference in the average number of revision procedures performed (1.3 versus 1.2; p-0.47). Among patients who underwent double incision mastectomy that required revision procedures (N = 62), 30 underwent revision for hypertrophic/widened scars, 30 underwent excision of dog ears, one underwent excision of a seroma pocket, and one underwent excision of fibrotic capsule following hematoma. Among patients who underwent periareolar mastectomy that required revision procedures (N = 14), 10 underwent scar revision, two underwent nipple reduction, one had lipodissolve injection for excess residual tissue, and one underwent excision of a seroma capsule. Notably, virtually all revision procedures with the exception of the hematoma capsule excision were performed under local anesthesia in the office.

Multivariate regression (Table 3) demonstrated no significant association between mastectomy type and development of hematoma ($P = 0.35$), seroma ($P = 0.45$), NAC necrosis ($P = 0.99$), or need for revision ($P = 0.47$). However, increasing BMI was found to be an independent predictor of surgical site infection ($\beta = 0.23$, 95% CI 1.05–1.51, $P = 0.014$). Additionally, increasing age ($\beta = 0.05$, 95% CI 1.02–1.08, $P = 0.005$) and recent nicotine use (OR = 1.73, 95% CI 1.01–31.2, $P = 0.048$) were associated with increased revision rates.

DISCUSSION

In this study, we review our single-surgeon series of 486 patients undergoing gender-affirming mastectomy using either a periareolar or double incision with free nipple grafting approach. We aimed to demonstrate a low complication and revision rate, irrespective of incision pattern and approach, through a 360-day follow-up interval.

Before outcomes can be analyzed, the differences between the two patient cohorts in demographic and preoperative risk factors must be assessed. Those who underwent mastectomy using a periareolar approach were younger, had a lower value BMI, and were more likely to use testosterone. Younger patients tend to have less ptosis and less elastic skin. Lower BMI often correlates with less breast tissue. Minimal ptosis, lower glandular volume, and less skin elasticity correlates with lower Fischer grades and better candidacy for the periareolar approach.[1,6] Patients with higher breast volumes who have accompanying excess skin are best treated with a longer incision.[1,2,7] In our practice, patients with Fischer grade 1, 2A, or 2B breasts are candidates for the periareolar approach; however, patient preference takes precedence, and on occasion these patients will opt for a double-incision gender-affirming mastectomy as was the case for several patients in our series. One perceived advantage frequently mentioned by patients seeking the periareolar approach is a decreased scar burden, and this often contributes to patient decision-making. However, in the senior author's experience, it is important to note that although the periareolar approach allows for more concealed scars, the technique does not allow significant repositioning of the nipple or excision of excess skin. The scar of the double incision, when properly placed, highlights the pec shadow and allows for excision of excess skin as well as resizing and repositioning of both the nipple and areola. Ultimately, choice of incision remains an individualized discussion with the patient, as preferences may be determined by factors unknown to the surgeon.

With regard to outcome measures, there were no significant differences in need for revision or complications between the two surgical approaches. One of the most common complications described in the literature is postoperative hematoma. The overall hematoma rate in this

Table 3. Multivariate Regression Analysis of Outcomes

	Hematoma			Seroma			SSI			NAC Necrosis			Revision		
Variable	β	95% CI	*p*	β	95% CI	*P*	β	95% CI	*P*	β	95% CI	*P*	β	95% CI	*P*
Age	–0.01	0.90–1.08	0.77	–0.06	0.71–1.24	0.66	–0.001	0.99–1.01	0.68	–0.003	0.99–1.01	0.51	–0.08	0.75–1.14	0.46
BMI	–0.07	0.81–1.08	0.33	0.44	0.77–1.41	0.77	0.04	0.96–1.13	0.32	0.002	0.87–1.16	0.98	–1.08	0.05–2.55	0.29
Operative time	0.001	0.97–1.04	0.97	–0.005	0.93–1.06	0.89	0.13	1.00–1.28	0.04	0.004	0.81–1.25	0.97	–0.41	0.20–2.16	0.50
Diabetes	—	—	0.99	—	—	0.99	—	—	0.99	—	—	0.99	—	—	0.99
Recent nicotine	—	—	0.99	—	—	0.99	—	—	0.99	—	—	0.99	—	—	0.99
Former smoker	—	—	0.99	—	—	0.99									
Cardiovascular comorbidities	—	—	0.99	—	–2.84	0.003–1.14	0.06	—	—	—	—	—	—	—	—
Mastectomy type	–1.14	0.03–3.47	0.35	1.54	0.09–253.1	0.45	0.99	0.26–28.1	0.41	0.80	0.20–25.2	0.52	—	—	0.99
Case number	0.002	0.99–1.01	0.38	0.001	0.99–1.01	0.86	1.15	0.27–37.5	0.36	—	—	0.99	—	—	0.99

SSI, surgical site infection; CI, confidence interval.

series is low and comparable with other published patient series.[1,2,6,8] This is in contrast to several previously published patient series which have reported a higher incidence of hematoma in those patients undergoing a periareolar approach.[6,9–11] This observation has been attributed to more difficult visualization during mastectomy dissection with limited incision techniques. While many studies demonstrate a higher incidence of hematoma with limited incision techniques, there are others that noted no difference in hematoma incidence when comparing incision and operative techniques.[1,2,7,8] The results of our present series—the largest to date in the published literature—add to the existing literature suggesting no difference in rates of hematoma based on incision pattern or operative technique. Ultimately, regardless of incision or technique, obtaining appropriate visualization and ensuring intraoperative hemostasis remain crucial for limiting postoperative hematomas.

Another commonly described complication is postoperative seroma. Similar to most published studies, we did not observe a difference in the rate of seroma formation between the two cohorts. The vast majority of seromas in our study population were managed conservatively, with aspiration and compression. Only one (1%) patient undergoing periareolar mastectomy and two (0.5%) patients undergoing double incision mastectomy required operative intervention. It can be extrapolated that regardless of incision pattern of surgical approach, the size of the cavity remaining following mastectomy and the tissues in need of adherence remain virtually the same, thereby resulting in similar rates of seroma formation.

Another postoperative outcome of considerable significance and discussion is the revision rate. A review of the literature suggests that in the setting of more limited incision techniques, like the periareolar approach, the need for revision is higher compared with the double incision technique.[3,9] In the present study, our series demonstrates a revision rate at the lower range of that in the published literature, and this may be a reflection of the senior author's extensive experience. Interestingly, the revision rate remained similar between the two groups, with no difference in revision rate observed based on incision design. This suggests that with proper patient selection, both techniques can be utilized with similar success and outcomes.

Multivariate regression analysis revealed no independent predictors of common complications such as hematoma, seroma, or nipple-areolar complex necrosis. However, increasing BMI was associated with increased incidence of surgical site infections. Again, this is not a surprising finding, as this increased incidence of surgical site infections in patients with a higher BMI has also been noted in other types of reconstructive and aesthetic breast surgery.[12,13] Additionally, in gender-affirming specific studies, Pittelkow et al found that BMI greater than 40 kg per square meter was associated with an increased risk of surgical site infections in patients undergoing gender-affirming mastectomy with free nipple grafts.[14] This finding was corroborated in a study by Gallagher et al, who reported increased rates of surgical site infections in obese patients.[15] Based on this well-described and supported association in the literature, it is important to counsel patients with a higher BMI that there is an increased risk of wound healing issues postoperatively. To mitigate these findings and minimize complications, patients should be presented options for weight optimization before surgical intervention, and any modifiable risk factors in these patients should be optimized, if possible. Additionally, there are important surgical considerations and expectations that must be discussed with patients with elevated BMI, including the need for revisions, where the incision will end (as it cannot be carried around onto the back), as well as the potential need to connect the incisions in the middle anteriorly.

Although comprehensive and sizeable in terms of the patient cohorts included, the limitations of our study should be considered when critically analyzing its results. The retrospective nature and lack of patient-reported outcome measures do present a simplistic analysis; however, we intend to soon present a prospective analysis using novel patient-reported outcome measures assessment tools to better understand the impact of these procedures on quality of life. Additionally, this study represents a single senior surgeon's experience, and the results may be unique to the expertise of this surgeon and thus not widely applicable to more novice surgeons performing these procedures. Although a limitation in certain context, this fact serves to demonstrate that with experience and improving comfort with these procedures, along with proper patient selection, both the periareolar and double incision techniques for gender-affirming mastectomy can be performed safely with comparable outcomes. Ultimately, surgeon experience and effective communication with the patient can facilitate desired outcomes with low complication and revision rates.

CONCLUSIONS

Here we present the largest comparison series of gender-affirming mastectomy procedures using either the periareolar or double incision with free nipple grafting techniques. Our results demonstrate no difference in the rates of revision or postoperative complications based on surgical technique and suggest that with proper patient selection, both techniques can be performed safely and with comparable outcomes.

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