

Refining Surgical Decision-Making in Top Surgery: Insights from a Learning Curve in Transgender and Non-Binary Chest Contouring

İşıl Akgün Demir¹, İhtişam Zafer Cengiz¹

¹ Department of Plastic, Reconstructive, and Aesthetic Surgery, Istanbul Atlas University, Istanbul, Türkiye

Abstract

Aim: Top surgery, historically associated with transgender individuals, is increasingly recognized as chest contouring due to the growing visibility of non-binary individuals. The procedure involves the removal of breast tissue to achieve a more masculine or gender-neutral chest appearance. While it may appear straightforward, optimal results depend on attention to key preoperative and intraoperative details.

Methods: A retrospective review was conducted of 90 patients who underwent chest wall contouring using the double incision free nipple graft (DIFNG) technique. Demographic and clinical data, operative details, and complication rates were analyzed. The rationale for major and minor revisions was assessed, and a simplified decision-making algorithm was proposed based on patient characteristics and intraoperative findings.

Results: Complications included dog ear formation, hypertrophic scarring, and hematoma, with contributing factors such as insufficient liposuction and poor scar placement. The implementation of adjunctive techniques—such as quilting sutures and targeted liposuction—reduced the need for drains and improved contour outcomes. Patient-specific refinements were incorporated into a decision-making framework to aid technique selection and anticipate common pitfalls.

Conclusions: Top surgery is a critical gender-affirming procedure that requires thoughtful technical execution. Sharing lessons learned during the early learning curve can help novice surgeons optimize outcomes. A structured algorithm based on skin quality, anatomical characteristics, and patient goals can support better decision-making and reduce revision rates.

Keywords: Mastectomy; top surgery; female-to-male; non-binary

1. Introduction

Top surgery has traditionally been associated with transgender individuals. With increasing recognition of non-binary identities, the term *chest contouring* better reflects its broader role in achieving masculine, feminine, or neutral appearances. Transmasculine or gender-neutral top surgery is often the initial surgical choice for many, as it significantly contributes to their social acceptance and self-esteem.

The primary goal of top surgery is to modify the feminine appearance of the chest by removing the breast tissue. This includes reshaping the chest wall, managing the nipple-areola complex (NAC), and eliminating the inframammary fold (IMF) and breast footprint.

Patient selection is generally limited to overall health status; thus, outcome optimization and tailored algorithms are essential.

Double incision with free nipple graft is a well-known technique among the top surgery techniques¹⁻². It allows removal of excess skin and tissue, reduces revisions in patients with poor skin elasticity, but leaves longer scars and loss of nipple sensation.

Although this procedure may seem straightforward, certain

technical details must be carefully considered preoperatively to achieve optimal outcomes. Sharing a simplified algorithm based on 90 cases can guide young surgeons in anticipating revisions and preoperative challenges.

2. Materials and Methods

This study was approved by the institutional ethics committee and conducted in accordance with the Declaration of Helsinki. Ninety consecutive patients over 18 years, all operated by the author, were retrospectively reviewed. Six had previous breast reduction or mastectomy requiring revision DIFNG. Complications were recorded during follow-up.

2.1. Statistical analysis

Data were analyzed with SPSS v22. Normality was assessed with Kolmogorov-Smirnov. Student's t-test or Mann-Whitney U was used for quantitative data, Chi-Square/Fisher's Exact for categorical variables, and logistic regression for multivariate analysis. Signifi-

cance was set at $p < 0.05$.

2.2. Preoperative evaluation

Each patient was required to undergo breast screening. Depending on their age, either a mammogram or breast ultrasound was requested. Demographic and clinical data, including age, status of hormone (testosterone) therapy, duration of binder usage, body mass index (BMI), comorbidities, smoking status, and skin elasticity were recorded. Sternal notch-nipple (SN-N) distances, nipple-IMF (N-IMF) distances, upper chest circumference, and sternal length were measured.

2.3. Markings

IMF, midline, breast meridians, and excision borders were marked; liposuction areas were added when needed.

2.4. Surgical technique

All patients received antibiotic prophylaxis before surgery and were operated on under general anesthesia. All excised tissue was sent for pathological examination.

The surgery starts with the preparation of the NAC grafts. A specially designed cookie cutter with a diameter of 20 mm is used for this purpose. The NAC graft is taken using a 15-blade as a full-thickness skin graft. This step is skipped for patients who do not wish to retain the NAC.

Next, the inferior border of the marking is incised, and the glandular breast tissue is elevated off the pectoralis major fascia up to the second intercostal space. The upper border marking is then rechecked with the help of a Pitanguy marker to ensure a tension-free closure, and the breast tissue is removed through the upper incision. The thickness of the upper flap is evaluated, and any excess tissue is trimmed accordingly. Following meticulous hemostasis, the upper flap is fixed to the pectoralis major fascia with 2-0 polyglactin sutures in a quilting fashion. In order to stabilize the incision line and prevent scar migrations, the Scarpa fascia at the level of inferior incision is sutured down to the pectoralis major and serratus anterior fascia. The Scarpa fascia at the skin closure line is sutured with the same material. Any dog ear formations are corrected after the deep skin closure with 3-0 poliglecaprone sutures. After correcting the dog ears, the final skin closure is performed with 4-0 poliglecaprone sutures.

Liposuction is performed if needed to eliminate bulky appearance on the lateral sides and to equalize the flap thickness over the pectoral region. No drains are used. Finally, the new position of the NAC is determined using the cookie cutter. After markings are placed, the alignment of the NACs is double-checked with a silk thread. The NAC grafts are then thinned using Metzenbaum scissors. Following de-epithelization, the NAC grafts are sutured to the recipient beds with 5-0 absorbable sutures and secured with tie-over dressings.

2.5. Postoperative Period

Patients were discharged the next day with pressure garments for 6 weeks, avoiding strenuous activity. Tie-over dressings were removed on day 5; antibiotic ointment applied to grafts every other day for 2 weeks.

3. Results

Ninety patients were included, mean age 28.3 years (18–50) and mean BMI 25.3 kg/m² (18.2–36.6). Six were secondary cases requiring revision DIFNG. Four revisions followed prior mastectomy (two peri-areolar, one liposuction, one DIFNG) and two followed breast reduction.

Thirty-eight patients were smokers; 60 were on testosterone. The mean binder duration was 56 months (0–300). Mean excised tissue weight: 463.7 g right, 446.5 g left. Liposuction was performed in 28 cases. NAC grafts were omitted in 2 patients by request. Mean

follow-up was 6.9 months (0–40). All the descriptive data pertaining to this study can be found on Table 1.

Complications included dog ear formation in 24 patients, surface irregularity of the mastectomy flap in 1 patient which required fat grafting, keloid formation in 1 patient, hypertrophic scarring in 10 patients, wound dehiscence in 1 patient requiring secondary closure, and hematoma formation in 2 patients. In 2 patients, inadequate debulking of the tissues between the final closure line and the original inframammary fold resulted in a highly positioned scar appearance. No cases of seroma or nipple loss were observed.

Regression analysis revealed that BMI, right and left J-N distances, right N-IMF distance, and tissue removed were significant predictors of dog ear formation ($p < 0.05$). The model had good explanatory power (Nagelkerke $R^2 = 0.396$, accuracy 83.3%).

Table 1

Demographic and surgical data of the groups.

	Min	Max	Avg.±SD	Median
Age (year)	18	50	28.63±7.82	27
Body mass index (kg/m ²)	18.2	36.6	25.34±4.21	24.15
Chest binding (month)	0	300	56.04±56.65	48
Excised breast tissue R (gr)	47	1600	463.70±270.77	422.5
Excised breast tissue L (gr)	45	1300	446.54±246.05	422.5
Follow-up duration (month)	0	40	6.88±8.02	5
	n	%		
Smoking status	38	42.2		
Testosterone therapy	60	66.7		
Liposuction	28	31.1		

4. Discussion

Female-to-male top surgery is a well-known concept, particularly since it was first introduced in the literature in 1995 with the first case series by Hage & Kesteren¹. Terminology now includes non-binary and genderqueer patients; a flat chest is associated with both masculine and gender-neutral appearances. Few studies report non-binary outcomes²; in this series, only 2 patients declined NAC grafting.

Although seemingly straightforward, top surgery is reconstructive with destructive elements, and complications such as scarring, asymmetry, and dog ears are unforgiving.

Numerous techniques and algorithms have been described in the literature for female-to-male top surgery³⁻⁴. Similarly, cases of advanced gynecomastia presenting with feminine breasts are managed using similar techniques⁵⁻⁶. The primary difference between non-double incision mastectomies and gynecomastia procedures lies in skin elasticity. Breast binding, commonly practiced by trans men and non-binary individuals to create the illusion of a flat chest, can result in decreased skin elasticity, leading to suboptimal skin retraction following liposuction and glandular tissue removal⁷⁻⁸.

Figure 1

a) The patient underwent top surgery with a periareolar approach. b) At the sixth postoperative month following the initial surgery, a revision was performed, resulting in conversion to the double incision free nipple graft (DIFNG) technique. c) The postoperative one-year results following DIFNG.

Inadequate skin retraction may result in a deflated appearance on the chest wall, accentuating the breast's footprint. These principles also apply to patients who have undergone massive weight loss. That is why the author prefers to perform DIFNG technique whenever the tissue quality and elasticity is poor to decrease the likelihood of revisions.

The author's decision-making algorithm is mainly based on the skin elasticity. Skin pinch evaluation is particularly critical for breasts with Regnault Class I ptosis. In cases of ptosis II or III, the patient is immediately considered a candidate for DIFNG, whereas skin elasticity serves as a secondary criterion for breasts with Class I ptosis or pseudoptosis in determining whether to proceed with a peri-areolar technique or DIFNG.

As previously discussed, due to impaired skin elasticity resulting from long-term breast binding, many patients who may appear suitable for a peri-areolar approach opt for the DIFNG procedure to avoid potential revisions. A simplified approach at the onset of top surgery practice can be beneficial for young surgeons to comprehend the nature of the procedure and implement refinements effectively. The author has chosen to utilize McEvenue et al.'s basic algorithm as a reference⁹.

The selection of the surgical technique plays a crucial role in achieving optimal outcomes in top surgery. Numerous studies have underscored the significance of skin laxity assessment in determining the appropriate technique. However, patients' aversion to visible scars can sometimes lead inexperienced surgeons to make erroneous decisions in technique selection. Long-term breast binding or significant weight loss can diminish skin elasticity, making concentric approaches impractical as the skin retraction may not adequately address residual skin laxity.

One notable case where the author revised their approach from a periareolar technique to DIFNG involved a patient with a history of massive weight loss (Fig. 1). In this instance, insufficient skin retraction and excessive skin laxity necessitated the use of the DIFNG procedure. Revision rates are typically lower with DIFNG compared to other techniques, as supported by previous studies³.

For individuals new to performing top surgery on trans men or non-binary individuals, adopting a simplified approach can help reduce revision rates while honing surgical skills and enhancing decision-making abilities. Prior to surgery, patient education is essential

in managing expectations. Surgeons should discuss the benefits of well-camouflaged scars versus the increased risk of revision surgery with patients⁷. Explaining the trade-off between long scars and the high risk of revision, majority of the patients tend not to venture another surgical intervention if possible.

The simplified approach outlined by McEvenue et al. is a valuable resource for young surgeons seeking to gain proficiency in chest contouring for trans men and non-binary individuals⁹. The author has integrated the basic algorithm, focusing on skin pinch evaluation, into their mastectomy practice. Considerations such as graft viability, potential dog ear formation, scar management, complete eradication of the breast footprint, and the likelihood of revision surgeries are essential topics to address depending on the chosen technique.

Figure 2

The incorrect debulking of the area beneath the lower border of the elliptical incision led to a misperception of an inaccurately positioned scar.

4.1. Importance of preoperative marking and the positioning of the final scars

The preoperative marking and the precise positioning of final scars play a critical role in achieving optimal aesthetic outcomes in top surgery. In cases where the chest wall is symmetrical and exhibits a relatively even IMF, the final scar placement can align with the existing IMF. However, when there is a significant disparity in IMF levels between the two sides or if the patient has a low-lying breast footprint, adjustments should be made to position the final scar appropriately.

When elevating the IMF to a higher position on the chest wall, it is crucial to draw the lower border of the elliptical incision above the current IMF level. The area below the planned incision should be debulked to create a shadow effect and ensure a seamless transition between the chest and the body. Failure to address this can result in the appearance that the final scar was not positioned correctly, which was also observed in 2 patients in this series (Fig. 2).

Figure 3



Placing the lower border of the incision to the existing inframammary fold resulted in a concave scar.

While the IMF typically follows a curved trajectory, there are instances where it closely resembles a wide parabolic curve. Placing the inferior border of the elliptical incision directly within the IMF in such cases can cause the final scar to mimic a parabolic shape as well (Fig. 3). To mitigate this effect, positioning the lower border above the existing IMF can help soften the concavity of the final scar. This manoeuvre is also helpful in achieving a tension-free closure for patients with relatively tight skin, where the pinch between the upper areolar border and the existing IMF is inadequate (Fig. 4).

It is essential to avoid overly extended scars as they may lead to dog ear formation, particularly in patients with back rolls that may merge with the breasts on the lateral aspect. In such cases, alongside

liposuction, extending the final scar towards the axilla in a "J" shape, akin to a vertical torsoplasty technique, can be beneficial. This approach ensures that the scars remain inconspicuous when the patient is in a resting position, as they are concealed on the posterior aspect.

Figure 4



The green striped area is to be debulked through direct excision and defined with liposuction to avoid incorrect scar placement and the formation of concave scars.

4.2. NAC grafts and repositioning

Nipple-areolar complex (NAC) grafting and repositioning are crucial. According to Maas et al., the average diameter of a male round NAC is approximately 25.9 mm¹⁰. Initially, the author utilized a custom-made cookie cutter with a 25 mm diameter; however, through follow-up visits, it was observed that NAC grafts tend to stretch over time. As a result, the author now employs a cookie cutter with a diameter of 20 mm for graft harvesting, always under maximal tension.

Ensuring graft survival requires thinning before placement; nipple reduction may be performed if needed.

The challenge lies in accurately positioning the grafts. Utilizing the existing breast meridians can assist in placing the NACs at an equal horizontal distance from the midline. For a masculine aesthetic, NACs should be slightly lateral to the breast meridian.

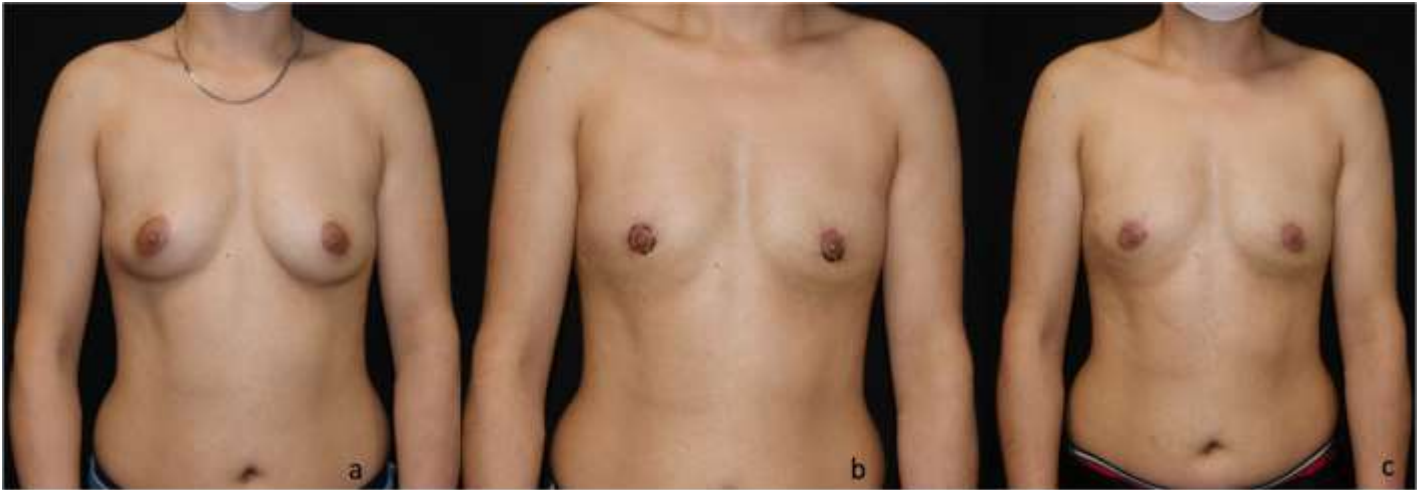
Verifying the SN-N distance can be done by fixing a thread at the level of the jugular notch. Additionally, the alignment of the upper and lower borders of the recipient area can be confirmed with the aid of a thread.

McEvenue et al. proposed an algorithm for NAC placement⁹, but [the author noted up to 1 cm discrepancy compared with final clinical positioning.

Some authors recommend placing the NACs 0.5-2 cm above the scar^{8,11}. It's important to note that if the final scar positions are not aligned, one NAC may end up higher than the other. As scars tend to fade over time, any disparity in NAC level can become more conspicuous. Therefore, prioritizing symmetrical NAC positioning is crucial. While many studies suggest that NAC placement should rely on anatomical landmarks and surgical experience rather than exact measurements, aiming for symmetry is paramount⁸.

For some gender-neutral patients, NAC preservation may be unnecessary and should be discussed during consultation.

Figure 5



The postoperative 1st year appearance following DIFNG procedure. An example for good scar quality.

4.3. Liposuction

Liposuction serves as a valuable tool in top surgery, offering benefits beyond fat removal. In addition to its fat-reducing effects, liposuction plays a crucial role in tissue debulking, particularly in the lateral areas, aiding in the prevention of dog ear formation and scar elongation. While traditionally associated with peri-areolar approaches for fat removal and establishing a dissection plane, liposuction has now become a standard practice in the author's procedures involving DIFNG. The author's observation was that all the dog ear formations resulted from either inadequate liposuction or complete absence of it. However, when statistically analysed, it was found that liposuction was performed in 37.5% of the cases with dog ear and in 28.8% of those without, and there was no statistically significant difference between the two groups in this regard ($p>0.05$).

The high BMI is also a risk factor for dog ear formation, since the bulkiness of the lateral chest wall and even the back significantly augments the dog ear appearance and this was statistically significant ($p<0.05$).

The chronological evaluation of the author's practice revealed that the addition of liposuction as an adjunctive intervention to the routine DIFNG procedures increased significantly over time, as its importance became evident in the management of lateral fullness and dog ear formation.

Following the elliptical excisions in DIFNG procedures, liposuction allows for fine adjustments to the thickness of the upper flap and enhancement of pectoral definition. Compared to direct excision for flap debulking, liposuction presents a lower risk in achieving uniform management of flap thickness bilaterally. This technique offers a safer and more effective method for refining the overall chest contour and achieving optimal aesthetic outcomes in top surgery.

4.4. Quilting sutures

In the author's initial cases, drains were routinely utilized following top surgery procedures. However, with the accumulation of patient cases, it became apparent that the drainage volume typically did not exceed 30 cc on the subsequent day. This observation was primarily attributed to the implementation of quilting sutures placed between the upper flap and the pectoralis major fascia. In 63 patients, drains were entirely excluded from the procedure, and no instances of seroma development were reported in the whole patient series.

In conjunction with quilting sutures, an essential preventive measure against seroma formation involves post-operative breast binding for a duration of 6 weeks. This additional step, coupled with the use of quilting sutures, has proven effective in minimizing the risk of seroma occurrence following top surgery procedures.

4.5. Breast screening

Preoperative imaging is mandatory, and annual screening should continue postoperatively, as top surgery is not a therapeutic mastectomy. Residual glandular tissue may remain; therefore, ongoing screening is essential.

4.6. Scar management

To ensure optimal scar quality in top surgery procedures, it is essential to prioritize tension-free closure during the surgical process. Aggressive tissue removal should be avoided, and following excision, the remaining flaps should be advanced towards each other without causing any undue strain. Scarpa's fascia should be meticulously repaired with interrupted sutures, followed by deep dermal and intradermal skin closure techniques.

Scar revisions are often associated with a high risk of recurrence due to increased tension at the time of skin closure. Therefore, the best approach in such cases is prevention. To prevent scar issues and reduce the likelihood of recurrence, it is recommended to avoid extensive skin removal and opt for techniques that minimize tension during closure.

After the 4th postoperative week and for a duration of up to 6 months, the use of silicone sheaths is recommended to promote scar healing and minimize scar hypertrophy (Fig. 5). In cases where patients are predisposed to developing hypertrophic scars or keloids, laser treatments can be initiated promptly. Additionally, pressure therapy with silicone sheaths is vital for optimizing scar outcomes in this patient population.

Protecting the scars from sun exposure is another crucial aspect of scar management. Patients should be educated on the importance of applying sunscreen regularly, especially during the summer months, to shield the scars from damaging ultraviolet rays. By incorporating these scar management strategies into postoperative care, surgeons can help patients achieve improved scar aesthetics and overall satisfaction with their top surgery outcomes.

In this study, receiving hormone therapy, high BMI, and being a smoker were found to be not associated with developing hypertrophic scars ($p>0.05$).

This study is limited by [small sample size, retrospective design,

lack of patient-reported outcomes, and no objective elasticity assessment]. Future research should include prospective evaluation with long-term and patient-reported outcomes.

11.Top H, Balta S. Transsexual Mastectomy: Selection of Appropriate Technique According to Breast Characteristics. *Balkan Med J.* 2017 Apr 5;34(2):147-155. [\[Crossref\]](#)

5. Conclusion

Top surgery is a transformative intervention for trans men and non-binary patients. Although the operation seems simple, surgical detail determines outcome. With a gradual learning curve, young surgeons should adopt a simplified, meticulous approach.

Statement of ethics

The study protocol received approval from the Bilgi University Local Research Medical Ethics Committee [Approval no: 2023/50162-167].

genAI

No artificial intelligence-based tools or generative AI technologies were used in this study. The entire content of the manuscript was originally prepared, reviewed, and approved by both authors.

Funding

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Conflict of interest statement

The authors declare that they have no conflict of interest.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Author contributions

Both authors read and approved the final manuscript.

References

- 1.Hage JJ, van Kesteren PJ. Chest-wall contouring in female-to-male transsexuals: basic considerations and review of the literature. *Plast Reconstr Surg.* 1995 Aug;96(2):386-391. [\[Crossref\]](#)
- 2.Wilson SC, Morrison SD, Anzai L et al. Masculinizing Top Surgery: A Systematic Review of Techniques and Outcomes. *Ann Plast Surg.* 2018 Jun;80(6):679-683. [\[Crossref\]](#)
- 3.Ammari T, Sluiter EC, Gast K et al. Female-to-Male Gender-Affirming Chest Reconstruction Surgery. *Aesthet Surg J.* 2019 Jan 17;39(2):150-163. [\[Crossref\]](#)
- 4.Wolf Y, Kwartin S. Classification of Transgender Man's Breast for Optimizing Chest Masculinizing Gender-affirming Surgery. *Plast Reconstr Surg Glob Open.* 2021 Jan 25;9(1):e3363. [\[Crossref\]](#)
- 5.Cardenas-Camarena L, Dorado C, Guerrero MT et al. Surgical Masculinization of the Breast: Clinical Classification and Surgical Procedures. *Aesthetic Plast Surg.* 2017 Jun;41(3):507-516. [\[Crossref\]](#)
- 6.Colić MM, Colić MM. Circumareolar mastectomy in female-to-male transsexuals and large gynecomastias: a personal approach. *Aesthetic Plast Surg.* 2000 Nov-Dec;24(6):450-454. [\[Crossref\]](#)
- 7.Safa B, Lin WC, Salim AM et al. Current Concepts in Masculinizing Gender Surgery. *Plast Reconstr Surg.* 2019 Apr;143(4):857-871e. [\[Crossref\]](#)
- 8.Monstrey S, Selvaggi G, Ceulemans P et al. Chest-wall contouring surgery in female-to-male transsexuals: a new algorithm. *Plast Reconstr Surg.* 2008 Mar;121(3):849-859. [\[Crossref\]](#)
- 9.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 Dec 13;38(1):49-57. [\[Crossref\]](#)
- 10.Maas M, Howell AC, Gould DJ et al. The Ideal Male Nipple-Areola Complex: A Critical Review of the Literature and Discussion of Surgical Techniques for Female-to-Male Gender-Confirming Surgery. *Ann Plast Surg.* 2020 Mar;84(3):334-340. [\[Crossref\]](#)