

Chest Masculinization Technique and Outcomes in 72 Double-incision Chest-contouring Procedures with Free Nipple Grafting

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Background: Chest masculinization for gender affirmation is the removal of breast tissue and excess skin, often with repositioning of the nipple areola complexes to achieve a male-appearing chest. A double-incision technique with free nipple grafting (FNG) is the preferred method for trans men with large, ptotic breasts. The authors present the outcomes of 72 consecutive chest masculinization cases using this technique.

Methods: A retrospective chart review was performed between 2015 and 2020 on all patients who underwent chest masculinization surgery for gender dysphoria by the senior author (JDK). Patients who underwent masculinization by concentric circle or liposuction-only techniques were excluded. Potential risk factors for complications were analyzed with Chi-square and logistic regression techniques. $P < 0.05$ was considered significant.

Results: Seventy-two patients underwent bilateral mastectomy with free nipple grafting. There were 6 major complications resulting in return to operating room, re-admission, or need for interventional procedure. These included 4 hematomas, 1 infection, and 1 hospital admission for shortness of breath and pain. Minor complications treated conservatively included 3 seromas, 1 instance of delayed wound healing, 1 case of superficial thrombophlebitis, and 4 hypertrophic scars. Eleven patients experienced nipple areolar complex complications. Four patients underwent revision surgery. Nicotine use was associated with a higher rate of hematoma ($\chi^2: 9.95, P = 0.007$). Later operative date, a surrogate for experience, was associated with decreased return to the operating room (Odds ratio: 0.99, $P = 0.025$).

Conclusion: Double-incision chest contouring with free nipple grafting provides good chest contour for transgender men, with low complication rates. (*Plast Reconstr Surg Glob Open* 2021;9:e3459; doi: [10.1097/GOX.0000000000003459](https://doi.org/10.1097/GOX.0000000000003459); Published online 15 March 2021.)

INTRODUCTION

Chest masculinization (or “top surgery”) provides patients with their desired chest shape by removing breast tissue and excess skin. Top surgery is usually the first procedure patients undergo during their transition and has been shown to have significant improved effects on many mental health factors.^{1,2} Multiple operative techniques for

chest masculinization have been described, including the semicircular approach, transareolar approach, concentric circular technique, extended concentric circular technique, and the double-incision free nipple graft (FNG) approach.^{3–5} The choice of reconstruction technique depends on several factors, such as age, breast size, breast ptosis, and skin quality.^{3,4} Smaller breasts with good skin elasticity are candidates for the semicircular or transareolar technique, whereas larger breasts with grade II or III ptosis and poor skin elasticity typically undergo a Pasot reduction or double-incision mastectomy technique with FNG.⁴

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All chest reconstruction techniques involve the creation of a masculine chest contour. Of the techniques described, the double incision with FNG technique allows for the removal of a significant amount of breast tissue and excess skin, and provides a method for repositioning the NAC. Various parameters have been considered when assessing postoperative outcomes of transgender surgery, including but not limited to the formation of hematomas and seromas, wound infection, wound dehiscence, NAC necrosis, loss of nipple sensation, and unplanned reoperation.⁶ However, data on the complication profiles of each chest masculinization technique remain sparse. The authors aimed to add to the literature regarding the rates of major and minor complications following double-incision mastectomy with FNG, and to analyze risk factors for these complications in 72 consecutive cases.

METHODS

A retrospective chart review was conducted on all patients who underwent chest masculinization surgery using the double incision with FNG method by the senior author (JDK) between 2015 and 2020. The choice of operative technique for chest masculinization is based on preoperative breast size, ptosis, and skin quality. In general, we use the double-incision technique for all medium to large size breasts with any degree of ptosis because it provides the flattest chest contour with the ability to easily reposition and decrease the size of the NAC. In patients with borderline eligibility for a periareolar technique, the senior author and surgeon discusses the pros and cons of each technique and a decision is made after a discussion with the patient. In general, a periareolar or short scar technique allows for decreased scar burden, but at the cost of less control over shape, contour, and nipple position. We have found that in many patients, a flatter, more male-appearing chest is preferable to suboptimal contour with a smaller scar. Patients who underwent chest masculinization by concentric circle or liposuction-only techniques were excluded. Patient demographics were collected along with patient history of chest wall binding, androgen therapy, and prior procedures. Descriptive statistics were recorded as counts and reported as proportions. Categorical data were analyzed using the Pearson's chi-squared test and continuous variables were analyzed using binominal logistic regression. Binary predictors included patient characteristics such as preoperative binding and nicotine use, and binary outcomes included the instance of hematoma, seroma, delayed healing, infection, and return to OR. The interplay between (dys)synergistic effects of multiple complications was not addressed in this series due to low incidence. Significance was defined as $P < 0.05$. IBM SPSS Statistics (version 23, Armonk, N.Y.) and Microsoft Excel (version 1806, Redmond, Wash.) were used for the statistical analyses.

Operative Technique

Preoperative Markings

The patient is marked in the standing position. The sternal notch is marked, and a line drawn down to the

xiphoid to delineate the midline. The original breast footprint is marked in dotted lines. The inframammary folds are marked with lateral extensions as needed, based on body habitus to prevent aesthetic deformity due to excess lateral chest wall fullness. Pitanguy's point marks the midline of the upper incision, and the breast is transposed medially and laterally to draw a straight line medially and laterally from this midline point to the IMF markings (Fig. 1). A pinch technique is used to ensure that these markings will remove enough skin while not placing the incisions under too much tension. In ptotic breasts, this planned resection easily includes the nipple areola complex (NAC). The patient is then asked to flex their pectoralis muscles by putting their hands on their hips, and the lateral border is marked. The new nipple position is tentatively marked along the lateral border of the muscle between the fourth and fifth ribs; however, this position will be verified intra-operatively. Planned drain sites are marked laterally below the incision. Our technique has been previously described and demonstrated.⁷

Intra-operatively, the patient is prepared with chlorhexidine with arms at 90 degrees. Arms are padded and secured to the arm boards so that the patient can be sat up during surgery.

Tissue Resection

In total, 3 cm³ of 1% lidocaine with epinephrine 1:100,000 is injected under each NAC, which are then removed as full-thickness grafts using a 36-mm cookie-cutter—the smallest cookie-cutter available in our set. The grafts are placed in moist gauze and placed on the back table and are trimmed immediately before inset. The superior and inferior incisions are made through the skin with a scalpel, and electrocautery is used to dissect down at the superior incision until the breast capsule is identified. This plane may be less well-defined in patients with a history of chest wall binding. The superior flap is elevated off breast tissue until the chest wall is reached, and dissection is extended up to the clavicle to allow better mobility and draping of the skin flap upon closure. Care should also be taken to ensure that all breast tissue in the axillary



Fig. 1. Preoperative markings.



Fig. 2. Elevation of superior flap up to clavicle.

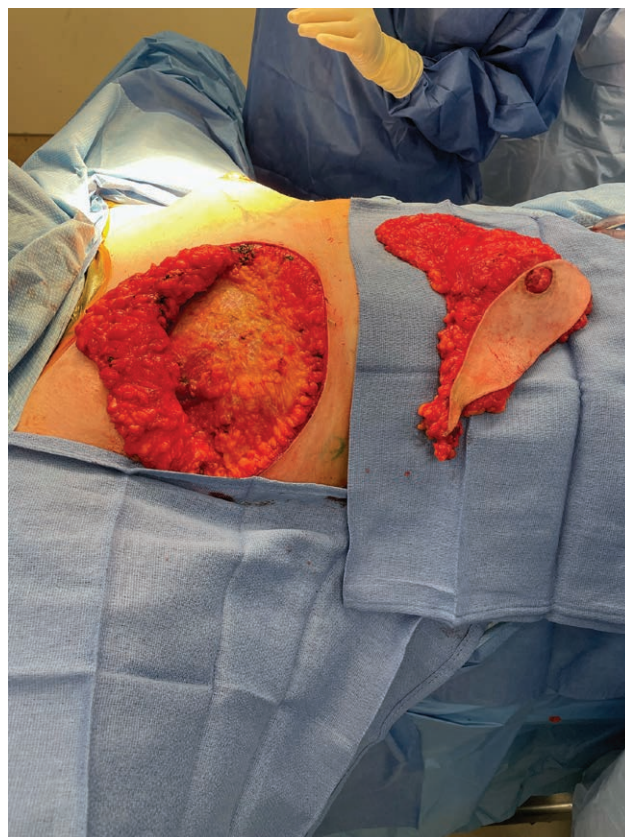


Fig. 3. En bloc tissue removal.

tail of Spence is removed (Fig. 2). Next, the inferior incision is made down to the chest wall. This dissection is beveled superiorly to leave fat inferiorly to prevent a step-off deformity. The inframammary fold is released through the inframammary incision and is excised with the breast specimen. The inferior skin flap is not raised. The breast tissue is then removed en bloc by dissecting the breast tissue off of the pectoralis fascia from medial to lateral (Fig. 3). The pectoralis fascia should be left undisturbed and ensures better hemostasis. Once the lateral border of the pectoralis major muscle is reached, the fat pad over the serratus anterior should be left down to prevent lateral hollowness. Each breast specimen is oriented with silk suture and sent to pathology for routine evaluation. Additional breast tissue may be removed as needed from the superior flap if necessary, but should also be sent for pathologic examination.

After hemostasis is ensured, liposomal bupivacaine is injected in the pectoralis fascia, along incisions and as intercostal blocks for postoperative pain control. The lateral border of the pectoralis muscle is marked on the skin flap for preliminary NAC placement and a drain is placed on each side. Because we often raise the skin flaps all the way to the clavicle to properly re-drape the skin, drains are placed due to the large dead space that is created. A fibrin sealant is then sprayed between the chest wall and skin flap and the incision tailor tacked closed with staples. Dog-ears can be addressed and removed as needed at this point.

Nipple Areolar Complex

The new NAC position is determined using 3 steps. First, the skin flap is marked at the lateral border of the pectoralis major muscle at about the fourth intercostal space to provide a preliminary position of the NAC. Three silk sutures are then placed in the midline: sternal notch, mid-point between proposed NACs, and xiphoid. The silk suture between the 2 NAC positions is pulled horizontally on a tangent over one side of the chest, and Steri Strips (3M) are placed along the suture to divide the chest wall into thirds. The NAC should lie at about two-thirds the distance of the chest wall, measured from midline to the edge of the lateral chest border. This same silk suture can be transposed to the other side of the chest wall to confirm placement of the contralateral NAC. The silk sutures at the sternal notch and xiphoid can be triangulated with a clamp and transposed from side to side to confirm the symmetry of the 2 NACs. This 3-step technique is demonstrated in supplemental video. (See Video [online], which displays NAC placement technique.) An oval measuring 25 mm × 20 mm is drawn at each determined site on a 20-degree cant superiorly from medial to lateral and the patient is sat up to confirm placement. Once accurate placement is verified, each NAC full-thickness graft is thinned with sharp scissors and edges contoured as needed. The NAC grafts generally heal flat with very little projection, without the need to reduce the nipple itself. However, in some cases where the nipples have significant

projection or are very wide, they can be reduced by wedge excision before reapplying as a graft. This was uncommon in our series and was only required in a few cases. The new NAC positions on the superior flap are de-epithelialized and grafts are inset with 3-0 chromic suture at the cardinal points and a 4-0 monocryl running half buried mattress suture with the buried side on the areola. We have found that this suture technique decreases any railroad tracking around the healed graft.

The technique to bolster down our NAC grafts has changed in our practice. Standard tie-over bolsters using Xeroform, cotton balls, and mineral oil were initially used; however, we have found better graft take after switching to a negative pressure dressing bolster. For this, we place Adaptic (Acelity) oil emulsion dressings directly over the NAC graft, followed by a Prevena (KCI) foam VAC dressing. The 2 foam dressings over the NACs are connected by a bridge that spans the midline chest superiorly and connected to the suction machine that the patient can easily manage at home until clinic follow-up. The VAC is maintained for 5–7 days. In this cohort, 32 patients had tie-over bolsters, while 37 patients received a negative pressure dressing.

Dermabond is used over remaining incisions, and patients are placed in a compressive chest dressing made of ACE wrap and silk tape.

Postoperative Care

Patients are either discharged the same day or on the morning of postoperative day 1. The NAC grafts are unveiled on postoperative day 5, and drains are removed once the output is <30 cm³ in 24 hours for at least 2 days. A compressive chest dressing is continued for 6 weeks. We believe the use of a negative pressure wound therapy system for bolstering of the grafts has improved the healing and appearance of the NACs. Postoperative outcomes are shown in Figures 4 and 5. We recommend that patients avoid heavy lifting and strenuous activity for 4 weeks following the operation and can resume full activity by 6 weeks post-procedure. Patients were followed for an average of 3 months postoperatively and all complications were recorded.

RESULTS

A total of 72 patients were included in the study. At the time this study was conducted, 75 chest procedures had

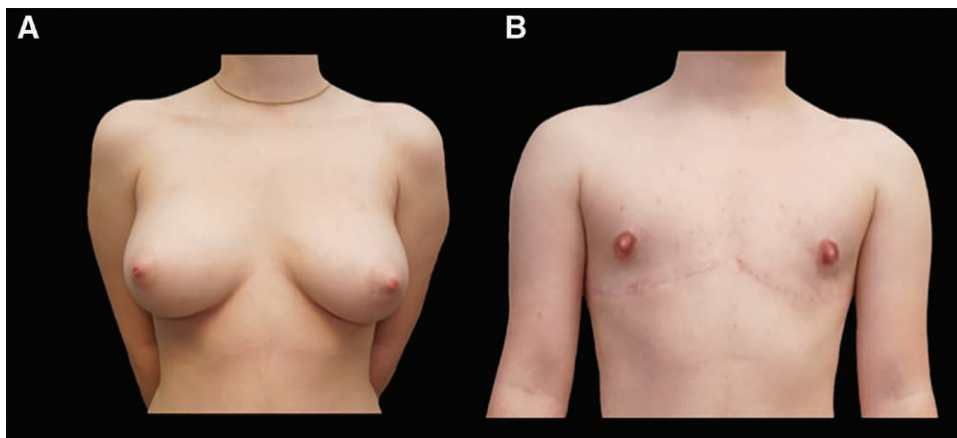


Figure 4. Pre- and postoperative photographs. A, Preoperative photograph of patient with grade I ptosis. B, Postoperative result.

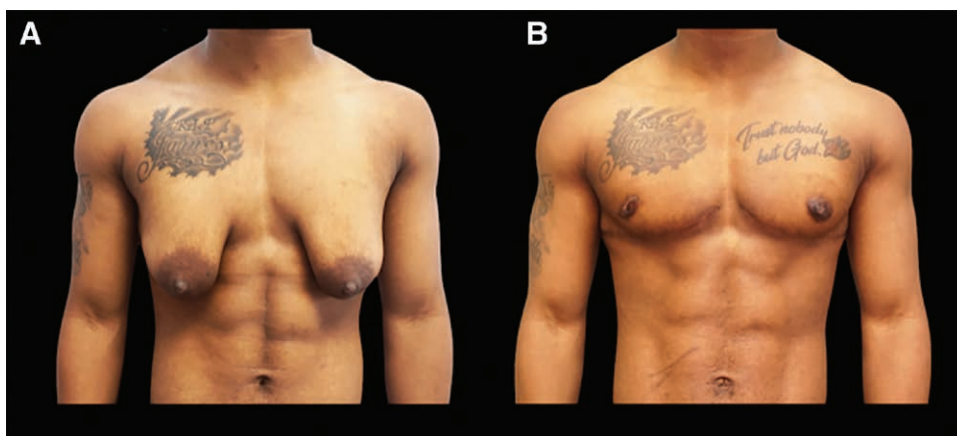


Figure 5. Pre- and postoperative photographs. A, Preoperative photograph of patient with grade III ptosis. B, Postoperative result.

been performed; 3 were excluded because the concentric circle or liposuction-only techniques were used. The average age was 26.5 (SD: ±7.9; range: 16–56) years, and mean body mass index (BMI) was 28.5 (SD ±6.8; range: 15.7–46.8) kg/m². Forty patients (56%) had a known history of chest wall binding for an average of 47.7 months (SD ±38.8; range: 3–120) and 57 patients (79%) had undergone preoperative androgen therapy for an average of 23 months (SD ±16.6; range: 3–72). Self-reported length of chest wall binding and androgen use were used in this study. Twenty-one patients (29.2%) were smokers. Patient demographics are detailed in Table 1. Patients were followed for an average of 3 (median 1; range: 0–31) months.

There were 6 major complications necessitating return to the operating room, an interventional radiological procedure, or hospital admission. These included 4 hematomas (5.6%), 1 infection (1.4%), and 1 hospital admission for shortness of breath and pain (1.4%). Minor complications that were treated conservatively included 3 seromas (4.2%), 1 instance of delayed wound healing (1.4%), 1 instance of superficial thrombophlebitis of the thigh (1.4%), and 4 hypertrophic scars (5.6%). Eleven patients (15.3%) experienced NAC complications including 6 with partial NAC slough or scabbing that were treated with local wound care, 1 total NAC graft loss, and 4 with nipple hypopigmentation. All NAC complications have gone on to heal completely without the need for additional intervention or revision. Six patients (8.3%) developed cosmetically displeasing dog-ears. Four patients (5.6%) underwent revision surgery. Complications are summarized in Table 2. The use of nicotine was significantly associated with a higher rate of hematoma (χ^2 : 9.95, $P = 0.007$). Both increased age was associated with infection [Odds Ratio (OR): 1.22, 95% Confidence Interval (CI): -0.99 to 1.45, $P = 0.081$], and increased BMI was associated with an increased incidence of hematoma formation (OR: 1.15, 95% CI: -0.99 to 1.31, $P = 0.08$), but did not reach statistical significance. Increased weight of tissue resected was associated with incidence of delayed wound healing but did not reach statistical significance (OR: 1.00, 95% CI: -1.00 to 1.00, $P = 0.105$). Although multiple findings approached significance such as BMI with hematoma and age with infection, these did not reach significance at $P < 0.05$. Given there was only 1 finding to reach significance at $P < 0.05$, namely nicotine use with hematoma formation, multiple logistic regression was neither possible nor indicated.

The overall mean operative time in our study was 156 minutes and we saw a downward trend as experience increased. From 2015 to 2017, 8 procedures were performed, and the average time was 174 minutes. In 2018 (n = 19), the average was 175 minutes, but in 2019 (n = 32) the average dropped to 152 minutes, and so far in 2020, 13 procedures have been performed with an average operative time of 128 minutes. Operative time was not associated with complications. Operations performed later within the cohort were associated with decreased rates of hematoma, although were not statistically significant (OR: 0.99, 95% CI: -0.99 to 0.99, $P = 0.060$) and significantly

Table 1. Patient Demographics and Operative Details (n = 72)

Age in years, mean (SD; range)	26.5 (±7.9; 16–56)
BMI, mean (SD; range)	28.5 (±6.8; 15.7–46.8)
Race, %	
White	52.8%
Black	30.6%
Hispanic	5.6%
Asian	1.4%
Other or mixed	9.7%
Binding	
History of binding, %	55.6%
Length of binding in months, mean (SD; range)	47.7 (±38.5; 3–120)
Testosterone use	
History of use, %	79.2%
Length of use in months, mean (SD; range)	22.9 (±16.6; 3–72)
Smoking history	
History of use, %	29.2%
Comorbidities	
Hypertension	2.8%
Diabetes	1.4%
Hyperlipidemia	4.2%
Psychiatric diagnosis	29.2%
Operative details	
Average weight per breast in grams (SD; range)	648 (±426.9; 118–2284)
Average operative time in minutes (SD; range)	156 (±35.1; 71–240)

Table 2. Complications

Major complications	n = 72 (%)
Hematoma (return to OR)	3 (4.2)
Hematoma (IR drain)	1 (1.4)
Abscess	1 (1.4)
Postoperative atelectasis	1 (1.4)
Minor complications	n = 72 (%)
Seroma	3 (4.2)
Delayed wound healing	1 (1.4)
Superficial thrombophlebitis	1 (1.4)
Dog-ear	6 (8.3)
Hypertrophic scarring	4 (5.6)
Nipple complications	n = 69 (%)
Nipple areolar complex sloughing	6 (8.7)
Nipple areolar complex loss	1 (1.5)
Nipple hypopigmentation	4 (5.8)
Revision procedures	n = 72 (%)
Return to OR	3 (4.2)
Revision performed in office	1 (1.4)

IR, interventional radiology; OR, operating room.

associated with decreased rates of return to the operating room (OR: 0.99, 95% CI: -0.99 to 0.99, $P = 0.025$). Statistical analysis results are summarized in Table 3.

DISCUSSION

Understanding the complication rates following chest masculinization using the double-incision chest-contouring technique and the patient factors that contribute to those complications is important for improving care. These data improve informed consent discussions and patient expectations. For the purposes of this study, we have classified complications as either major or minor. Complications were classified as major if they required immediate return to the operating room, an interventional procedure, or hospital admission. All other complications were considered minor, including non-operative seromas, dog-ears, delayed wound healing, NAC sloughing and graft loss, nipple hypopigmentation, hypertrophic

Table 3. Inferential Analysis of Complications and Patient Characteristics

	Hematoma			Seroma			Delayed Healing			Infection			Return to Operating Room		
	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P	OR	95% CI	P
Age	1.07	-0.96 1.18	0.285	0.82	-0.52 1.12	0.193	0.89	-0.48 1.30	0.572	1.22	-0.99 1.45	0.081	1.06	-0.02 2.10	0.308
BMI	1.15	-0.99 1.31	0.08	0.87	-0.62 1.12	0.282	1.41	-0.88 1.94	0.205	0.95	-0.62 1.28	0.792	1.07	-0.93 1.21	0.33
Binding time	NC	NC NC NC	NC	1.03	-0.97 1.09	0.35	1.04	-0.97 1.11	0.265	NC	NC NC NC	NC	0.7	-0.13 1.27	0.222
Testosterone duration	1.04	-0.98 1.10	0.25	0.96	-0.83 1.09	0.504	1.04	-0.95 1.13	0.387	NC	NC NC NC	NC	1.05	-0.99 1.11	0.118
Weight resected	1	-1.00 1.00	0.944	0.99	-0.99 0.99	0.34	1	-1.00 1.00	0.105	1	-1.00 1.00	0.949	0.99	-0.99 0.99	0.351
Operative date	0.99	-0.99 0.99	0.06	1	-1 1	0.118	1	-1 1	0.645	1	-1 1	0.108	0.99	-0.99 0.99	0.025
Operative time	0.97	-0.94 1.00	0.822	0.99	-0.96 1.02	0.809	0.99	-0.93 1.05	0.741	0.98	-0.92 1.04	0.515	1	-0.97 1.03	0.515
		χ^2	P		χ^2	p		χ^2	p		χ^2	p		χ^2	P
Nicotine use		9.95	0.007		0.3	0.862		3.22	0.2		0.43	0.808		1.74	0.418
Marijuana use		0.4	0.526		0.4	0.526		0.13	0.719		0.13	0.719		0.53	0.465
Preop binding		0.35	0.555		0.34	0.555		0.46	0.499		NC	NC		0.98	0.321
Testosterone use		0.77	0.38		0.77	0.38		0.25	0.618		0.25	0.618		1.12	0.291
Psychiatric comorbidity		0.02	0.884		2.07	0.15		2.42	0.12		2.42	0.12		0.04	0.85

NC, no combination.

Bold values indicate a statistically significant finding.

scaring, and superficial thrombophlebitis. Unplanned revisions were also noted.

Major Complications

Four patients (5.6%) developed postoperative hematomas, which is comparable to what has been reported in the literature.^{4,8-11} Cohen et al conducted a literature review and found that the overall hematoma rate for chest wall reconstruction for gender dysphoria ranged from 6%–30%, but that the rate was only 3%–5% following oncological mastectomies.⁹ This higher rate of hematoma in transgender surgery has been partly attributed to smaller incisions and less visibility to achieve hemostasis compared with oncologic resections. In fact, Monstrey et al studied the complication rates in multiple chest wall reconstruction techniques and found that the rate of hematoma formation was lower in patients with larger breasts undergoing double-incision mastectomies than patients with smaller breasts who opted for a semicircular or transareolar reconstruction.⁴ Other studies have presented similar findings.^{10,12,13} The rate of hematomas following mastectomy with FNG for chest masculinization has been reported as low as 2.1%.¹⁴

Hormone therapy has also been theorized to contribute to a higher hematoma rate in transgender surgery, but has not been found to be associated, in the literature. Likewise, our study, where patients are allowed to continue testosterone during the peri-operative period, found no correlation between preoperative androgen therapy and incidence of hematoma.

The one correlation that we found was that the use of nicotine was associated with a significantly higher risk of hematoma formation ($P = 0.007$). Smoking is a well-documented risk factor for postoperative complications. Nicotine alone causes a decrease in proliferation of red blood cells, vasoconstriction of the microvasculature, and increased platelet adhesion (leading to clots and poor perfusion), while carbon monoxide, another component of cigarettes, leads to a decrease in oxygen-carrying capacity of hemoglobin.¹⁵ Other studies have also reported a significant correlation between smoking and hematoma formation in different types of surgeries, although the

mechanism for this correlation has not been fully elucidated.¹⁶ In our practice, we require patients to quit smoking at least 4 weeks before surgery, but confirmatory tests are not performed.

Although we did see an association between BMI and hematoma formation, it failed to reach statistical significance ($P = 0.08$). BMI is another patient factor that has been associated with increased rates of postoperative complications. Cuccolo et al found that BMI was an independent risk factor for all-cause or wound complications, in patients undergoing chest reconstruction for cancer risk reduction, gynecomastia, or gender dysphoria, but that trans men did not have increased risk compared with the other groups.¹¹ One proposed mechanism of these complications, especially infection, is that obese patients have been found to have decreased subcutaneous tissue oxygenation despite supplemental oxygen.¹⁷ We did not see an association between BMI and infection rate or delayed wound healing. Because associations between various complications and BMI did not reach statistical significance, we do not recommend a BMI cutoff for patients seeking chest masculinization.

Similarly, we found that an increasing weight of tissue resected was associated with increasing incidence of delayed wound healing, although it did not reach statistical significance ($P = 0.105$). The weight of breast resection has been shown to be a risk factor for mastectomy skin flap necrosis for oncologic resections¹⁸⁻²¹; however, to our knowledge, it has not been shown for transgender subcutaneous mastectomies. Theories for this correlation in oncologic mastectomies include decreased blood flow to the skin flaps or increased damage to the subdermal vascular plexus by surgical retraction during large resections. A larger sample size may have shown a similar correlation for transgender mastectomies. No other factors significantly contributed to the development of hematoma or delayed wound healing in our cohort.

The last 2 major complications in our cohort required hospital admission. One patient (1.4%) in our study required an incision and drainage procedure, and antibiotics for the management of a postoperative abscess. No other patients developed an infection that required

medical or surgical intervention. This is consistent with the rates reported in the literature, which ranged from 0% to 10%.¹⁴ An additional patient (1.4%) experienced shortness of breath on postoperative day 3 and was found to have left-sided atelectasis. The patient was admitted to an observation unit overnight for pain control and incentive spirometry.

Minor Complications

Overall, 18 patients (25%) experienced a minor complication. Although there are some variations on what is considered a minor complication in the literature, the parameter of non-operative management is widely accepted. The rate of overall minor complications in the literature ranges from 18.7% to 65.7%,^{10,22} One possible explanation for this wide range of data is that much of the literature on postoperative complications in chest-contouring procedures is based on a single-surgeon or single-institution experience, and complications are likely to decrease with increased experience.²² Another possible reason is that what is considered a minor complication varies slightly with each study; so direct comparison is not always possible.

One feared complication of the double incision with FNG graft technique is NAC necrosis and graft loss. The rate of NAC necrosis (either partial or complete) has been reported from 0.4% to 12%.^{10,23} In our cohort, all but 3 patients underwent free nipple grafting as part of their double-incision reconstruction. Only 1 patient (1.5%) experienced complete NAC graft loss, and 6 patients (11.6%) experienced some degree of NAC sloughing. All these patients were successfully treated with local wound care. Although 1 patient experienced total NAC graft loss, it was managed with local wound care and healed with an acceptable appearance, for which the patient did not undergo additional reconstruction. Four patients (5.8%) developed hypopigmentation of the NAC after reconstruction. Depigmentation of the NAC follow FNG is a well-documented phenomenon,²⁴ with some authors recommending consideration of a double incision with nipple transposition on a pedicle technique to avoid this complication.²² We do not employ this technique in our practice because we find the tradeoff for a suboptimal chest contour unacceptable. NAC graft hypopigmentation can be corrected with tattooing, if desired.

Hypertrophic scarring occurred in 4 patients (5.6%) and was treated with silicone tape or steroid injections and creams. Additional minor complications included 3 (4.2%) seromas that were managed conservatively, 1 of which was improved with drain stripping and 2 were resolved with observation and improved compression wrapping. The seroma requiring drain stripping resolved immediately, and the remaining 2 seromas resolved within 2–4 weeks. There was 1 occurrence (1.4%) of delayed wound healing, which resolved with local wound care.

Revision Surgeries

A total of 4 patients (5.6%) had revision surgery for dog-ear correction and 2 patients had axillary or lateral fullness, 1 of which was corrected by liposuction and the other by excision. The overall rate of revision surgery

following chest masculinization of any kind ranges from 5.9% to 42.8%.³ The rate of secondary procedures using the FNG technique is favorable compared with other techniques described. Wilson et al reports a significantly higher rate of revisional procedures for those patients who underwent chest masculinization with a periareolar skin resection (37.5%) or inferior pedicle mammoplasty (27.9%) compared with those who underwent the double-incision FNG (20.3%).²⁵ Donato et al reported similar findings.¹² Although McEvenue et al reported no significant difference in the overall reoperation rates of FNG compared with the “keyhole” technique (14.4% versus 10.6%), they did find that reoperation following nipple grafting usually involved contour revisions rather than nipple-related revisions.¹⁰ The rate of secondary revision procedures in our cohort is favorable when compared with what has been reported in the literature. However, we recognize that additional follow-up time may change these statistics, as an average of 3 months may not be long enough to evaluate final scars and contours.

SUMMARY AND LIMITATIONS

Double-incision chest contouring with FNG is generally considered an appropriate reconstruction technique for patients with large breasts. It offers significant advantage in contour and allows for the ideal placement of the NAC. Similar to what has been published, we showed that once mastered, this technique can also be completed quickly, leading to decreased operative times.^{10,14}

Although this approach provides excellent contouring capabilities, it also leaves large horizontal scars across the chest, which can be displeasing to some patients. Given the goal of chest masculinization is largely cosmetic, one limitation of this study is that we did not assess patient satisfaction. Patient preference, expectations, and desired look play a large role in the decision-making process and we hope to include these data in future studies.

CONCLUSIONS

The double incision with free nipple grafting technique provides good chest contour for transgender men with low complication rates. Smoking was associated with a higher rate of hematoma. A higher BMI was associated with a higher rate of hematoma, and the weight of tissue resected was associated with an increased incidence of delayed wound healing, although these did not reach statistical significance. With more experience, the operative time and complications necessitating return to the operating room can be reduced.

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REFERENCES

1. van de Grift TC, Kreukels BP, Elfering L, et al. Body image in transmen: multidimensional measurement and the effects of mastectomy. *J Sex Med.* 2016;13:1778–1786.

2. Poudrier G, Nolan IT, Cook TE, et al. Assessing quality of life and patient-reported satisfaction with masculinizing top surgery: a mixed-methods descriptive survey study. *Plast Reconstr Surg*. 2019;143:272–279.
3. Ammari T, Sluiter EC, Gast K, et al. Female-to-male gender-affirming chest reconstruction surgery. *Aesthet Surg J*. 2019;39:150–163.
4. Monstrey S, Selvaggi G, Ceulemans P, et al. Chest-wall contouring surgery in female-to-male transsexuals: a new algorithm. *Plast Reconstr Surg*. 2008;121:849–859.
5. Safa B, Lin WC, Salim AM, et al. Current concepts in feminizing gender surgery. *Plast Reconstr Surg*. 2019;143:1081e–1091e.
6. Tolstrup A, Zetner D, Rosenberg J. Outcome measures in gender-confirming chest surgery: a systematic scoping review. *Aesthetic Plast Surg*. 2020;44:219–228.
7. Ayyala HS, Mukherjee TJ, Le TM, et al. A three-step technique for optimal nipple position in transgender chest masculinization. *Aesthet Surg J*. 2020;40:NP619–NP625.
8. Olson-Kennedy J, Warus J, Okonta V, et al. Chest reconstruction and chest dysphoria in transmasculine minors and young adults: comparisons of nonsurgical and postsurgical cohorts. *JAMA Pediatr*. 2018;172:431–436.
9. Cohen WA, Shah NR, Iwanicki M, et al. Female-to-male transgender chest contouring: a systematic review of outcomes and knowledge gaps. *Ann Plast Surg*. 2019;83:589–593.
10. McEvenue G, Xu FZ, Cai R, et al. Female-to-male gender affirming top surgery: a single surgeon's 15-year retrospective review and treatment algorithm. *Aesthet Surg J*. 2017;38:49–57.
11. Cuccolo NG, Kang CO, Boskey ER, et al. Mastectomy in transgender and cisgender patients: a comparative analysis of epidemiology and postoperative outcomes. *Plast Reconstr Surg Glob Open*. 2019;7:e2316.
12. Donato DP, Walzer NK, Rivera A, et al. Female-to-male chest reconstruction: a review of technique and outcomes. *Ann Plast Surg*. 2017;79:259–263.
13. Frederick MJ, Berhanu AE, Bartlett R. Chest surgery in female to male transgender individuals. *Ann Plast Surg*. 2017;78:249–253.
14. Cuccolo NG, Kang CO, Boskey ER, et al. Masculinizing chest reconstruction in transgender and nonbinary individuals: an analysis of epidemiology, surgical technique, and postoperative outcomes. *Aesthetic Plast Surg*. 2019;43:1575–1585.
15. Silverstein P. Smoking and wound healing. *Am J Med*. 1992;93(1A):22S–24S.
16. Hwang K, Son JS, Ryu WK. Smoking and flap survival. *Plast Surg (Oakv)*. 2018;26:280–285.
17. Kabon B, Nagele A, Reddy D, et al. Obesity decreases perioperative tissue oxygenation. *Anesthesiology*. 2004;100:274–280.
18. Ito H, Ueno T, Suga H, et al. Risk factors for skin flap necrosis in breast cancer patients treated with mastectomy followed by immediate breast reconstruction. *World J Surg*. 2019;43:846–852.
19. Matsen CB, Mehrara B, Eaton A, et al. Skin flap necrosis after mastectomy with reconstruction: a prospective study. *Ann Surg Oncol*. 2016;23:257–264.
20. Davies K, Allan L, Roblin P, et al. Factors affecting post-operative complications following skin sparing mastectomy with immediate breast reconstruction. *Breast*. 2011;20:21–25.
21. Cho JW, Yoon ES, You HJ, et al. Nipple-areola complex necrosis after nipple-sparing mastectomy with immediate autologous breast reconstruction. *Arch Plast Surg*. 2015;42:601–607.
22. Whitehead DM, Weiss PR, Podolsky D. A single surgeon's experience with transgender female-to-male chest surgery. *Ann Plast Surg*. 2018;81:353–359.
23. Lo Russo G, Tanini S, Innocenti M. Masculine chest-wall contouring in FtM transgender: a personal approach. *Aesthetic Plast Surg*. 2017;41:369–374.
24. Frey JD, Yu JZ, Poudrier G, et al. Modified nipple flap with free areolar graft for component nipple-areola complex construction: outcomes with a novel technique for chest wall reconstruction in transgender men. *Plast Reconstr Surg*. 2018;142:331–336.
25. Wilson SC, Morrison SD, Anzai L, et al. Masculinizing top surgery: a systematic review of techniques and outcomes. *Ann Plast Surg*. 2018;80:679–683.