



# Surgical and patient-reported outcomes following double incision and free nipple grafting for female to male gender affirmation: does obesity make a difference?

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## KEYWORDS

Gender dysphoria;  
Chest contouring;  
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**Abstract** *Background:* The efficacy of chest wall contouring in alleviating symptoms of gender dysphoria in transmale and nonbinary patients is well established. As the popularity and indications for these procedures continue to increase, more surgeons are performing these surgeries on obese patients. The aim of this study was to investigate the association of obesity on postoperative and patient-reported outcomes.

*Methods:* A retrospective chart review was performed for 97 consecutive masculinizing mastectomies by a single surgeon using the double incision and free nipple graft technique (DIFNG). Surgical outcomes were collected using electronic records and patient-reported outcomes using BODY-Q questionnaires.

*Results:* DIFNG mastectomies were performed in 97 patients from 2016 to 2019, of which 43(44%) were obese and 54(56%) were non-obese. The average follow-up time was 62(12 - 112) months in obese patients and 61(10 - 127) months in non-obese patients. There was no difference in minor and major complication rates between non-obese and obese patients [minor: 4(7%) vs 5(12%),  $p=0.19$  and major: 0(0%) vs 1(2%),  $p=0.46$ ]. BODY-Q data was available for 33(77%) of obese and 43(80%) of non-obese patients. There was no difference in scores for each module of the BODY-Q between obese and non-obese patients ( $p>0.05$ ).

Photo consent: Written consent was obtained for all clinical photographs used in this manuscript.

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**Conclusion:** Chest wall contouring using the DIFNG technique continues to be safe and effective for the management of gender dysphoria in transmale and nonbinary patients. Considering that obese patients have comparable surgical and patient-reported outcomes as non-obese patients, it is our practice to routinely offer the DIFNG technique to healthy obese patients with BMI's between 30 and 40.

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## Background

Gender dysphoria is defined as the incongruence between gender identity and physical characteristics and has significant implications for long term physical and psychological well-being.<sup>1</sup> Transgender and nonbinary patients suffer disproportionately from higher rates of social stigma, physical abuse and depression compared to the general population.<sup>2-4</sup> It has also been demonstrated that they report lower quality of life and encounter significant provider insensitivity and discrimination in seeking healthcare.<sup>5,6</sup>

Approximately 1.4 million adults identify as transgender in the United States<sup>7</sup>, and many will choose to initiate their transition with medical therapy, usually consisting of exogenous testosterone to induce virilization and suppress feminizing characteristics. To many, however, persistent discord between gender identity and their physical characteristics continues to contribute to significant bodily and emotional distress. As such, many patients turn to tight compressive garments to conceal their sexual characteristics, alleviating their anxiety and allowing them to live more comfortably as their chosen identity. Binding has been shown to be uncomfortable, cumbersome and leads to a host of dermatologic, respiratory, and gastrointestinal issues.<sup>8,9</sup>

Gender affirming surgery is important for alleviating such symptoms of gender dysphoria and has been shown to improve quality of life.<sup>10-12</sup> Chest wall masculinization or "top surgery", refers to the excision of female glandular tissue in order to facilitate male chest wall shaping. It represents the most common, and typically the first, surgical intervention that these patients undergo.<sup>13,14</sup> Techniques vary based on breast size, skin quality and degree of ptosis. The most common surgical techniques consist of periareolar "keyhole" subcutaneous resections (PAM),<sup>15,16</sup> circumareolar mastectomies (CAM)<sup>17,18</sup> and double incision mastectomies with free nipple grafting (DIFNG).<sup>19</sup> A recent survey by the National Center for Transgender Equality demonstrated that 97% of transmale and 73% of non-binary respondents had undergone chest masculinization or were planning to in the future.<sup>20</sup> The surgery is deemed medically necessary by the World Professional Association for Transgender Health (WPATH), and as such, is increasingly covered by healthcare networks.

As the popularity for these procedures continues to increase and surgical indications continue to broaden, there are an increasing number of obese patients meeting criteria for surgery. Obesity has been associated with a variety of postoperative complications in plastic surgery procedures, such as wound healing problems, infection and thromboembolic events.<sup>21</sup> As such, many plastic surgeons encourage patients undergoing chest contouring to lose weight preoper-

atively such that their BMI is less than or equal to 30. To date, the association between obesity and increased postoperative complications following chest contouring is not well established. The objective of the present study was to compare surgical and patient-reported outcomes between non-obese and obese patients undergoing chest masculinization via the double incision mastectomy and free nipple grafting (DIFNG) technique.

## Methods

Research ethics board approval (Protocol ID 20200236-01H) was granted for a retrospective review of transmale and nonbinary patients who underwent chest masculinization via the DIFNG technique from February 2016 to December 2019 (Figure 1). All surgeries were performed at a single institution by the senior surgeon (M.B.J). Patients were excluded if they underwent keyhole, periareolar or circumareolar mastectomy techniques or if they underwent previous chest wall contouring either by the primary surgeon or at a different institution. Electronic medical records were reviewed and patient characteristics, perioperative and surgical outcome data collected. It is the attending surgeon's practice to offer chest masculinization surgery to all transmale and nonconforming patients with a BMI < 45 who are appropriate surgical candidates. As such, patients were stratified by BMI to allow comparison of surgical and patient-reported outcomes between non-obese and WHO obesity classification.

Comprehensive outcome reporting was adopted (Appendix 1). Complications were defined as major or minor. Major complications were those that required operative intervention, whereas minor complications were those managed conservatively. Medical-related complications which did not pertain to their operation were excluded. Revisionary surgery was defined as secondary surgeries for scar revision, fat grafting or asymmetry correction.

Patient reported outcomes were evaluated by the BODY-Q chest module, a validated patient-reported outcome instrument designed to represent the impact of mastectomy and chest contouring on quality of life and satisfaction. BODY-Q scores was calculated through the QScore scoring software. All data were analyzed with SPSS software (version 20). Scores ranged from 0 (worst) to 100 (best).

Means and standard deviations were used to summarize continuous variables. Frequencies and proportions were used to present the categorical clinical characteristics. Independent *t*-test or Wilcoxon signed-rank test was used to compare means between groups and Fisher's exact test or Chi-squared was used to compare categorical data between

groups. A value of  $p < 0.05$  was considered statistically significant. The analyses were performed in SAS v 9.4.

## Results

### Patient Demographics

Of 97 patients undergoing chest masculinization via the DIFNG technique, 54 (56%) were obese and 43 (44%) were non-obese. Patients were followed for an average of 66(10-127) months, 61 months (10-127) for obese patients and

62 (12-112) for non-obese patients. The average BMI for obese patients was 35 [27(63%) WHO Class I, 9(21%) WHO Class II and 7(16%) WHO Class III]. Obese and non-obese cohorts were adequately matched with respect to preoperative characteristics such as smoking status and comorbidities ( $p > 0.05$ ), however obese patients were significantly older (29 years vs 24 years,  $p < 0.001$ ) (Table 1).

The DIFNG technique in obese patients took longer (2.2 h vs 2.6 h,  $p < 0.001$ ) and was associated with greater intraoperative blood loss (62.0 mL vs 113 mL,  $p = 0.009$ ) compared to those done in non-obese patients. No surgeries required

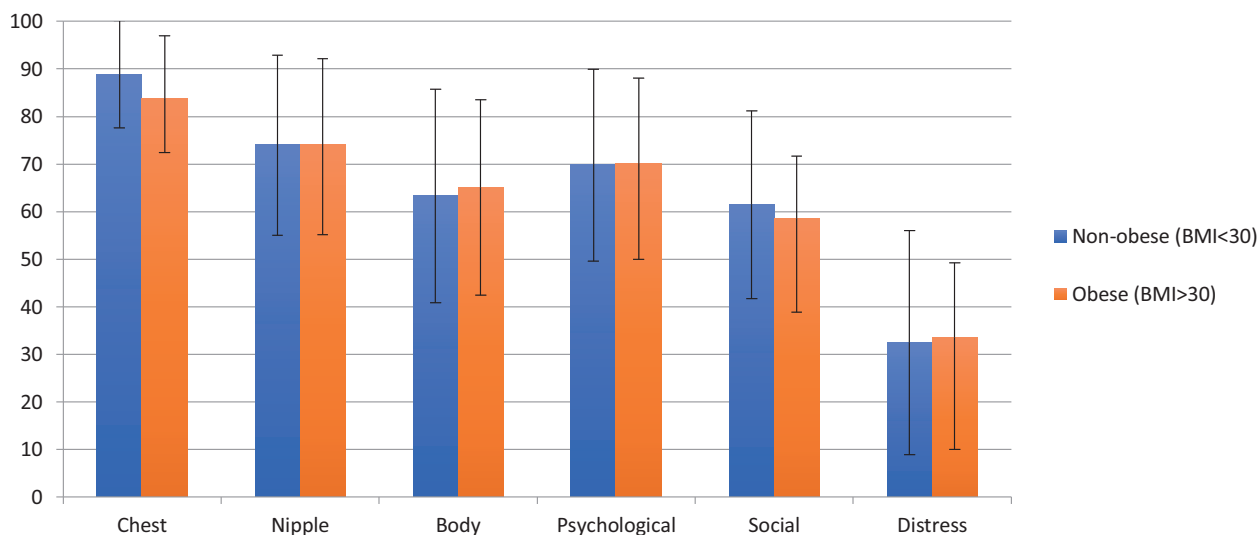


Figure 1 Comparison of BODYQ scores between obese and nonobese patients.

Table 1 Patient demographics.

Variable	Overall	Non-Obese (BMI < 30)	Obese (BMI ≥ 30)	p-value
Total patients	97	54	43	-
Body mass index (BMI) <sup>a</sup>	29 (6.8)	25 (3.1)	35 (5.9)	<0.001*
WHO obesity classification <sup>c</sup>				
Obese Class I (30.0 - 34.9)			27 (63)	
Obese Class II (35.0 - 39.9)	-	-	9 (21)	-
Obese Class III (≥ 40)			7 (16)	
Age, years <sup>a</sup>	26 (7.7)	24 (6.1)	29 (8.6)	0.002*
Smoking status <sup>c</sup>				
Non-smoker	49 (49)	30 (64)	17 (35)	
Former smoker	40 (39)	19 (45)	21 (55)	0.417
Active smoker	8 (10)	4 (50)	4 (50)	
Drains administered <sup>c</sup>	0 (0)	0 (0)	0 (0)	1.0
Comorbidities <sup>c</sup>				
Asthma	15 (16)	9 (19)	6 (12)	0.781
Diabetes mellitus	6 (5.2)	4 (5.7)	2 (4.6)	0.686
Sleep Apnea	6 (6.2)	1 (1.9)	5 (12)	0.237
Hypertension	6 (6.2)	1 (1.9)	5 (12)	0.059
Arthritis	6 (6.2)	2 (3.8)	4 (9.3)	0.372
Cardiac disease	0 (0)	0 (0)	0 (0)	1.0
Follow-up, months <sup>b</sup>	66 (10 - 127)	62 (12 - 112)	61 (10 - 127)	0.120

\*Indicates statistical significance at  $p < 0.05$ .

<sup>a</sup> Data presented as mean (SD). Independent *t*-test used to compared difference in means between groups.

<sup>b</sup> Data presented as mean (range). Independent *t*-test used to compared difference in means between groups.

<sup>c</sup> Data presented as frequency (%). Chi-square used to compare difference in proportions (or Fischer's exact for counts < 5).

**Table 2** Perioperative Data.

Variable	Overall	Non-Obese (BMI < 30)	Obese (BMI ≥ 30)	p-value
Total patients	97	54	43	-
<b>Mastectomy Weight<sup>a</sup></b>				
Left Breast (g)	698	464 (270)	961 (553)	<0.001*
Right Breast (g)	666	445 (255)	919 (522)	<0.001*
Use of JP Drains <sup>b</sup>	0 (0)	0 (0)	0 (0)	1.0
Blood loss (mL) <sup>a</sup>	85.2 (94.8)	62.0 (84.2)	113 (100)	0.009*
Operative Time (hrs) <sup>a</sup>	2.33 (0.55)	2.19 (0.46)	2.58 (0.55)	<0.001*
Hospital Length-of-Stay (days) <sup>a</sup>	0 (0)	0 (0)	0 (0)	1.0
Postoperative admission (N/%) <sup>b</sup>	0 (0)	0 (0)	0 (0)	1.0

\*Indicates statistical significance at  $p < 0.05$ .

<sup>a</sup> Data presented as mean (SD). Independent *t*-test used to compare difference in means between groups.

<sup>b</sup> Data presented as frequency (%). Chi-square used to compare difference in proportions (or Fischer's exact for counts < 5).

**Table 3** Postoperative outcomes (Comparison of Non-obese and Obese Patients).

Outcome	Overall	Non-Obese (BMI < 30)	Obese (BMI ≥ 30)	p-value
Total patients	97	54	43	-
<b>Surgical Outcomes</b>				
<b>Total Complication Rate</b>	14 (14)	4 (7.4)	14 (9.3)	0.19
<b>Total patients with major complications<sup>b</sup></b>	1 (1.0)	0 (0)	1 (2.3)	0.46
Fluid collection requiring surgery	0 (0)	0 (0)	0 (0)	1.0
Total flap necrosis	0 (0)	0 (0)	0 (0)	1.0
Complete wound dehiscence	0 (0)	0 (0)	0 (0)	1.0
Complete nipple graft loss	1 (1.0)	0 (0)	1 (2.3)	0.46
Major revisions surgery	0 (0)	0 (0)	0 (0)	1.0
<b>Total patients with minor complications<sup>b</sup></b>	13 (13)	4 (7.0)	5 (12)	0.19
Seroma	2 (2.1)	0 (0)	2 (2.6)	0.20
Hematoma	1 (1.0)	0 (0)	1 (2.3)	0.080
Minor wound dehiscence	3 (3.1)	0 (0)	3 (7.0)	0.45
Local wound infection	4 (4.1)	3 (5.6)	1 (2.3)	0.40
Partial nipple graft loss	1 (1.0)	0 (0)	1 (2.3)	0.080
Cellulitis	0 (0)	0 (0)	0 (0)	1.0
Partial flap necrosis	0 (0)	0 (0)	0 (0)	1.0
Pneumothorax	0 (0)	0 (0)	0 (0)	1.0
Minor revisions surgery	2 (2.1)	0 (0)	1 (2.3)	0.027*
Mortality <sup>b</sup>	0 (0)	0 (0)	0 (0)	1.0
<b>Patient Reported Outcomes</b>				
<b>BODY-Q response (N/%)<sup>a</sup></b>	76 (77)	43 (80)	33 (77)	0.16
<b>BODY-Q scores (mean/SD)<sup>b</sup></b>				
Chest score	86 (12)	89 (11)	84 (13)	0.080
Nipple score	74 (18)	74 (19)	74 (18)	0.98
Body score	64 (21)	63 (22)	65 (18)	0.73
Psychological score	70 (19)	70 (18)	70 (18)	0.96
Social score	60 (17)	61 (20)	59 (13)	0.48
Distress score	33 (20)	32 (24)	34 (16)	0.81

\*Indicates statistical significance at  $p < 0.05$ .

<sup>a</sup> Data presented as mean (SD). Independent *t*-test used to compare difference in means between groups.

<sup>b</sup> Data presented as frequency (%). Chi-square used to compare difference in proportions (or Fischer's exact for counts < 5).

the use of JP drains and all surgeries were performed in an ambulatory fashion. Not surprisingly, the mastectomy weights were significantly larger in obese patients (Left 961 g vs 464 g,  $p=0.005$  and Right 919 g vs 445 g,  $p<0.001$ ) (Table 2).

### Surgical Outcomes

The total complication rate for the DIFNG technique was 7% for non-obese patients and 9% for obese patients ( $p=0.19$ ). There was no difference in minor and major complication rates between non-obese and obese patients

**Table 4** Postoperative Outcomes (Outcomes based on increasing BMI).

Outcome	Overall	Non-Obese (BMI < 30)	Obese Class I (BMI 30 - 34.9)	Obese Class II (BMI 35 - 39.9)	Obese Class III (BMI ≥ 40)	p-value
<b>Total patients<sup>c</sup></b>	97	54	25	11	7	-
<b>Surgical Outcomes</b>						
<b>Total Complication Rate</b>	14 (14)	4 (7.4)	8 (32)	6 (60)	0 (0)	0.054
<b>Total patients with major complications<sup>b</sup></b>	1 (1.0)	0 (0)	1 (4.0)	0 (0)	0 (0)	0.40
Fluid collection requiring surgery	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1.0
Total flap necrosis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1.0
Complete wound dehiscence	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1.0
Complete nipple graft loss	1 (1.0)	0 (0)	1 (10)	0 (0)	0 (0)	1.0
Major revisions surgery	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.19
<b>Total patients with minor complications<sup>b</sup></b>	13 (13)	4 (7.4)	4 (16)	3 (30)	0 (0)	0.062
Seroma	2 (2.1)	0 (0)	1 (4.0)	0 (0)	1 (12.5)	0.15
Hematoma	1 (1.0)	0 (0)	1 (4.0)	0 (0)	0 (0)	0.11
Minor wound dehiscence	3 (3.1)	0 (0)	0 (0)	3 (27)	0 (0)	<b>0.003*</b>
Local wound infection	4 (4.1)	3 (5.6)	0 (0)	1 (4.0)	0 (0)	0.32
Partial nipple graft loss	1 (1.0)	0 (0)	0 (0)	1 (4.0)	0 (0)	0.80
Cellulitis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1.0
Partial flap necrosis	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1.0
Pneumothorax	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	<b>1.0</b>
Minor revisions surgery	2 (2.1)	0 (0)	1 (4.0)	0 (0)	1 (12.5)	0.15
<b>Mortality<sup>b</sup></b>	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1.0
<b>Patient Reported Outcomes</b>						
<b>BODY-Q response (N/%)</b>	76 (77)	43 (80)	20 (60)	7 (82)	6 (71)	0.63
<b>BODY-Q scores (mean/SD)</b>						
Chest score	86 (12)	89(11)	88 (9.7)	84 (15)	83 (12)	0.77
Nipple score	74 (18)	74 (19)	77 (18)	69 (22)	64 (15)	0.46
Body score	64 (21)	63(22)	68 (15)	57 (14)	55 (8)	0.44
Psychological score	70 (19)	70 (18)	69 (12)	74 (19)	65 (11)	0.87
Social score	60 (17)	61 (20)	55 (14)	63 (22)	68 (8.3)	0.39
Distress score	33 (20)	32 (24)	34 (16)	27 (23)	29 (27)	0.77

<sup>a</sup>Data presented as mean (SD). Independent *t*-test used to compare difference in means between groups.

\*Indicates statistical significance at  $p < 0.05$ .

<sup>b</sup> Data presented as frequency (%). Chi-square used to compare difference in proportions (or Fischer's exact for counts < 5).

[minor: 4(7%) vs 5(12%),  $p=0.19$ ) and major: 0(0%) vs 1(2%),  $p=0.46$ ] (Table 3). Postoperative outcomes were also comparable between obese patients, irrespective of the WHO class of obesity [Minor: 4(16%) Class I, 3(30%) Class II, and 0(0%) Class III,  $p=0.062$ ; Major: 1(4.0%) Class I, 0(0%) Class II, and 0(0%) Class III,  $p=0.40$ ] (Table 4). The most common complications were local wound infection and minor wound dehiscence. These were all successfully managed conservatively and did not require revision in the main operating room.

### Patient-reported outcomes

Among 76(77%) patients that responded to the BODY-Q survey, 43(80%) were non-obese and 33(77%) obese. There was no significant difference in the BODY-Q scores for each module [Chest: 89 (11) vs 84 (13)  $p=0.08$ ; Nipple: 74 (19) vs 74 (18)  $p=0.98$ ; Body: 63 (22) vs 65 (18)  $p=0.73$ ]; Psychological: 70 (18) vs 70 (18)  $p=0.96$ ; Social: 61 (20) vs

59 (13)  $p=0.48$ ; Distress: 32 (24) vs. 34 (16)  $p=0.81$ ] (Table 3 and Figure 1). BODY-Q scores were also comparable among obese patients in each WHO class of obesity ( $p>0.05$ ) (Table 4).

### Discussion

The last decade has seen considerable advances in the surgical management of gender dysphoria. These changes have resulted from increasing social acceptance, an improved understanding for the true spectrum of gender identity and, most importantly, infrastructural changes that have resulted in increased funding and improved access to care. Historically, these procedures were deemed cosmetic rather than reconstructive, and as such were not reimbursed by provincial healthcare authorities in Canada. Patients seeking chest masculinization surgery were therefore met not only with social barriers, but significant financial ones. Chest masculinization surgery prior to 2016 typically cost



**Figure 2** Preoperative and postoperative photographs of 20-year-old patient with BMI of 19.



**Figure 3** Preoperative and postoperative photographs of 20-year-old patient with BMI of 25.

\$8000 to \$12,000 with added costs for transportation and accommodation for surgery and follow-up.

As of March 1, 2016, however, the Ontario Health Insurance plan (OHIP) amended funding criteria to reflect internationally accepted standards by WPATH.<sup>22</sup> These changes now recognized chest masculinization as an essential reconstructive (rather than aesthetic) procedure for patients suffering from gender dysphoria. With one supporting recommendation from a qualified physician or nurse practitioner, preapproval applications are submitted after the initial consultation and confirmation of funding is received from the ministry of health before final surgical booking.

These infrastructural changes have significantly impacted the access to transgender care in Ontario. Deconstructing the social and financial barriers has inspired more patients to step forward and seek chest masculinization. Furthermore, more surgeons are beginning to offer these procedures, decreasing travel cost and improving access to

care. As the indications for chest masculinization continue to broaden, an increasing number of obese patients are now seeking surgery. It has been previously demonstrated that transgender patients have a higher risk for obesity, and as such, there is an increasing need to investigate surgical and patient-reported outcomes in this unique patient population.

Recent reviews by Ammari<sup>23</sup> and Gallagher<sup>24</sup> demonstrate few studies that describe surgical outcomes in obese patients undergoing DIFNG. Furthermore, to date no studies have compared patient-reported outcomes between non-obese and obese patients. Pittelkow et al<sup>25</sup> compared 66 non-obese to 79 obese patients undergoing DIFNG and showed that postoperative complications were similar between non-obese and obese patients with a BMI under 40. The authors, similar to our own practice, suggest that it is therefore unnecessary to delay surgery for weight loss. Gallagher et al<sup>26</sup> presented a cohort of 165 patients undergoing



**Figure 4** Preoperative and postoperative photographs of 43-year-old patient with BMI of 32.



**Figure 5** Preoperative and postoperative photographs of 19-year-old patient with BMI of 39.

mastectomy, 54% of which were obese and noted that cases of hematoma, infection and wound dehiscence exclusively occurred in obese patients. Van der Grift et al<sup>27</sup> performed a cross sectional study of patient-reported outcomes using the BODY-Q chest module and demonstrated that postoperative patients reported significantly higher scores in chest, nipple, body and psychological modules compared to preoperative patients.

The present study confirms that the double incision and free nipple graft technique continues to be safe and effective in obese patients (Figures 2-6). Approximately half

of our cohort had a BMI greater than 30 at the time of surgery, and these patients had a comparable complication rate and satisfaction as their non-obese counterparts. Furthermore, we demonstrate similar complication rates between obese patients with increasing WHO obesity classification, demonstrating that, for our obese patients with a BMI less than 45, increasing BMI was not associated with an increased complication profile. While the study is limited by its retrospective design and relatively small sample size, it is one of few studies to report outcomes in obese trans-male patients. With respect to patient-reported outcomes,



**Figure 6** Preoperative and postoperative photographs of 38-year-old patient with BMI of 45.

our study was limited by the lack of preoperative baseline BODY-Q scores to allow for perioperative comparison. This was due to the fact that the BODY-Q chest module is a novel patient-reported outcome measure that was not available at the time of the majority of our cohorts preoperative visits.

## Conclusion

Chest wall contouring via the DIFNG technique continues to be safe and effective for the management of gender dysphoria in transmale and non-binary patients. Obese patients have similar surgical and patient-reported outcomes as non-obese patients. The study supports our practice of offering chest contouring to healthy obese patients without delaying surgery for weight reduction.

## Previous presentations

None.

## Funding

None.

## Ethical approval

Not Required.

## Declaration of Competing Interest

None declared.

## Appendix 1. Outcome definitions

- 1 Major complications
  - Seroma or hematoma requiring evacuation in the main OR
  - Wound dehiscence requiring revision in the main OR
  - Superficial or deep wound infection requiring treatment in the main OR
  - Large contour irregularities requiring revision in the main OR.
- 2 Minor complications
  - Local wound infection treated with antibiotics alone
  - Minor wound dehiscence allowed to heal secondarily
  - Seroma or hematoma managed conservatively
  - Dog ear correction performed under local in clinic.
- 3 Patient Reported Outcome
  - All patients completed the chest module of the BODY-Q Questionnaire, a validated transgender-specific pre- and post-operative patient satisfaction tool that uses Likert-scales [6].

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