

A Drain-free Technique for Female-to-Male Gender Affirmation Chest Surgery Decreases Morbidity

Outcomes From 306 Consecutive Masculoplasties

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Purpose: One of the most common surgical procedures for gender affirmation surgery of the chest is mastectomy. The aims of this article are to review the outcomes of a single surgeon's experience with a drainless technique, which we named "masculoplasty" and compare morbidity in this group to previously published outcomes where drains were used.

Methods: A retrospective chart review was undertaken of all patients presenting to a single surgeon for gender-affirming chest surgery. A literature review was completed, compiling data from previously published studies of mastectomy with free nipple graft for the transgender patient. Outcomes of this drain-free group were compared with historical data, where drains were known to have been used.

Results: One hundred fifty-three patients underwent 306 masculoplasties in a university teaching hospital. The mean age of patients was 30 years (17–66 years). Sixty-five (42%) had 1 or more chronic medical comorbidities with 17 diabetic patients (11%). The mean body mass index was 32 kg/m² (18–57 kg/m²), and 83 (54%) were obese. Forty-two (27%) of the patients had a history of smoking. Mean operative time was 136 minutes (74–266 minutes).

Hematoma occurred in 1 patient (0.3%). Infections occurred in 7 masculoplasties (2%) with wound dehiscence in 3 (1%). Two masculoplasties (0.7%) had partial nipple necrosis. Two patients (0.7%) developed a symptomatic pneumothorax. There were 0 seromas, and no procedures were performed to drain fluid. Eight masculoplasties (3%) underwent secondary corrections. Median follow-up was 9 months.

Outcomes from this drain-free technique were compared with previously published outcomes of mastectomy where drains were known to be used. When compared with previously published series (n = 1334), the drain-free group had statistically significantly lower rates of hematoma (1/306 vs 39/1334, $P = 0.0036$) and acute reoperation (1/306 vs 42/1334, $P = 0.0024$). There was a shorter length of hospital stay in the drain-free group with a statistically significantly lower revision rate (8/306 vs 116/1334, $P = 0.0001$).

Conclusions: Gender affirmation chest surgery can be safely offered using a drain-free or "masculoplasty" technique. Compared with historical data, the use of progressive tension sutures decreases the incidence of hematoma, the need for acute reoperation, and other complications.

Key Words: drainless, female to male, mastectomy, outcomes, transgender

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The criterion standard for treatment of gender dysphoria is a multimodal approach using medical and surgical techniques.¹ One of the most common gender affirmation surgeries offered is masculinization of the chest with mastectomy.¹ There has been an increase in the number of gender affirmation surgeries performed in the United States according

to the American Society of Plastic Surgeons procedural statistics report in 2016.² In our practice, the most commonly performed procedure to achieve masculinization when skin resection is required is a simple mastectomy with free grafting of the reduced, masculinized nipple. Patients undergoing this technique have been previously shown to have the lowest incidence of secondary surgeries.^{3,4}

We present 153 consecutive patients who underwent 306 mastectomies or "masculoplasties" performed with the use of progressive tension sutures to obviate the need for closed suction drainage. The aim of this article is to compare perioperative morbidity in this group to previously published outcomes where drains were used, evaluating therefore the role of routine use of closed suction drainage in this group.

METHODS

A retrospective chart review was undertaken of all patients presenting from December 2015 to May 2018 to a single surgeon for gender-affirming chest surgery. The study was submitted to and approved by the Indiana University Institutional Review Board. To prepare for surgery, all candidates were seen by a mental health professional and assessed for suitability for surgery with guidance of the World Professional Association for Transgender Health standards of care.⁵

The majority of patients presenting for this technique had too much skin and breast tissue to undergo less invasive "keyhole" techniques. Patients presenting for gender confirmation surgery who did qualify for minimal scar techniques were excluded from this study.

Operative Technique

Mastectomies were performed taking care to preserve the pectoralis muscle fascia (this is preferable as the fascia better holds progressive tension sutures). Taking care to avoid the skin, electrocautery is used for the dissection set at 60 W on coagulation mode. The thickness of superior flaps of both sides is compared prior to closure. In order to avoid drains, as much dead space as possible is obliterated using a progressive tension technique similar to that described by Pollock and Pollock⁶ in abdominoplasty.

Using a 1-0 Vicryl suture with the largest tapered needle available (CTX; Ethicon, Inc; Somerville, NJ), multiple interrupted sutures were placed from the superficial fascia of the superior flap. Tension was placed on the superior flap, and a bite of the more caudal pectoralis fascia was taken, and the suture tied down. In this way, the flap is advanced downward on the chest so that tension is distributed out over the flap and is not present only at the skin suture line. Minimal dead space is left behind so the need for a drain was obviated. Care is taken not to place the sutures too superficially so as to avoid puckering of the skin. Patients were placed in a compression garment for 7 days postoperatively.

A retrospective chart review of these patients was undertaken focusing on perioperative morbidity. The study design included a review of MEDLINE and PubMed databases for human studies restricted to the English language.

Searched terms included "female to male," "transgender," and "mastectomy." Studies selected used a similar mastectomy with free nipple graft technique. In articles where multiple techniques were used,

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only results from the mastectomy and free nipple graft procedures were included. All studies were confirmed to have had drains placed from either the study description or by contacting the authors.

Outcomes of this drain-free group were compared with these historical data where drains were used. Preoperative demographics (age, body mass index, and comorbidities), intraoperative outcomes (weight of resected tissue, operative time, and estimated blood loss), and postoperative outcomes (seroma, hematoma, wound dehiscence, infection, and reoperation rates) were collected. Any wound area documented as 1 cm² or more was considered a wound dehiscence. Any patient prescribed a course of postoperative antibiotics was considered to have a wound infection. Any revision procedure, under local anesthetic either in the office or in the operating room, was recorded as a reoperation.

Using χ^2 and Fisher exact test for categorical variables, this drain-free group was compared with historical data in terms of operative data and complications.

SPSS software (version 20) was used to perform all statistical analyses. Statistical significance was set to the level of $P < 0.05$.

RESULTS

Patient Characteristics

One hundred sixty-five patients presented for gender-confirming chest surgery; however, 12 of these were excluded as they opted for minimal scar techniques.

One hundred fifty-three patients underwent 306 mastectomies or “masculoplasties.” Ninety-four percent of patients identified as transgender men; 6% identified as nonbinary. Ninety-five percent of patients were taking testosterone. The mean age of patients was 30 years (range, 17–66 years). Eighty-three (54%) of the patients were obese. Sixty-five patients (42%) had 1 or more chronic medical comorbidities, with 17 (11%) having a diagnosis of diabetes. The mean body mass index was 32 kg/m² (range, 18–57 kg/m²). See Table 1 for all demographic data.

Sixty (39%) of these patients had an American Society of Anesthesiologists Physical Status Classification grade of 1, 68 (44%) were grade 2, and the remaining 25 (17%) were a grade 3. Forty-two (27%) of the patients had a history of smoking—all patients were counseled to stop smoking 6 weeks prior to surgery. Fifty-nine (39%) of our patients had psychiatric comorbidities, and 6 had previous known suicide attempts. It was a requirement per World Professional Association for Transgender Health standards of care that all medical and psychiatric comorbidities were controlled prior to proceeding with surgery.

Intraoperative

Mean weight resected was 833 g on the right and 826 g on the left (overall mean, 830 g [range, 98–4650 g]). Mean operative time was 136 minutes (range, 74–266 minutes). Mean estimated blood loss was 50 mL. No blood transfusions were given. One hundred twenty-five patients (82%) were discharged home the day of surgery, and all admissions were planned.

Postoperative

The median pain score on the visual analog pain scale on discharge from the recovery room was 4/10. Hematoma occurred in 1 masculoplasty (0.3%) after surgery, requiring acute return to the operating room. Infections occurred in 7 masculoplasties (2%), with wound dehiscence in 3 (1%). All of these complications happened in obese patients. Two masculoplasties (0.7%) had partial nipple necrosis. Two patients developed a symptomatic pneumothorax, which was found and treated with a chest tube after surgery. There were 0 seromas, and no aspirations were required. Eight patients (3%) underwent secondary corrections, including 7 “dog-ear” revisions and 1 nipple revision.

These drain-free technique outcomes were compared with previously published reports of female-to-male gender affirmation surgeries (Tables 1, 2, and 3).

When compared with previously published series, in which drains were known to be used, meta-analysis showed that the drain-free group had statistically significantly lower rates of hematoma ($P = 0.0036$), acute reoperation ($P = 0.0024$), and other complications ($P = 0.001$). There was a shorter length of hospital stay in the drain-free group with a statistically significantly lower revision rate ($P = 0.0001$).

Mean follow-up on our patient group was only 9 months, so when cases with less than 6 months' follow-up were excluded, the difference in rates of revision still reached significance ($P = 0.0052$). See Figures 1, 2, and 3 for preoperative photographs and postoperative results.

DISCUSSION

An estimated 0.6% of adults, approximately 1.4 million, identify as transgender in the United States.¹⁵ Gender affirmation surgery is becoming more available to the US transgender population, either through private insurers who increasingly offer plans with benefits covering surgical procedures,¹⁶ or some in states with laws protecting the transgender patient from discrimination while seeking treatment. There will therefore likely be continued growth in the number of gender affirmation surgeries performed in the United States. Until recently, much of the published data on female-to-male gender affirmation chest surgery came from Europe.

TABLE 1. Patient Characteristics

First Author	No. Mastectomies	Diabetes	Testosterone	Smokers	Mean Age (Range), y	Mean BMI (Range),b_k;kg/m ²	Obese
Berry ⁷	n = 158	—	88%	37%	28 (18–55)	—	1%
Wolter ⁸	n = 124	—	—	—	33 (16–54)	29.1 (22–39)	—
Wolter ⁹	n = 352	—	—	—	30 (18–52)	27.4 (18–43)	—
Monstrey ¹⁰	n = 36	—	—	—	31 (20–60)	—	—
Cregten-Escobar ³	n = 150	—	—	—	35	27	—
Kaariainen ¹¹	n = 56	0	93%	19%	24	26.6	14%
Top ¹²	n = 32	—	31%	—	28 (20–38)	24	—
Frederick ¹³	n = 96	—	74%	—	24 (15–71)	22.3 (18.6–41.3)	—
Knox ⁴	n = 110	2	—	32%	33 (18–65)	28.6 (20.5–40)	—
Donato ¹⁴	n = 220	—	—	—	—	—	—
Gallagher (present study)	n = 306	17	96%	27%	30 (17–66)	32 (18–57)	54%

NAC, nipple areola complex; SSI, surgical site infection.

TABLE 2. Operative Data

First Author	No. Mastectomies	Operative Time (Range), min	Compression	Length of Stay (Range)	Mean Weight Resected (Range), g
Berry ⁷	n = 158	—	3 wk	—	376 (42–2600)
Wolter ⁸	n = 124	79 (56–120)	6 wk	5 d (3–9)	R: 742.4 (244–1700) L: 730 (208–1400)
Wolter ⁹	n = 352	66 (19–129)	6 wk	5 d (5–8)	R: 573.3 (70–2132) L: 586.9 (121–1986)
Monstrey ¹⁰	n = 36	—	—	—	550 (150–1312)
Cregten-Escobar ³	n = 150	—	—	5 d	570
Kaariainen ¹¹	n = 56	—	4–6 wk	1 day	—
Top ¹²	n = 32	—	—	—	560 (145–1310)
Frederick ¹³	n = 96	—	1 wk	—	493 (98–2760)
Knox ⁴	n = 110	—	4–6 wk	—	700.1 (125–1610)
Donato ¹⁴	n = 220	—	4 wk	—	710
Gallagher (present study)	n = 306	136 (74–266)	1 wk	0.2 d (0–4)	830 (98–4650)

This study focuses on the impact of the drain-free “masculoplasty” technique on perioperative morbidity. In previous reports, hematoma is the most commonly reported complication. Although the double incision with free nipple graft has a lower rate of hematoma as compared with skin-sparing techniques,¹⁴ hematomas, often requiring urgent surgical evacuation, are reported in up to 11% of procedures (Table 2). Previous articles have suggested modalities for decreasing this risk, including the routine use of aminocaproic acid and blood pressure control.⁸ The 1 patient who developed a unilateral hematoma in this group was hypotensive throughout his surgery and then had poorly controlled hypertension in the recovery room where the hematoma occurred. It is also well established in the facelift literature, where there also is a flap raised, that blood pressure control is vital to prevent hematoma formation.¹⁷ There is, however, a statistically significant decrease in the rate of hematoma and acute reoperations when drains were omitted. We hypothesize that, in the case of the drain-free technique, by eradicating much of the dead

space a bleeding vessel can fill; bleeding may be tamponaded prior to becoming clinically significant. Therefore, progressive tension sutures may be protective against this complication. Of note, the use of external compression does not explain the difference in hematoma and seroma rates as our patients are safely liberated from their compression garment at 1 week as opposed to a median time of 5 weeks in the drained group. This study not only reiterates the surgical dogma that drains do not prevent hematoma, but also indeed their use over obliteration of dead space may actually help cause the complication.

McEvenue et al¹⁸ published on a similar drain-free technique using progressive tension sutures in a large cohort of 575 female-to-male patients. Morbidity was similarly low in this group with reported rates of hematoma (3.8%, 1.6% requiring reoperation).

Drain-free techniques have previously been described in mastectomy for treatment of breast cancer. Ouldamer et al¹⁹ demonstrated significantly lower seroma rates with quilting sutures as compared with

TABLE 3. Complications

First Author	No. Mastectomies	Hematoma Rate	Seroma Rate	SSI	Acute Reoperation	NAC Necrosis	Secondary Corrections	Other Complications	Wound Dehiscence	Median Follow-up, mo
Berry ⁷	n = 158	5 (3.1%)	0	3 (1.8%)	5 (3.1%)	2 (1.2%)	16 (10.1%)	0	0	7
Wolter ⁸	n = 124	5 (4.0%)	2 (1.6%)	—	5 (4.0%)	1 (0.8%)	4 (3.2%)	—	—	—
Wolter ⁹	n = 352	4 (1.1%)	3 (0.8%)	—	4 (1.1%)	0	20 (6.7%)	—	—	—
Monstrey ¹⁰	n = 36	1 (2.7%)	0	0	1 (2.7%)	0	4 (11.1%)	0	1 (2.7%)	—
Cregten-Escobar ³	n = 150	7 (4.6%)	—	—	7 (4.6%)	—	34 (22.6%)	—	—	—
Kaariainen ¹¹	n = 56	3 (5.3%)	1 (1.7%)	1 (1.7%)	0	1 (1.7%)	7 (12.5%)	4 (7.6%)	Fistula	0
Top ¹²	n = 32	2 (6.2%)	0	0	1 (3.1%)	5 (15.6%)	0	0	0	20
Frederick ¹³	n = 96	2 (2.1%)	0	0	2 (2.1%)	0	4 (4.2%)	0	0	—
Knox ⁴	n = 110	4 (3.6%)	0	4 (3.6%)	0	1 (0.9%)	19 (17.2%)	1 (0.9%)	(mastectomy flap necrosis)	3 (2.7%)
Donato ¹⁴	n = 220	6 (2.7%)	—	—	17 (7.8%)	0	8 (3.6%)	17 (7.8%)	—	6
Total	n = 1334	39 (2.9%)	6/964 (0.6%)	8/488 (1.6%)	42/1334 (3.1%)	10/1184 (0.8%)	116/1334 (8.7%)	22/454 (4.8%)	4/488 (0.8%)	13.5
Gallagher (present study)	n = 306	1 (0.3%)	0	7 (2%)	1 (0.3%)	2 (0.7%)	8/230 (2.8%)	2 (0.7%)	(pneumothorax)	3 (1%)

NAC, nipple areola complex; SSI, surgical site infection.



FIGURE 1. Patient 1: preoperative and postoperative photographs at 1-year follow-up.

drainage tubes. In other studies, drain-free techniques have been shown to decrease hospital length of stay and costs.^{20,21} This is consistent with the findings of the present study.

When mastectomy is performed for breast cancer, seroma rates are reported at a rate of 25% to 50%.²² The reported rate is much lower for gender confirmation procedures presumably because the extent of dissection is less and the axilla is undisturbed.^{3,4,7-14} Seroma rates were zero in the current study. Controversy still exists as to the best approach to avoid seroma when subcutaneous dead space is present. Many modalities continue to be described to prevent seroma accumulation,

including corticosteroid use,²³ fibrin glue,²⁴ and negative-pressure wound therapy.²⁵ In the case of drain-free abdominoplasty, seroma rates are decreased with a drain-free technique.^{6,26} Our results are consistent with the abdominoplasty experience.

There was a significant decrease in “other complications” in the drain-free group. Unfortunately, however, the nature of many of these “other” complications was not specified often in the publications. Examples include fistulae and mastectomy flap necrosis.

The most significant complications in this study were the 2 pneumothoraces that required intervention with a chest tube placement.



FIGURE 2. Patient 2: preoperative and postoperative photographs at 6-month follow-up.

The likely cause for this was the previous routine use of interoperative intercostal blocks, which have been shown to be beneficial after breast surgery.²⁷ Intercostal blocks are reported to have a 1.4% incidence of pneumothorax per level used²⁸; a total of 4 levels were used in each masculoplasty. This practice has now been replaced by use of pectoralis nerve blocks, and no further pneumothoraces have been encountered.

Drains themselves can cause significant discomfort. It has been previously shown that placement of a drain after breast reduction surgery significantly increases patient-reported discomfort.²⁹ Corion et al³⁰

showed a decreased length of hospital stay when drains were omitted in breast reduction surgery. Patients in our study had a shorter hospital stay, and indeed most were performed as outpatient procedures. The reduction of the incidence of hematoma rates requiring emergent evacuation also improves the safety of these procedures being done as an outpatient. Also, the progressive tension sutures themselves appear not to add to the patient's postoperative pain. All patients who were admitted overnight were planned as such either due to concern for sleep apnea, comorbidities, or social reasons. There were therefore no



FIGURE 3. Patient 3: preoperative and postoperative photographs at 6-week follow-up.

unplanned admissions for pain control. The most common pain rating of patients leaving the postanesthesia care unit was 4/10 on a visual analog pain scale. This is consistent with findings of shorter hospital stays when progressive tension sutures were used instead of drains in abdominoplasty.²⁶

Apart from the obvious modest savings in not using the drains themselves, the drain-free technique may decrease costs by reducing length of stay and morbidity. Transgender patients typically are at an increased risk of poverty.³¹ Practicing in a state where patients often must fund their own surgical transition, a drain-free technique may be protective of a costly trip back to the operating room and/or overnight stay.

Most studies do not include length of procedure in their data. Length of procedure was longer when compared with those reported by Wolter et al⁸ (mean of 136 vs 79 and 66 minutes), although in that study 2 attending surgeons were usually working in tandem so shorter durations would be expected compared with this study, where the surgeon operated either alone or with a resident. The author estimates

the progressive tension sutures to add approximately 15 minutes to the case, depending on the habitus of the patient.

In our study, the rate of infection was not decreased. However, of note, infections occurred only in obese patients, and there was a high prevalence of obesity (54%) in our patient population.

In a population where aesthetic concerns can be paramount in order to allow the patient, if they choose, to “pass” in society, every effort is made to hide the scar where the pectoralis would insert. A potential aesthetic benefit of drain omission is the absence of an additional drain exit site scar. Also, with the progressive tension technique, the tension is dispersed over the entire skin flap so the skin closure itself is relatively tension-free. The 3 wound dehiscences in this study were all in the setting of infection. It is impossible to compare aesthetic outcomes of the 2 techniques in this study as we lack patient or observer ratings of the results. However, there is a statistically significant decrease in the number of patients undergoing secondary corrections in the drain-free group. Although this could be attributed to a relatively

short median follow-up time (9 months), there is still a trend toward less corrections when patients with less than 6 months of follow-up are excluded with secondary correction rates of (8/230; $P = 0.0052$). This could potentially possibly point toward improved scarring with the use of progressive tension suture, which disperses the tension across the flap rather than just at the skin closure.

Other benefits of drain omission may include decreased nursing requirements, decreased office visits, ability to shower early postoperatively, and avoidance of commonplace misuse of antibiotics to “cover the drain.”³² Drains are unreliable—they get clogged and can accidentally be dislodged too early (5% in the first 24 hours).³³ A Cochrane review previously failed to show a benefit with the routine use of drains after breast reduction.³⁴ It is indeed possible that the routine placement of drains may be not only unnecessary but also even harmful. Using the mastectomy model in addition to the abdominoplasty model³⁵ to help prove this hypothesis has far-reaching implications. Multiple surgeries are performed with the routine use of subcutaneous drains across many surgical fields. The results from the current study add to the growing body of literature to support quilting/progressive tension sutures and the routine obliteration of dead space over the use of drains.^{36,37} This literature may help lead to a paradigm shift, modernizing the way surgeons address subcutaneous dead space.

Limitations of this study include its retrospective nature as well as relatively short long-term follow-up and lack of patient satisfaction data. Limitations of the meta-analysis portion include missing data for comparison and limitations within the individual studies. Future areas for study would include randomizing patients to either have drains or omit them.

CONCLUSIONS

Female-to-male gender affirmation chest surgery can be safely offered using a drain-free technique. Compared with historical data, the use of progressive tension sutures decreases the incidence of hematoma, the need for acute reoperation, and other complications. They may also facilitate a shorter hospital stay and a decreased need for revision surgeries. More studies are needed to evaluate the effect of this technique on patient comfort, surgical costs, and aesthetic outcomes.

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