

A Comparison of Gender-Affirming Chest Surgery in Nonbinary Versus Transmasculine Patients

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Background: Increasingly more nonbinary patients are obtaining better access for gender-affirming chest surgery (top surgery), representing an important subset of patients who undergo such surgery.

Objective: We review our experience at gender-affirming chest surgery in nonbinary versus transmasculine patients in an integrated health care setting.

Methods: We performed a retrospective study of nonbinary and transmasculine patients who underwent gender-affirming chest surgery from May 1, 2012, to December 27, 2017.

Results: There were 111 nonbinary patients and 665 transmasculine patients included in the final analyses. Nonbinary patients were more likely to seek more than 1 surgical consultations than transmasculine patients (24.3% vs 1.7%, respectively, $P < 0.0001$). More nonbinary patients (17.3%) indicated nipple sensation to be important relative to their transmasculine counterparts (0.4%, $P < 0.0001$). Fewer nonbinary patients were on testosterone before surgery (33.64%) in comparison to transmasculine patients (86.14%, $P < 0.0001$). When only prior reduction mammoplasty or top surgery were considered, nonbinary patients (8.1%) were more likely than transmasculine patients (3.5%) to have had a prior chest surgery. When evaluating patients who did not have prior chest surgery before undergoing top surgery at our institution ($n = 721$), rates of major complications, minor complications, as well as revisions, were comparable between nonbinary and transmasculine patients.

Conclusions: This study demonstrated that more nonbinary patients requested nonflat chests relative to their transmasculine counterparts. Both groups in our sample displayed comparable rates of complications after top surgery.

Key Words: nonbinary, genderqueer, gender-affirming chest surgery

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Although there is increasing data on gender-affirming chest surgery (top surgery) in transmasculine patients,^{1–18} there is limited information on top surgery in nonbinary patients. With increasing awareness and acceptance, it is likely that there will be increasing numbers of patients who identify as non-binary-seeking access to medical and surgical treatment for gender affirmation, and it will be prudent for providers to learn about their needs and expectations. We reviewed our experience in performing top surgery in transmasculine versus nonbinary patients in an integrated health care setting to determine the similarities and differences in these 2 groups. In this study, we use the term transmasculine to refer to patients who reported their gender as male ($n = 665$) and the term nonbinary to refer to patients who reported their gender as any of the following: nonbinary ($n = 91$), genderqueer ($n = 14$), queer ($n = 4$), gender neutral ($n = 1$), or agender ($n = 1$). By this definition, there were a total of 111 nonbinary patients included in the study. The sample sizes

displayed here, and all statistical analyses, exclude any patients who had concurrent gynecological surgeries.

PATIENTS AND METHODS

Patients who were assigned as female at birth and identified as transmasculine or nonbinary and underwent top surgery at Kaiser Permanente Northern California from May 1, 2012, to December 27, 2017, were included in the study. Patients were excluded if they underwent mastectomy for cancer treatment or if they had concurrent gynecological surgery. Approval was obtained from the institutional review board, and all ethical research guidelines were followed.

Study Design

Patients received care from a multidisciplinary team that included endocrinologists, internists, mental health providers, social workers, gynecologists, and plastic surgeons. Adult patients obtained a letter of approval from a mental health provider before getting a surgical consultation, and patients younger than 18 years received 2 independent letters from mental health providers. There were 7 plastic surgeons who performed all top surgeries included in the study.

Preoperative, perioperative, and postoperative data were retrospectively collected from electronic medical records and analyzed to compare patient characteristics, preferences, and operative experiences across transmasculine and nonbinary groups. Preoperative data included age at surgery day, body mass index (BMI), American Society of Anesthesiologists (ASA) status (an assessment of a patient's overall health), comorbidities, prior chest surgery or procedures, testosterone use, nicotine use, marijuana use, and number of consultations before surgery. Patients who requested a second opinion after the initial surgical consultation would be referred to another plastic surgeon within Kaiser Permanente Northern California. Data were collected on patients' preference for chest shape, as well as the shape and location of nipple areolar complex (NAC). Operative data collected included length of operative time, duration of drain use (days), intraoperative blood loss (mL), weight of tissue excised from each chest (grams), and surgical technique (see Description of Surgical Techniques). The choice of surgical technique would be based on the patient's anatomy, the patient's expectations, as well as the surgeon's preference. Postoperative data on complications included infection, seroma, hematoma, poor wound healing, wound dehiscence, anesthesiology problems, and problems with healing of the NAC. Major complications were defined as those requiring unplanned hospitalization or operation in the operating room within 90 days after surgery. Minor complications were defined as those treated in the out-patient setting within 90 days after surgery. Revisions were performed to improve the appearance of the scars, chest contour, dog ears, and NAC. Revisions were included up to 1 year after surgery.

Each revision or complication was considered as a separate event. Statistical analysis was performed using χ^2 (Fisher exact) tests or 2-tailed t tests where appropriate. An alpha level of 0.05 was used for the evaluation for each statistical test.

Description of Surgical Techniques

Surgical techniques reported in the study included (1) double incision with or without free nipple grafts, (2) circum-areola technique,

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TABLE 1. Preoperative Characteristics of Nonbinary Versus Transmasculine Patients

	Nonbinary (N = 111)	Transmen (N = 665)
Age, y	32.1 ± 8.7 (15–61)	28.7 ± 9.8 (15–68)
BMI	27.1 ± 5.0 (17–45)	27.5 ± 6.0 (15–58)
ASA class	1.5 ± 0.6	1.6 ± 0.6
mean ± standard deviation (range).		

(3) inverted T technique, and (4) buttonhole technique, explained in more detail below. Placement of drains for each technique varied by surgeons' preference and patients' anatomy. Top surgery was generally an outpatient surgery.

The double-incision technique involved excising the excess skin/chest parenchyma via incisions along the lower poles of the chests. The contour of the incisions and location of the incisions were based on patients' anatomy, patients' expectations, and surgeons' preference. Patients might request a flat chest or not entirely flat chest by leaving more tissue behind. Almost all patients chose to have reconstruction of the NACs, and the NACs were removed, thinned, and contoured as needed. Most NAC grafts were reduced as appropriate before repositioning. Patients might choose to have their nipples placed laterally or more medially (along the chest meridian). If the patient elected to not have NACs, the NACs were removed and discarded.

The circum-areolar technique involved deepithelializing a strip of skin in a circum-areolar fashion and removing the excess chest parenchyma via a hemicircular incision. The NACs were preserved on a superiorly based pedicle. The incisions were reapproximated with long-acting absorbing or permanent sutures.

The inverted T technique was performed in a similar manner to reduction mammoplasty. The pedicle supporting the NAC was chosen based on the patient's anatomy and surgeon's preference, and either superomedial or inferior pedicle was used in this study.

The buttonhole technique involved deepithelializing the inferior mastectomy flap that supported the NAC and making an incision

superior to NAC all the way to the pectoralis fascia. The superior mastectomy flap and inferior mastectomy flap were raised above the pectoralis fascia and thinned. A new opening was then created for the insert of the NAC.¹⁹

RESULTS

There were 111 nonbinary patients and 665 transmasculine patients included in the final analyses. Nonbinary patients were comparable to transmasculine patients with regard to age, BMI, and ASA status (Table 1). Nonbinary patients were comparable to transmasculine patients in marijuana use ($P = 0.17$) or nicotine use ($P = 0.6$) during perioperative period (Table 2). However, fewer nonbinary patients were on testosterone before surgery (33.64%) in comparison to transmasculine patients (86.14%) ($\chi^2(1) = 152, P < 0.0001$). When only prior reduction mammoplasty or top surgery was considered (ie, chest biopsy was excluded), nonbinary patients were more likely than transmasculine patients to have had a prior surgery (Table 2). Among nonbinary patients who had reduction mammoplasty before seeking top surgery at our institution, all of them underwent double-incision, free nipple graft technique for their top surgery. There was a paucity of data on why patients sought reduction mammoplasty before top surgery. Most commonly, the patient noted that prior insurance covered reduction mammoplasty but not top surgery (3 transmen, 1 nonbinary patient). One transmasculine patient reported that reduction mammoplasty was requested as part of his transition process. Another transman reported that reduction mammoplasty was offered as the wrong surgery for him. Patients also indicated that they erroneously hoped that reduction mammoplasty would be satisfactory as a gender-affirming measure and that they would not need top surgery (1 transman, 1 nonbinary patient). One nonbinary patient revealed that reduction mammoplasty was chosen because of lack of family support for top surgery. Overall, no patient requested reversal of their top surgery at our institution. Notably, having had a prior surgery did not appear to be related to rates of major or minor complications. However, when compared with patients with no prior chest surgery on record, patients who had undergone a prior surgery less likely need revisions ($P = 0.030$). Of those who had prior surgery, 11.76% required (or requested) a revision after the surgery relevant to this study. Of those

TABLE 2. Demographics of Nonbinary Versus Transmasculine Patients

	Nonbinary (n = 111)	Transmen (n = 665)	Test Statistic (df)	P
Prior chest surgery				
• Breast reduction	8 (7.2%)	21 (3.2%)	NA*	0.04
• Unilateral chest biopsy	2 (1.8%)	4 (0.6%)		
• Top surgery	1 (0.9%)	2 (0.3%)		
• No prior surgery	100 (90.1%)	621 (95.8%)		
Nicotine products use			$\chi^2(2) = 0.64$	0.73
• Never	81 (73.0%)	475 (71.4%)		
• Quit >1 month before surgery	26 (23.4%)	154 (23.2%)		
• Quit <1 month before surgery or active users	4 (3.6%)	36 (5.4%)		
Marijuana use			$\chi^2(2) = 1.22$	0.54
• Never	61 (70.1%)	372 (69.9%)		
• Quit >1 month before surgery	9 (10.3%)	39 (7.3%)		
• Quit <1 month before surgery or active users	17 (19.5%)	121 (22.7%)		
Testosterone use			$\chi^2(1) = 152$	<0.0001
• Yes	37 (33.6%)	572 (86.1%)		
• No	73 (66.4%)	92 (13.9%)		

Number of patients (percentage of patients within gender).
*Fisher exact approximation was used for contingency tables with any cell sizes <5. No test-statistic reported for Fisher exact approximations.

TABLE 3. Patients' Preference Comparisons Between Nonbinary Versus Transmasculine Patients

	Nonbinary (n = 111)	Transmen (n = 665)	Test Statistic (df)	P
No. consultations				
• 1	84 (75.7%)	653 (98.3%)	NA*	<0.0001
• 2	21 (18.9%)	11 (1.7%)		
• 3 or more	6 (5.4%)	0 (0.0%)		
Flat chest				
• Yes	96 (86.5%)	664 (100.0%)	NA*	<0.0001
• No	15 (13.5%)	0 (0.0%)		
NAC size				
• Small	95 (85.6%)	663 (99.9%)	NA*	<0.0001
• Large and round	13 (11.7%)	0 (0.0%)		
• No NAC	3 (2.7%)	1 (0.1%)		
NAC sensation				
• Important	19 (17.3%)	3 (0.4%)	NA*	<0.0001
• Not important	91 (82.7%)	661 (99.6%)		
NAC position				
• Repositioned low and lateral	91 (84.3%)	662 (99.9%)	NA*	<0.0001
• Along breast meridian	17 (15.7%)	1 (0.1%)		
Surgical technique				
• Double incision	98 (88.3%)	622 (93.7%)	NA*	0.0005
• Circum-areola	5 (4.5%)	31 (4.7%)		
• Inverted T	5 (4.5%)	1 (0.1%)		
• Buttonhole	3 (2.7%)	8 (1.2%)		

Number of patients (percentage of patients within gender).
*Fisher exact approximation was used for contingency tables with any cell sizes <5. No test-statistic reported for Fisher exact approximations.

who had not undergone a prior surgery, 14.66% required (or requested) a revision for the surgery relevant to this study.

Table 3 displays the medical and surgical preferences of the 2 groups. Nonbinary patients were more likely to seek more than 1 consultation before surgery relative to transmasculine patients. Among transmasculine

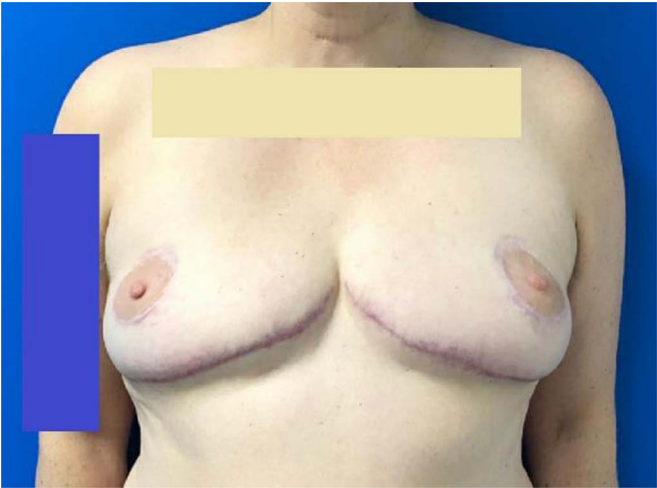


FIGURE 2. Frontal view of patient who identified as nonbinary 18 months after top surgery via buttonhole technique. Nipple areola complexes were placed along the meridian.

patients who reported the reason(s) for requesting multiple consultations, 90% cited the desire to get an earlier surgery date. In contrast, there was frequently no clear documentation of the reason(s) for nonbinary patients asking for multiple consultations. More nonbinary patients requested an androgynous or nonflat chest (Fig. 1 & 2) than their transmasculine counterparts who requested flat, masculine-appearing chests (Fig. 3 and 4). A small number of patients opted out of NAC reconstruction (3 nonbinary patients as shown in Fig. 5 and 6, 1 transman). The majority of all patients requested for reduction of their NACs, but relative to transmasculine patients, nonbinary patients were more likely to prefer NACs to be large and round. Nonbinary patients more frequently requested that NACs be placed along the chest meridian (Fig. 1 & 2), whereas more transmasculine patients requested that NACs be relocated in a lower and more lateral position (than the meridian) on the chest. More nonbinary patients reported preservation of nipple sensation as an important procedural outcome relative to transmasculine patients (Table 3). This finding persists even when controlling for procedure by only including patients undergoing surgery via the double-incision method ($P < 0.0001$). Of this subset, 9.30% of

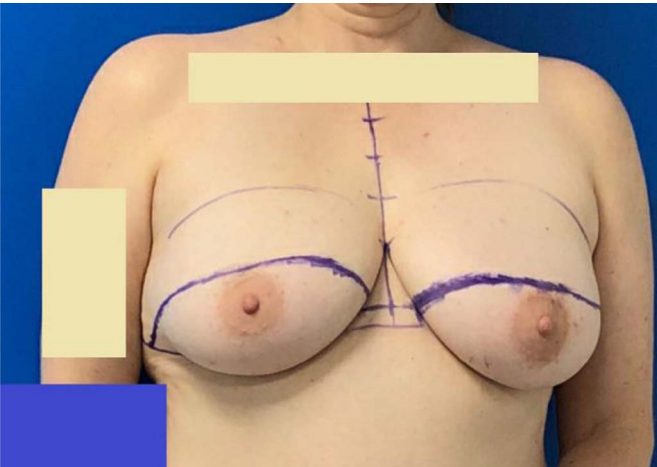


FIGURE 1. Frontal view of patient who identified as nonbinary before top surgery.



FIGURE 3. Frontal view of patient who identified as transmasculine before top surgery.



FIGURE 4. Frontal view of patient who identified as transmasculine 12 months after top surgery. The nipple areola complexes were placed low and lateral on the chest.

nonbinary patients regarded postsurgery nipple sensation as an important outcome compared with 0.34% of transmasculine patients.

The choice of surgical techniques across the 2 groups is also shown in Table 3 and did not reveal significant differences between the 2 groups. The incidence of the double-incision technique was comparable between the 2 groups. The 2 groups were comparable in the amount of chest tissue excised, duration of drain usage, and blood loss (Table 4).

To assess whether nonbinary patients experienced different rates of complications and revisions, we evaluated patients without a prior chest surgery on record ($N = 721$). Of these patients, rates of major and minor complications, as well as revisions, were all comparable between nonbinary and transmasculine patients (Table 5).

When all patients were evaluated, BMI demonstrated a moderate correlation with the weight of tissue excised from the chest (Pearson $r = 0.67$, adjusted $P < 0.001$). Body mass index remained moderately correlated to weight of tissue excised from the chest when nonbinary (Pearson $r = 0.63$, adjusted $P < 0.001$) and transmasculine patients

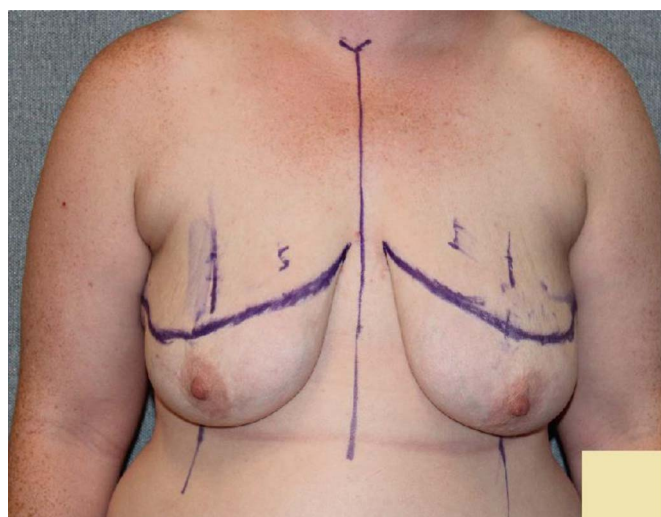


FIGURE 5. Frontal view of patient who identified as nonbinary before top surgery.



FIGURE 6. Frontal view of patient who identified as nonbinary 12 months after top surgery. Patient did not have nipple reconstruction.

(Pearson $r = 0.68$, adjusted $P < 0.001$) were analyzed separately. Body mass index did not correlate with operative time, blood loss, or duration of drain usage. All reported P values for correlations were adjusted for multiple significance tests (data not shown).

DISCUSSION

Nonbinary patients have traditionally been difficult to study. The reasons for this may be multifold. A limitation could be a lack of reliable measures of gender identity encompassing transmasculine and nonbinary identities.²⁰ Without adequate ways to identify nonbinary individuals, research in this population would be difficult. It is conceivable that given the inadequate or inconsistent opportunities for individuals to report gender nonconforming identity in prior research, nonbinary individuals were hidden in the midst of the transmasculine population previously.²¹ Furthermore, it was unpredictable in how nonbinary participants would respond to surveys about gender identity.²⁰ There was speculation that some nonbinary and genderqueer people were reticent to disclose their identities because of concern that they would not receive the treatment they desired if they did not conform to binary gender norms. Anecdotally, some nonbinary and genderqueer patients seen at our institution reportedly described their identity as transmasculine in addition to nonbinary to their surgeons at their initial consultation, so that they would qualify for top surgery. Although the true incidence of patients who identified as nonbinary may be hard to elucidate, studies have estimated the incidence of patients who identify as nonbinary to be 0.8% to 3.5%.^{22–25} One such study reported that in the United States, 0.51% of the adults were identified as a gender minority; 0.11% as gender nonconforming (314,935 adults), and 0.4% as gender binary transgender (1,180,949 adults).²⁶ Despite not knowing the true incidence of nonbinary patients, simply stating that outcomes were poor or limited for this population of patients would not be sufficient. We must understand their unique expectations and identify interventions to provide patient-centered care that extends beyond binary gender concepts.^{20,27} Our comparative study between nonbinary versus transmasculine patients demonstrates that although the 2 groups had similarities, each also displayed unique characteristics.

Nonbinary patients appeared more likely than transmasculine patients to seek multiple consultations before committing to a surgeon, but there was no clear documentation of the rationale behind that. It was possible that, similar to the transmasculine patients, nonbinary patients were seeking earlier surgery day. Nonbinary patients might feel that they needed to see several surgeons to gather all available data before they could decide on a surgical technique and surgeon. Further studies

TABLE 4. Operative and Postoperative Findings of Nonbinary Versus Transmasculine Patients

	Nonbinary (n = 111)	Transmen (n = 665)
Weight of chest tissue excised from left chest (grams)	567.6 ± 376.0 (40–2302)	584.5 ± 390.8 (40–1646)
Weight of chest tissue excised from right chest (grams)	470.9 ± 351.5 (8–1897)	464.7 ± 351.5 (15–1801)
Duration of drain use (days)	4.2 ± 3.4	5.2 ± 3.6
Blood loss (ml)	36.3 ± 26.8 (5–150)	37.3 ± 41.72 (5–100)
mean ± standard deviation (range).		

on nonbinary patients who sought a second opinion would be required to fully understand this phenomenon.

Nonbinary patients in our study not only shared similarities with transmen in terms of their expectations of surgical goals but also presented with their unique differences. Similar to transmasculine patients, many nonbinary patients in our study underwent double-incision with free nipple graft technique. On the other hand, although many nonbinary patients in our study requested to have a flat chest with small NACs positioned in a lower and lateral location on the chest, traditionally characterized as a “masculine”-appearing chest, a significant portion of nonbinary patients did not. This subset of nonbinary patients asked for androgynous chests, larger NACs along the meridian. These patients could be seeking to avoid a distinct gender assignment and were not looking to have a binary appearance. Nonbinary patients might seek to remove the external markers of what was not congruent with the gender identity, that is, excess chest tissue while maintaining a nonbinary identity. Hence, they would seek a surgery to achieve an androgynous chest that was not completely flat, with NAC shape and position that did not convey an appearance associated with “masculinity.” More nonbinary patients reported preservation of nipple sensation as important. However, the choice of techniques was not statistically significant between the 2 groups. The cases involving the buttonhole, circumareola, or inverted T techniques were too few and thus underpowered to determine if there was a correlation between desire to preserve nipple sensation and choice of surgical technique. It would be helpful for surgeons, when discussing top surgery, to set realistic expectations with any patient while considering the uniqueness and validity of every person's experience of self.^{28,29} This study suggested that the surgical needs of nonbinary individuals are diverse. Surgeons would benefit from not having preconceived notions that all transindividuals would be interested to present and live as the “opposite” gender, or that patients seeking top surgery all seek to achieve a binary appearance.

These conclusions are not unique to our study. One previous study surveyed 75 nonbinary and 28 transmasculine Canadian students who reportedly resented the need to educate practitioners about gender identity and associated the need to educate providers with perceived discrimination and delayed health care.²¹ This observation was supported by other studies.³⁰ Therefore, it is important for providers to explore with patients how they see their sex expressed and what result would meet their goals to express their identity.

Our study demonstrated that nonbinary patients were comparable to their transmasculine counterparts with regard to many demographic factors. For example, the mean age of nonbinary patients was comparable to transmen in our study. This is in contrast to other reports that showed nonbinary patients were more commonly identified in younger individuals.³¹ A possible explanation for this inconsistency could be that the transmasculine patient population in our study was notably younger than in many prior studies. This could reflect an overall younger patient population seeking top surgery in our institution compared with other institutions. Another explanation could be that our study only included patients who had top surgery, whereas other studies evaluated transgender patients seeking both medical and surgical care. On the other hand, similar to other studies, there was no significant

difference in nicotine use between gender binary and gender and nonbinary transgender adults.²⁶

Nonbinary patients were more likely than their transmasculine counterparts to have reduction mammoplasty before seeking top surgery at our institution. The limited data we had on factors influencing the decision to undergo prior reduction mammoplasty included economic stresses, social pressures, and personal readiness. However, the paucity of data on that topic would not allow for a meaningful comparison between the 2 groups, and further studies will be needed to address this issue. Notably, no patients sought reversal after their top surgery at our institution in the study period, suggesting a low recidivism rate among both transmasculine and nonbinary patients.

In this sample, nonbinary patients were comparable to transmasculine patients in terms of surgical complications and postsurgical revisions. This result is encouraging in the face of reports that gender nonconforming individuals experienced worse outcomes than their peers who adhere to the gender binary, the former group is already known to suffer greater disparities in health status relative to their cisgender peers.^{31,32} A research group performed a retrospective analysis of the 2014 to 2016 behavioral risk factor surveillance system that was conducted by state health departments and the Centers for Disease Control and Prevention. After adjusting for social demographic characteristics, proxy for health care access, and health conditions, the authors found that sex nonconforming transgender adults, relative to their binary transgender peers, displayed an increased odds of self-reported poor or fair health and self-reported limitations in activities.^{25,26} Another group also found that gender nonconforming patients experienced higher rates of discrimination than gender-conforming people.³³

Our study population consisted of more patients who identified as transmasculine relative to nonbinary patients. This was consistent with other reports that revealed a significantly higher percentage of transmasculine patients than nonbinary patients reporting intention to undergo treatment for gender affirmation.^{28,29} Notably, nonbinary patients were less likely to use testosterone than transmen in our study, a finding consistent with prior studies.^{28,29} Similarly, Beak et al³⁴ found that nonbinary patients often did not seek medical treatment, and when they did, they did not necessarily desire to receive all available medical options for gender affirmation. Furthermore, another group performed an online survey on experiences of 415 transindividuals of whom 81.7% reported as binary and 18.3% nonbinary. They found that nonbinary patients reported receiving significantly fewer treatments compared with binary

TABLE 5. Outcomes of Fisher Exact Tests for Nonbinary Versus Transmasculine Patients

	Nonbinary (n = 111)	Transmen (n = 665)	P
Major complications	0 (0.0%)	22 (3.3%)	0.06
Minor complications	13 (11.7%)	76 (11.5%)	1.00
Revisions	21 (18.9%)	98 (14.9%)	0.32
Number of patients (percentage of patients within gender).			

participants. For planned treatments, binary participants reported undergoing more treatments related to primary gender characteristics only.^{28,29}

CONCLUSIONS

This study demonstrated that more nonbinary patients requested large and round NACs positioned along the chest meridian relative to their transmasculine counterparts. More nonbinary patients reported preservation of nipple sensation as important. Both groups in our sample displayed comparable rates of complications after top surgery. It is conceivable that there will be increasingly more nonbinary and gender nonconforming individuals seeking access to medical and surgical treatment for gender affirmation. In the absence of robust guidelines and surgical techniques for this population, providers will benefit from understanding the unique requests of this underserved group. Further research including a prospective study to compare these 2 groups would help to address the differences between them.

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