

Labial Fat Grafting After Penile Inversion Vaginoplasty

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ABSTRACT

Background: Penile inversion vaginoplasty (PIV) has become the most commonly performed genital surgery for transfeminine patients. However, patients undergoing this procedure may still require revisions to achieve a satisfactory result.

Objectives: We report on the use of autologous fat grafting to the labia majora to improve results after PIV, and complications that may predict the need for grafting.

Methods: A retrospective chart review was conducted of a single surgeon's patients who underwent PIV between July 2014 and December 2019. Demographic information, operative information, and postoperative outcomes were abstracted from the health records. Wilcoxon rank sum tests and chi-squared and were used for continuous variables and categorical, respectively.

Results: A total of 182 transfeminine and gender-diverse patients underwent PIV, with 6 patients (3.3%) eventually undergoing labial fat grafting. The most common indication for labial fat grafting was flattened labia majora (83%). All fat grafting procedures were performed concurrently with other revisions of the vaginoplasty. There were no demographic or medical history differences detected between the fat grafting and non-fat grafting groups. Patients who underwent labial fat grafting were more likely to suffer from introital stenosis (33% vs 6%, $p = 0.007$) and prolonged granulation tissue greater than 6 weeks after initial vaginoplasty (83% vs 32%; $p = 0.01$).

Conclusions: Labial fat grafting is a safe and effective method to address defects in the labia majora after PIV. Prolonged granulation tissue and introital stenosis may predict the need for labial fat grafting, possibly due to increased scarring and contracture at the surgical site.

Penile inversion vaginoplasty (PIV) is the most common genital surgical procedure for transfeminine patients, and often the final stage in the gender-affirming process.^{1,2} The goals of PIV are to create a vulva, an adequately sized vaginal canal to enable penetrative intercourse, and a functional clitoris.^{2,3} Gender affirming therapies, in general, have been found to lead to high levels of patient satisfaction,^{4,5} and this has held true for transfeminine patients undergoing PIV.^{2,6,7}

Although PIV has been met with high levels of patient satisfaction, patients often require revision procedures to achieve optimal aesthetic and functional results.^{2,8-13} Clitoroplasty, labiaplasty, or less commonly, repeat vaginoplasty have been commonly cited as revision procedures that have led to improved results and high levels of patient satisfaction.^{3,12,13} Augmentation of the labia with autologous fat grafting can be combined with labiaplasty or an independent procedure to improve projection and fullness. Indications for autologous fat grafting to labia majora include loss of volume and downward displacement of labial skin. While fat grafting for labia augmentation has been described in the cisgender literature, there has been no study looking at predictors and outcomes of the procedure after PIV in the transfeminine population.¹⁴⁻¹⁷ Here, we report on technique, outcomes, and risk factors that may lead to the need for labial fat grafting after PIV. A comprehensive understanding of the revision procedure and its outcomes can aid gender affirming surgeons in counseling transfeminine patients both before and after PIV.

METHODS

Study Design

A retrospective review was conducted of a single surgeon's (T.S.) records of patients undergoing PIV and subsequent revisions. The patient cohort included transfeminine and gender diverse patients, who were assigned male at birth. Patients included in the study underwent PIV between July 2014 and December 2019, and were at least 18 years of age at the time of initial vaginoplasty. The study protocol was approved by the institutional review board [Advarra (Columbia, Md) Institutional Review Board Protocol number Pro00031075].

Variables of interest included preoperative risk factors and postoperative outcomes that could be associated with the need for labial fat grafting. Preoperative variables of interest include patient demographics, medical history, transition related care and social factors. History of mental health illness was defined as any previous diagnosis related to mental health, including depression, bipolar, previous suicide attempt, generalized anxiety disorder or post-traumatic stress disorder. Postoperative variables include complications of PIV and patient satisfaction. Wound necrosis was defined as any surgical site

requiring dressing changes or debridement, while granulation tissue was considered a complication if it was still present six weeks after vaginoplasty. In this study, urinary retention was defined as needing to replace a catheter after removal.

Technique

Fat grafting to the labia was offered to patients who complained of lax or flattened labia majora, with exam findings demonstrating loss of fullness. Labial fat grafting can be performed at the same time as other revisionary procedures, but should be performed after revision labiaplasty to ensure the tissue is set in the correct position before administering fat. The patient is brought to the operating room and placed in lithotomy position. Standard liposuction technique is used to harvest fat from the abdomen, flanks or other areas of excess fat. Generally, approximately 400 – 600 mL of lipoaspirate is extracted to generate at least 200 mL of purified fat, using the Revolve™ System (Allergan, Madison, New Jersey)

Purified fat is placed into 3 cc syringes, and it is delivered with 1 mm cannulas. The fat is infiltrated into the labia majora and administered in a fanning fashion, delivering small aliquots to ensure fat survival. This process is repeated in both the superior and inferior aspects of the labia, along the perineum. The goal is to create a smooth transition from the mons to the lower perineum, without any step-offs or concavities, and to eradicate any laxity and wrinkles in the skin. Fat is administered until the labia achieves a plump, rounded shape, which requires typically 50-100 mL of fat per side to achieve this aesthetic goal (Figure 1 & 2).

Statistical Analysis

Standard descriptive statistics were used to analyze patient demographics and postoperative outcomes, with respect to the need to labial fat grafting. Chi-squared and Wilcoxon rank sum tests were used for categorical and continuous variables, respectively. Statistical significance was set a two-tailed $p < 0.05$. All statistics were conducted using StataMP 14 (StataCorp, Texas, USA).

RESULTS

Demographic and Medical History

A total of 182 patients underwent PIV, of which 6 patients (3.3%) subsequently underwent a revision procedure with labial fat grafting (Table 1). Overall, there were no significant differences between demographics of patients who required labial fat grafting and those who did not. The average age of patients who went on to require labial fat grafting was 34.1 years compared to 36.2 years (Entire cohort Range: 18-78 years), for patients who did not undergo fat grafting ($p = 0.78$) (Table 2). Similarly, there

was no difference in BMI (25.2 vs 24.3; $p = 0.62$, Range: 17.7-42.0) or length of time on hormonal therapy (5.6 vs 3.6; $p = 0.53$). Overall follow-up was similar between the two cohorts, with an average follow-up time of approximately 12 months in both cohorts ($p = 0.42$, Range: 2.8- 42 months).

Medical co-morbidities were common with 50% of labial fat grafting patients and 60% of patients who did not undergo fat grafting having at least one co-morbidity present prior to initial vaginoplasty ($p = 0.68$). Most commonly, this was patients presenting with a history of a mental health illness ($p = 0.43$). Nicotine use was also common, with 13% of the patients not undergoing labial fat grafting and 17% of the fat grafting group reporting nicotine use ($p = 0.43$). Incidences of all other co-morbidities were low, and similar between the two groups.

Postoperative Complications

Postoperative outcomes after initial PIV were compared to determine if there were any initial indications that patients would go on to require labial fat grafting. All 6 patients (100%) in the fat grafting cohort suffered at least 1 complication, while 135 patients (77%) in the non-fat grafting group suffered a complication ($p = 0.18$) (Table 3). Patients who eventually underwent labial fat grafting were significantly more likely to have granulation tissue at over 6 weeks after initial vaginoplasty, when compared to the patients who did not need labial fat grafting (83% vs 32%; $p = 0.01$). Similarly, introital stenosis was observed at a significantly higher rate in the fat grafting group when compared to the non-fat grafting group (33% vs 6%, $p = 0.007$).

Patient-reported complications were also compared between the groups (Table 4). One patient (17%) in the labial fat grafting group reported loss of sensation, compared to 4 patients (2%) in the non-grafting cohort, and this difference was significant ($p = 0.03$). Dissatisfaction with the aesthetic result of the PIV was reported in similar rates, with 20% of the patients in the non-grafting group, compared to 17% of patients in the fat grafting group ($p = 0.85$). All other patient-reported complications occurred similarly between both cohorts.

Labial Fat Grafting Data

Overall, 6 patients underwent labial fat grafting as a part of a revisionary procedure for PIV (Table 1). The average age of patients at the time of labial fat grafting was 35.4 years, which was on average 478 days after the initial PIV. The most common indications for grafting in this patient cohort included flattened labia majora (83%) and loss of fullness (33%). The abdomen was used as a donor site

for all operations, with supplementary fat extraction from the flanks, thighs and mons, based on patient preference. On average, 300 mL of lipoaspirate was extracted from these sites to then administer 81 mL of fat into each labia majora. All patients in this study were satisfied with results after one round of fat grafting and subsequent sessions were not necessary. All procedures were done concurrently with other revision procedures, most commonly clitoral hood unroofing/creation (83%), revision labiaplasty (66%), vaginal scar revision (66%) and urethromeatoplasty (33%).

DISCUSSION

In this study, we present the first report of using labial fat grafting as means to revise and improve aesthetic outcomes after PIV for transfeminine and gender diverse patients. Furthermore, this is the first study to describe demographic and postoperative complications that may predict the need for future labial fat grafting. While complications and outcomes following PIV have been well documented, no study has centered around autologous fat grafting to labia majora as a means to improve the aesthetic result after vaginoplasty.^{2,3,8-10,13,18-27}

We aimed to determine if there were any preoperative or postoperative factors that were associated with the need of labial fat grafting. Unsurprisingly, there were no demographic factors or medical comorbidities that occurred in higher incidences in the fat grafting group. Interestingly, prolonged granulation tissue, defined as over 6 weeks after vaginoplasty, was significantly more common in the fat grafting group, with 83% developing this complication, compared to only 32% of the non-fat grafting cohort. In normal wound healing, granulation tissue formation begins within a week, and starts to be remodeled and replaced 2 weeks after the initial insult.²⁸⁻³⁰ The presence of granulation tissue at 6 weeks postoperatively suggests some issue with normal wound healing in these patients, although the etiology remains unclear. Regardless, the persistence of granulation tissue can suggest disordered extracellular matrix formation, and could lead to increased scar formation.²⁸ Increased scarring in these patients could lead to the contracture and loss of volume of the labia after the wound finally healed. Additionally, the presence of granulation can be indicative of prolonged inflammation in the vulva, which could contribute to postoperative atrophy of the labia fat (derived from the scrotal fat originally). As a result, these patients would benefit from fat grafting to address this contracture and to achieve a more natural labial appearance.

Similarly, the fat grafting cohort was found to have significantly higher rates of introital stenosis when compared to the non-fat grafting group. Introital stenosis is a relatively common complication after

gender-affirming vaginoplasty, with estimates suggesting that 10-20 percent of transfeminine patients go on to develop this complication, compared to 33% of patients in the fat grafting cohort^{3,13,31} Although risk factors for development of introital stenosis have not been uncovered, the authors postulate that the same wound healing issues that led to the contracture of the labia could also play a role in causing introital stenosis.

Anecdotally, based on the senior author's experience, it seems that lower BMI patients have a higher likelihood of needing fat grafting. In the study, the number of patients in the fat grafting group was small (n=6), and therefore our analysis was not powered to detect this difference from a statistical standpoint. Still, patients with lower BMI (<24 kg/m²) are generally counseled that they have a higher chance of experiencing loss of labial volume and labial flattening, and therefore may require fat grafting to achieve a satisfactory aesthetic result.

Overall, fat grafting to the labia has been shown to be a safe, and effective technique for labia majora augmentation. When comparing our operative information to that from the cisgender literature, it seems that transfeminine patients generally require higher volumes of fat. Surgeons describing the technique for vaginal rejuvenation for cisgender women describe using between 18 mL to 120 mL of total fat for bilateral labia majora, whereas transfeminine patients may require up to 300 mL of fat to achieve an appropriate aesthetic result.^{14-17,32} There have also been reports of using hyaluronic acid injections to add volume to the labia in cisgender women.^{33,34} While these studies have shown promising results, they involve only small volumes of hyaluronic acid injections, in the range of 10-20 mL.^{33,34} Due to the large volume needed in patients undergoing revisions after penile inversion vaginoplasty, autologous fat transfer is likely the safest means of achieving a satisfactory result.

In this study, we are unable to report on satisfaction rates after this procedure, considering patients underwent multiple revisionary procedures in the same operation, and it would be difficult to attribute changes in satisfaction specifically to labial fat grafting versus other concurrent changes. In reports from cisgender women, labial fat grafting and other means of labia majora augmentation have been met with high levels of satisfaction. *Cihantimur et al* reported that 98% of their patients were "happy" with their results, with 32% reporting they were "very happy."¹⁴ *Fasola et al* reported a 65% improvement in Global Aesthetic Improvement Score (GAIS) from patients, compared to a 42% improvement based on physician evaluation, although this was with hyaluronic acid injections.³³ Beyond cosmetic outcomes, *Felicio* reports that patients report improved sexual comfort and satisfaction, possibly due to the grafted fat's ability to both act as shock absorber and to tighten the vaginal space.¹⁵ Further

studies will necessary to determine how labial fat grafting affects patient satisfaction in the transfeminine and gender diverse patient population.

Limitations

There are several limitations to the current study. The most obvious limitation would be the small sample size of the labial fat grafting group. Despite this, this sample was large enough to detect complications that may be associated with the need for labial fat grafting. Moreover, this study serves as the description of a technique that gender affirming surgeons may use to improve aesthetic results for their patients. Further patient satisfaction studies, specifically targeted at aesthetic and functional outcomes related to labial fat grafting are necessary.

CONCLUSIONS

Penile inversion vaginoplasty has become the preferred method for feminizing genital surgery for gender affirming surgeons treating transfeminine and gender diverse patients. Yet, revisionary procedures are often necessary to achieve a satisfactory aesthetic and functional result. Here, we show that fat grafting to the labia may serve as an adjunct to achieving a result that meets patient goals. Generally, labial fat grafting can be accomplished in the same procedure as other revisions. The need for labial fat grafting is associated with the presence wound healing issues and complications, possibly suggesting these patients suffer from some underlying issue in wound healing that leads to increase contracture of the surgical site.

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Table 1. Labial Fat Grafting Operative Information

Age at time of fat grafting	Time since initial vaginoplasty (days)	Indication for grafting	EBL (mL)	Donor Site	Lipoaspirate harvested (mL)	Fat injected per side (mL)	Concurrent procedures
25.7	199	• Laxity of labial majora • Flatten labia majora	50	• Abdomen • Flanks	400	50	• Revision labiaplasty • Clitoral hood creation • Urethromeatoplasty
34.5	401	• Increased Mons fullness • Flattened labia majora	150	• Abdomen • Mons	400	150	• Vaginal scar revision
37.8	889	• Flattened labia majora • Contour deformity	75	• Abdomen • Flanks • Thighs	N/A	75	• Vaginal scar revision • Clitoral hood unroofing
22.8	210	• Flattened labia majora	30	• Abdomen • Thighs	200	30	• Revision labiaplasty • Clitoral hood unroofing/creation • Urethromeatoplasty

55.6	296	• Flattened labia majora • Loss of fullness	100	• Abdomen • Flanks	N/A	100	• Revision labiaplasty • Clitoral hood creation • Vaginal scar revision
35.9	875	• Loss of fullness	N/A	• Abdomen	200	N/A	• Revision labiaplasty • Clitoral unroofing • Vaginal scar release

Table 2. Patient Demographics and Medical History

	Penile Inversion Vaginoplasty without labial fat grafting N=176	Labial Fat Grafting N=6	p- value
Age at time of initial vaginoplasty (y)	36.2 ± 12.6	34.1 ± 11.4	0.78
BMI (kg/m ²)	25.2 ± 4.8	24.3 ± 4.1	0.62
Length of time on hormonal therapy (y)	5.6 ± 5.9	3.6 ± 2.8	0.53
In long-term relationship			0.61
Yes	103 (59%)	2 (33%)	
No	62 (35%)	2 (33%)	
Prefer not to answer	11 (6%)	2 (33%)	
Comorbidities Present			0.61
Yes	105 (60%)	3 (50%)	
No	71 (40%)	3 (50%)	
Diabetes			0.59
Yes	8 (4.5%)	0 (0%)	
No	168 (95.5%)	6 (100%)	
Hypertension			0.48
Yes	13 (7.4%)	0 (0%)	
No	161 (91%)	6 (100%)	
N/A	2 (1.1%)	0 (0 %)	
Hyperlipidemia			0.35
Yes	11 (6.3%)	1 (17%)	
No	154 (88%)	5 (83%)	
N/A	11 (6.3%)		
HIV			0.56
Yes	9 (5%)	0 (0%)	
No	167 (95%)	6 (100%)	
History of Pelvic Trauma/Surgery			0.79
Yes	2 (1%)	0 (0%)	
No	174 (99%)	6 (100%)	
History of Mental Health			0.34

Illness			
Yes	78 (44%)	2 (33%)	
No	69 (39%)	4 (67%)	
N/A	29 (17%)	0 (0%)	
Nicotine Use			0.80
Yes	23 (13%)	1 (17%)	
No	152 (87%)	5 (83%)	
History of drug use			0.49
Yes	15 (9%)	1 (17%)	
No	160 (91%)	5 (83%)	

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Table 3. Postoperative Complications

	Penile Inversion Vaginoplasty without labial fat grafting N=176	Labial Fat Grafting N=6	p-value
Any Complication			0.18
Yes	135 (77%)	6 (100%)	
No	41 (23%)	0 (0%)	
Venous thromboembolism			0.85
Yes	1 (0.5%)	0 (0%)	
No	175 (99.5%)	6 (100%)	
Hematoma			0.47
Yes	14 (8%)	0 (0%)	
No	162 (92%)	6 (100%)	
Urinary Tract Infection			0.57
Yes	9 (5%)	0 (0%)	
No	167 (95%)	6 (100%)	
Wound Infection			0.51
Yes	12 (7%)	0 (0%)	
No	164 (93%)	6 (100%)	
Wound Dehiscence			0.67
Yes	5 (3%)	0 (0%)	
No	171 (97%)	6 (100%)	
Wound Necrosis			0.39
Yes	58 (33%)	1 (17%)	
No	118 (66%)	5 (83%)	
Granulation tissue (>6 weeks)			0.01
Yes	57 (32%)	5 (83%)	
No	119 (68%)	1 (17%)	
Vaginal Prolapse			0.71
Yes	4 (2%)	0 (0%)	
No	172 (98%)	6 (100%)	
Urinary Retention			0.55
Yes	10 (6%)	0 (0%)	
No	166 (94%)	6 (100%)	
Urethral Injury			0.71
Yes	4 (98%)	0 (0%)	

No	172 (2%)	6 (100%)	
Introital Stenosis			0.007
Yes	10 (6%)	2 (33%)	
No	166 (94%)	4 (67%)	
Vaginal Stenosis			0.24
Yes	27 (15%)	2 (33%)	
No	149 (85%)	4 (67%)	
Excess erectile tissue			0.38
Yes	20 (11%)	0 (0%)	
No	156 (89%)	6 (100%)	
Excess external scarring			0.52
Yes	11 (6%)	0 (0%)	
No	165 (97%)	6 (100%)	

Table 4. Patient-Reported Complications

	Penile Inversion Vaginoplasty without labial fat grafting N=176	Labial Fat Grafting N=6	p-value
Dissatisfaction with aesthetic result			0.85
Yes	35 (20%)	1 (17%)	
No	141 (80%)	5 (83%)	
Dyspareunia			0.65
Yes	6 (3%)	0 (0%)	
No	170 (97%)	6 (100%)	
Loss of sensation			0.03
Yes	4 (2%)	1 (17%)	
No	172 (98%)	5 (83%)	
Hypersensitivity			0.85
Yes	1 (0.5%)	0 (0%)	
No	175 (99%)	6 (100%)	
Anorgasmia			0.59
Yes	8 (5%)	0 (0%)	
No	168 (95%)	6 (100%)	

FIGURE LEGEND

Figure 1. 35-year-old transfeminine patient A) Preoperative B) Immediate postoperative after revision labiaplasty and fat grafting C) 1-year postoperative D) 1.5-year postoperative (total fat = 100 cc)

Figure 2. 38-year-old transfeminine patient A) Preoperative B) 1-year postoperative after revision labiaplasty and fat grafting (total fat = 100 cc)

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Figure_1a



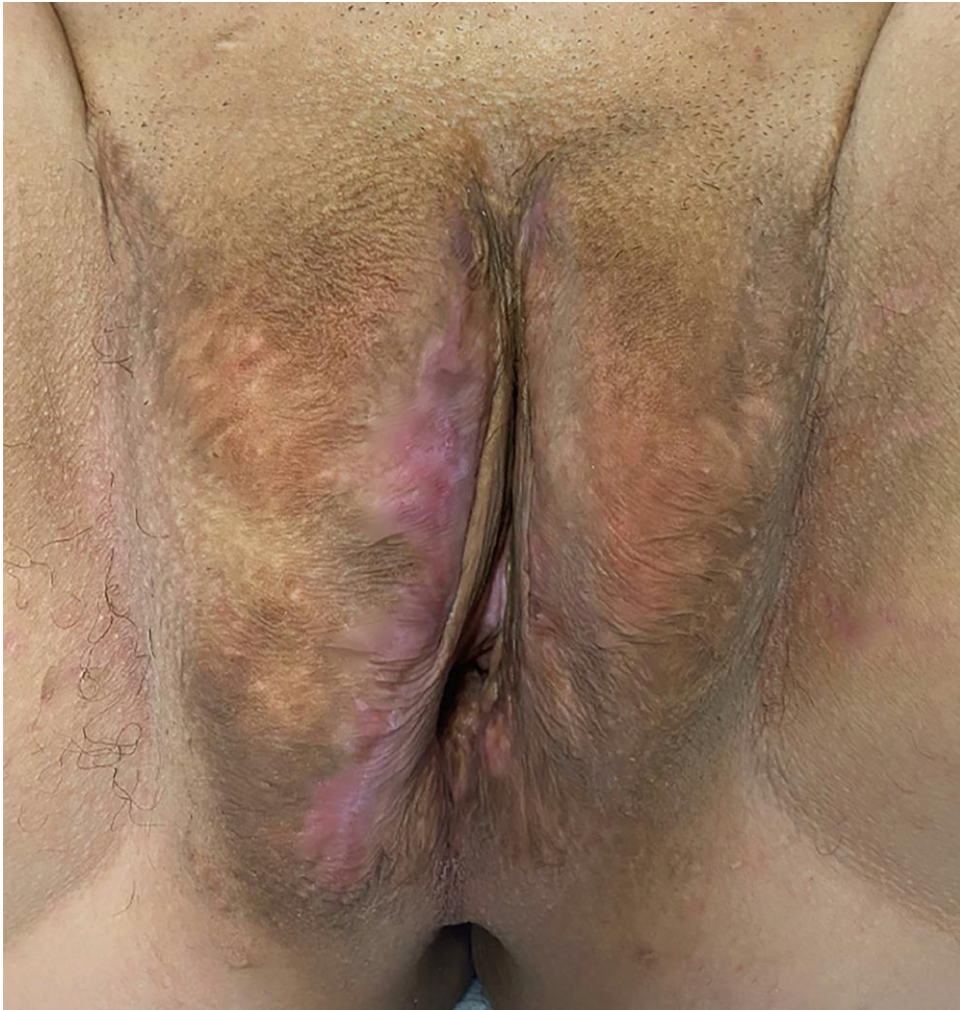
Figure_1b



Figure_1c



Figure_1d



Accepted

Figure_2a



Figure_2b

