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Short Communication

Comparing scrotoplasty complication rates in transgender and cisgender men: An ACS NSQIP study ☆

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ABSTRACT

While masculinizing gender-affirming genital surgeries may include scrotoplasty, there has been limited research on the safety and outcomes of scrotoplasty among transgender men. We compared scrotoplasty complication rates between cisgender and transgender patients using data from the American College of Surgeon's National Surgical Quality Improvement Program (NSQIP) database. Data was queried between 2013 and 2019 for all patients with procedure codes for scrotoplasty. Transgender patients were identified through a gender dysphoria diagnosis code. T-tests and Fisher's exact test were used to identify any differences in demographics, operative characteristics, and outcomes. The primary outcomes of interest were demographic factors, operative details, and surgical outcomes.

A total of 234 patients were identified between 2013 and 2019. Fifty were transgender and 184 were cisgender. Age and BMI were significantly different between the two cohorts, such that the cisgender cohort was older (M_{trans} = 38 years (SD:14), M_{cis} = 53

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years (SD: 15)) and had higher BMI than the transgender cohort (M_{trans} = 26.9 (SD: 5.5), M_{cis} = 35.2 (SD: 11.2)). Cisgender patients also had poorer overall health (p = 0.001), and were more likely to have hypertension (p = 0.001) and diabetes (p = 0.001). Race and ethnicity did not vary significantly between the cohorts. Operative details differed significantly between cohorts, such that transgender patients had a longer operating time (M_{trans} = 303 min (SD: 155), M_{cis} = 147 min (SD: 107)) and fewer transgender patients had a simple scrotoplasty (p = 0.02). The majority of gender-affirming scrotoplasties were performed by plastic surgeons (62%) whereas the majority of cisgender scrotoplasties were performed by urologists (76%). Despite these demographic and pre-operative differences, the number of patients who underwent complex scrotoplasty experiencing any of the tested complications did not differ by gender. Our results support scrotoplasty as a safe procedure for transgender patients, with no significant differences in outcomes between transgender and cisgender patients.

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Introduction

Scrotoplasty, the surgical repair or reconstruction of the male scrotal sac, is performed in both transgender and cisgender patients. For cisgender men, scrotoplasty is performed to treat trauma, infection, and cancer – among other conditions. In transgender patients, scrotoplasty is primarily performed as part of gender-affirming genital surgery for individuals who desire it (Figure 1). Scrotoplasty in cisgender men is considered a safe procedure with an overall 20% complication rate, with the most common complications being wound breakdown and hematoma.[1] In the context of gender-affirming surgery, research has primarily reported outcomes of scrotoplasty in tandem with other procedures such as phalloplasty and metoidioplasty, which makes it difficult to assess the safety of scrotoplasty in transgender patients.[2] Even when scrotoplasty as part of gender care has been examined as a standalone procedure, there has been no included comparator group.[3] To address this lack, we analyzed complication rates following non-cancerous scrotoplasty in transgender and cisgender patients using a large, national, deidentified database.

Materials and methods

The American Collect of Surgeons' National Surgical Quality Improvement Program (NSQIP) is a large, national, risk-adjusted, deidentified database that collects 30-day patient outcomes, pre-operative, and operative characteristics from over 600 participating institutions.[4] All patients included in this analysis were identified using procedure (i.e. CPT) codes for scrotoplasty and had a procedure between 2013 and 2019. Only patients who underwent scrotoplasty as a standalone procedure were included. Transgender patients were identified through ICD-9 or ICD-10 codes for gender dysphoria or history of sexual reassignment.

Analyzed variables included pre-operative characteristics such as age and body mass index (BMI), operation time, and all potential 30-day post-operative outcomes. 30-day post-operative outcomes included: superficial surgical site infection (SSI), deep wound SSI, organ/space SSI, wound dehiscence, pneumonia, bleeding requiring transfusion, deep vein thrombosis, sepsis, urinary tract infection, renal insufficiency, unplanned reoperation, pulmonary embolism, unplanned intubation, being on a ventila-

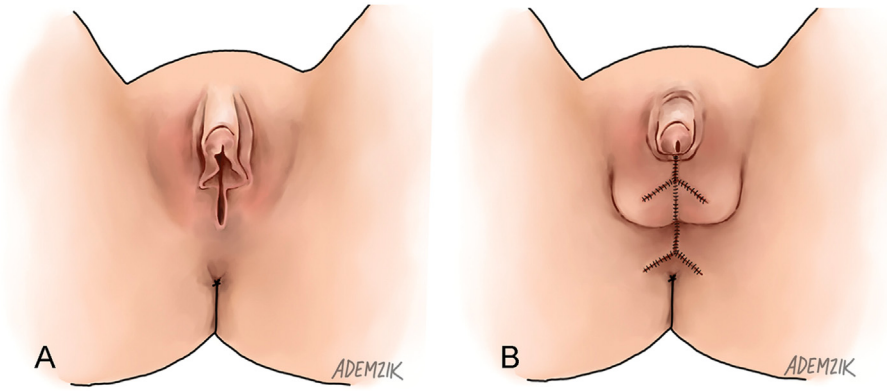

Figure 1. Scrotoplasty in a patient undergoing metoidioplasty. (A) Before. (B) After.

tor >48 h, renal failure, stroke, cardiac arrest, myocardial infarction, septic shock, unplanned readmission, and death. Overall health status was determined by ASA classification.

Differences in continuous pre-operative characteristics and operative time were determined through Student's *t*-test. All other differences in pre-operative characteristics, as well as any differences in complications, were determined through Fisher's exact test. The alpha level was set at 0.05. All data were analyzed using Stata 16 (2019, Statacorp LLC, College Station, TX).

Results

Of the 234 people included in our dataset, 184 (79%) were cisgender and 50 (21%) were transgender. The majority of patients, regardless of gender, were White and non-Hispanic. Transgender patients were significantly younger at the time of surgery ($M_{\text{transgender}}$: 38, SD: 14 years vs. $M_{\text{cisgender}}$: 53, SD: 15 years, $p = 0.001$) (Table 1). Transgender patients also tended to be significantly healthier than cisgender patients. 92% of transgender individuals were ASA class I or II, compared to only 49% of cisgender patients. Transgender patients had significantly lower BMI ($M_{\text{transgender}}$: 26.9, SD: 5.5 vs. $M_{\text{cisgender}}$: 35.2, SD: 11.2, $p = 0.001$). Transgender individuals were also less likely to have hypertension requiring medication ($p = 0.001$) and diabetes ($p = 0.001$). There were no significant differences in the number of patients with bleeding disorders or number of patients who were smokers within the past year. The number of scrotoplasties performed in transgender individuals increased exponentially during the study period, with the majority of procedures being performed between 2017 and 2019 (Figure 2).

With respect to surgical technique, transgender individuals were less likely than cisgender individuals to undergo simple scrotoplasty ($p = 0.02$). All surgeries were performed by either a gynecologist, urologist, plastic surgeon, or general surgeon. The procedure was more likely to be performed by a plastic surgeon if the patient was transgender ($p = 0.001$). Operating time was higher for transgender patients than cisgender patients ($M_{\text{transgender}}$: 303 min, SD: 155 vs. $M_{\text{cisgender}}$: 147, SD: 107 min, $p = 0.001$).

Differences in complications between the cisgender and transgender cohorts were calculated among those patients who underwent complex scrotoplasty. Across these patients, the most common complications were unplanned readmission, superficial surgical site infection, and bleeding requiring transfusion, although all complications were relatively uncommon (Table 2). There were no significant gross differences in 30-day complications by gender for all assessed study complications.

Discussion

This study has several important findings. There were significant differences in the demographics of the two cohorts such that transgender men were significantly more likely to be younger and health-

Table 1
Sample demographics, pre-operative characteristics, and complication outcomes of scrotoplasty procedures. Note: percentages may not add up to 100 due to rounding.

	Transgender ($n = 50$) Mean (SD)	Cisgender ($n = 184$) Mean (SD)	$p <$ *t*-test
Age	38 (14)	53 (15)	**0.001**
BMI	26.9 (5.5)	35.2 (11.2)	**0.001**
Operating time (min)	303 (155)	147 (107)	**0.001**
	N (%)	*N* (%)	**Fisher's exact**
Race			
White	39 (78)	138 (75)	0.64
Asian	3 (6)	4 (2)	
Black	12 (6)	24 (13)	
Native Hawaiian	0 (0)	1 (0.5)	
AI/AN	0 (0)	2 (1)	
Unknown	2 (4)	15 (8)	
Hispanic			
Yes	5 (10)	19 (11)	1.00
No	43 (90)	150 (89)	
Simple scrotoplasty			
Yes	23 (46)	118 (64)	**0.02**
No	27 (54)	66 (36)	
ASA class			
1	17 (34)	20 (11)	**0.001**
2	29 (58)	69 (38)	
3	4 (8)	85 (46)	
4	0 (0)	10 (5)	
Surgical specialty			
General surgery	0 (0)	23 (12)	**0.001**
Gynecology	1 (2)	0 (0)	
Plastics	31 (62)	21 (11)	
Urology	18 (36)	140 (76)	
Hypertension			
Yes	10 (20)	95 (52)	**0.001**
No	40 (80)	89 (48)	
Diabetes			
Yes	2 (4)	51 (28)	**0.001**
No	48 (96)	133 (72)	
Bleeding disorders			
Yes	1 (2)	7 (4)	1.00
No	49 (98)	177 (96)	
Smoking			
Yes	8 (16)	34 (18)	0.84
No	42 (84)	150 (82)	

ier than cisgender males undergoing scrotoplasty. All complications were originally assessed across lines of gender, and subsequently as a sensitivity analysis, procedures were restricted to only complex scrotoplasty and compared. This was done to account for the additional procedural complexity of gender-affirming scrotoplasty and was warranted by the significant differences in Table 1. Our results also indicated an exponential growth in scrotoplasty procedures performed on transgender men after 2016. Despite significant differences in the age and reasons for pursuing scrotoplasty between the cisgender and transgender cohort, our results did not show evidence of a significant difference in complications between cisgender and transgender individuals, and complications were rare in both groups. This is consistent with other research comparing surgical outcomes between transgender and cisgender people, despite the procedures being performed for fundamentally different reasons.[5,6]

The differences in pre-operative characteristics, such as overall health, between the study cohorts may be due to the differences in why these procedures are pursued by these two groups. Cisgender males typically undergo the procedure after medical pathologies such as Fournier's gangrene, trauma, burns, and cancer. Conversely, transgender men may opt to have scrotoplasty performed as part of

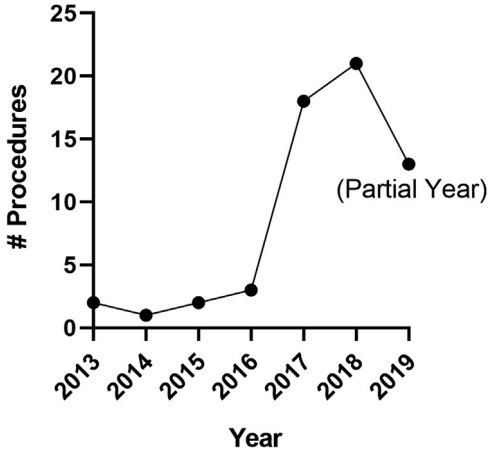

Figure 2. Number of scrotoplasty procedures performed between 2013 and 2019.

Table 2
Complication outcomes of complex scrotoplasty procedures, by cisgender/transgender. *p*-values correspond to Fisher's exact test.

	Transgender ($n = 28$)	Cisgender ($n = 66$)	$p <$
All cause complications			
Any	*4 (14)*	*19 (29)*	*0.19*
Wound complications			
Any	*1 (4)*	*8 (12)*	*0.27*
Superficial SSI	1 (4)	5 (8)	0.66
Deep SSI	0 (0)	2 (3)	1.00
Organ/space SSI	0 (0)	1 (2)	1.00
Wound dehiscence	0 (0)	2 (3)	1.00
Mild systemic complications			
Any	*3 (11)*	*9 (14)*	*1.00*
Pneumonia	0 (0)	1 (2)	1.00
Bleeding requiring transfusion	0 (0)	5 (8)	0.32
Deep vein thrombosis	0 (0)	1 (2)	1.00
Sepsis	1 (4)	2 (3)	1.00
Urinary tract infection	1 (4)	3 (4)	1.00
Unplanned reoperation	1 (4)	3 (4)	1.00
Severe systemic complications			
Any	*2 (7)*	*9 (14)*	*0.50*
Unplanned intubation	0 (0)	1 (2)	1.00
On ventilator >48 h	0 (0)	2 (3)	1.00
Renal failure	0 (0)	1(2)	1.00
Stroke	0 (0)	0 (0)	
Cardiac arrest	0 (0)	0 (0)	
Myocardial infarction	0 (0)	0 (0)	
Septic shock	0 (0)	1 (2)	1.00
Unplanned readmission	2 (7)	7 (11)	0.72
Death within 30 days	0 (0)	0 (0)	

gender-affirmation, generally either during or following gender-affirming phalloplasty or metoidioplasty. As such, it would be expected that transgender patients would be younger and therefore have fewer comorbid conditions.[7] This may also be the reason why transgender individuals were less likely to have had simple scrotoplasty, given that gender-affirming scrotoplasty generally involves complex reconstruction of local tissues that differ from the structures in cisgender men. The increased procedural complexity also likely explains the increased operating time and, in combination with the

increased proportion of transgender individuals undergoing complex scrotoplasty, highlights the increased operative complexity of scrotoplasty in transgender individuals. Procedure coding systems should consider adding additional procedure codes that accurately capture these procedures.[8]

Overall, the complication rates for all assessed complications were similar to those reported in prior literature and did not differ between transgender and cisgender patients who underwent complex procedures. This provides evidence in support of the safety of these procedures. Scrotoplasty is generally viewed as a safe procedure with complications occurring in up to 20% of procedures.[1] Unfortunately, it was not possible to determine the exact surgical approach used (e.g., what tissues were used, incision types, exact steps, and procedural components) as the deidentified nature of the NSQIP does not allow extraction of such information from the medical record. Future research should investigate whether tissue types used, incision types, usage of tissue expanders, and whether the addition of silicone testicular implants at the time of scrotoplasty affect the outcomes of gender-affirming scrotoplasty.

The safety of scrotoplasty in this population is particularly relevant as our results indicated an exponential uptick in the number of scrotoplasties performed for transgender patients, although the available data remain limited. This is consistent with rising rates of gender affirming surgery from the 2000s onwards, particularly after Medicaid expansions under the Affordable Care Act of 2012 and subsequent state-specific expansions in 2015.[7,9] However the relative growth of masculinizing genitoplasty has lagged in comparison to other procedures, likely due to the limited numbers of qualified, culturally-competent providers available in the professional workforce,[10] and as evidenced by the relatively few patients identified in our analysis.

Conclusion

Despite significant differences in pre-operative characteristics and an overall longer operation time, the safety profile of scrotoplasty in transgender individuals undergoing complex procedures does not appear to be different than that of complex scrotoplasty in cisgender individuals. This provides evidence in support of scrotoplasty as a safe gender-affirming surgery for transgender individuals who desire this procedure. However, there remains a need for better coding options that capture the differential complexity of procedures performed in transgender and cisgender populations.

Ethics

The Boston Children's Hospital Institutional Review Board determined this to be non-human subjects research, and approved this research on 2/5/2021 (IRB-P00038129).

Declaration of Competing Interest

None.

Funding

None.

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