Partial Flap Loss in Gender Affirming Phalloplasty

Isabel Cylinder, MD[1] Aaron Heston, MD[1] Jourdan Carboy, MD[2] Breanna Jedrzejewski, MD, MPH[2] Blair Peters, MD[2] Jens Urs Berli, MD[2]

[1] School of Medicine, Oregon Health and Science University, Portland, Oregon
[2] Division of Plastic Surgery, Oregon Health and Science University, Portland, Oregon

Address for correspondence Jens Urs Berli, MD, Division of Plastic Surgery, Oregon Health and Science University, 3303 SW Bond Avenue, Portland, OR 97239 (e-mail: berli@ohsu.edu).

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Abstract

Background Flaps used in phalloplasty are larger than described for other indications, with a design that is tubularized up to two times. While the incidence of partial flap loss (PFL) is well described, current literature lacks granularity comparing donor sites and techniques with minimal discussion of etiology and management. The purpose of this study was to review our experience with PFL in phalloplasty.

Methods This was a retrospective cohort study of patients who underwent phalloplasty by a single surgeon at a single institution between 2016 and 2020. PFL was defined as any patient requiring sharp excision of necrotic tissue and reconstruction. Patient variables (demographics, body mass index, American Society of Anesthesiologists physical status classification, comorbidities), flap variables (donor site, design, dimensions, perforator number) and intraoperative variables (use of vasopressors, intraoperative fluid volume) were collected.

Results Of 76 phalloplasties, 6 patients suffered PFL (7.9%). 5/6 patients were radial forearm free flap tube-within-tube (TWT) and 1/5 patients were pedicled anterolateral thigh TWT. 4/6 cases involved the shaft only and were treated with excision ± Integra and full-thickness skin grafting. 2 cases of PFL involved the urethral extension requiring excision of the necrotic segment.

Conclusion PFL occurred in 7.9% of cases and was solely found in the TWT cohort. The majority of cases involved the shaft, sparing the urethral segment. Cases in the acute postoperative period appeared to be related to macrovascular venous congestion, while cases in the subacute period appeared to be due to microvascular arterial ischemia.

Keywords
- phalloplasty
- transgender
- gender affirmation
- free flap

Phalloplasty is a complex surgical procedure with the goals of creating an adult-sized neophallus that is aesthetically accurate, sensate, and achieves the ability to stand to urinate and allow for sexual penetration.[1,2] Achieving these lofty demands necessitates the use of tissue transfer, with techniques utilizing pedicled and/or free tissue. Flaps used for the construction of a neophallus are often significantly larger in dimension than traditionally described in other areas of reconstruction. Phalloplasty thus places unique demands on flap perfusion. The creation of a shaft necessitates tissue tubularization. When a neourethra is constructed as well, this means tubularizing the flap twice ("tube-within-tube" (TWT) design), placing further stress on tissue perfusion. In some cases, this can place excessive strain on flap vascularity

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as one aspect of the flap (or in the case of a composite phalloplasty, a separate flap) lies within the confines of the penile shaft, increasing potential for vascular compromise and areas of local tissue ischemia.

While the reported incidence of total flap loss in gender affirming phalloplasty is relatively low, the literature on partial flap loss (PFL) reports an incidence ranging from 0 to 33.3%.[3,4] Aside from reporting incidence rates, existing literature on PFL lacks details on the clinical significance, anatomic location, extent, and management as summarized by a recent systematic review by our group.[5] Therefore, there exists a need for further research regarding PFL in gender affirming phalloplasty. In this article, we review a single surgeon's experience with PFL when performing phalloplasty as part of gender affirming surgery. We use the results of this study to discuss strategies to mitigate PFL risk and suggest management strategies for when PFL occurs.

Methods

A retrospective cohort study of all patients who underwent gender affirming phalloplasty by a single surgeon at a single institution from September 2016 through August 2020 was performed. Institutional Review Board approval was obtained (OHSU IRB Protocol #18390). Variables collected fell under three categories; (1) patient factors: age, body mass index (BMI), American Society of Anesthesiologists physical status classification (ASA class), medical co-morbidities; (2) flap factors: type of phalloplasty (shaft-only, TWT, or composite), donor site(s) used, flap dimensions (including flap area, maximum flap length, and maximum flap width); (3) intraoperative factors: use of phenylephrine, intraoperative fluid volume. When the thigh was used, we further included the number of perforators and the proximal and distal flap thickness. Flap area was calculated to include the 3.5×4 cm urethral extension for all TWT phalloplasties; maximum length includes the urethral extension for all TWT phalloplasties. PFL was defined as any patient requiring sharp excision of necrotic flap tissue. Superficial epidermolysis was not included. Once an incidence of PFL was identified, further data was collected on each patient who suffered PFL. If secondary reconstruction was required, surgical methods used and their outcomes were recorded.

Patient Selection

Candidates must meet the criteria for surgery according to World Professional Association for Transgender Health (WPATH) standards of care, version 7.[6] Body habitus is evaluated. While there is no objective data to refer to, it is the senior author's opinion that a BMI less than 30 is ideal and a BMI greater than 35 is a relative contraindication to phalloplasty. In some cases, the distance that needs to be traversed to successfully perform urethral lengthening is not feasible due to BMI and fat distribution. Patients are counseled on smoking cessation and we routinely request patients have a negative cotinine urine test 3 months prior to surgery.

Phalloplasty Selection

Our institution offers shaft-only, TWT, and composite phalloplasty. For patients seeking urethral lengthening, we routinely perform a staged "Big Ben method" phalloplasty as described by the St. Peter Andrology institute in London.[7] In the "Big Ben method" of staging, the phallus is created at the first surgery as compared with a metoidioplasty where the tissue transfer occurs at the second stage.[8] Routine donor sites for the flap(s) include the radial forearm, anterolateral thigh (ALT), and lower abdomen (shaft-only). When possible, the senior author prefers radial forearm free flap (RFFF) phalloplasty for TWT phalloplasty due to superior tissue pliability and sensory reinnervation.[9,10] The ALT phalloplasty was utilized when anatomy did not permit RFFF or patient preference strongly favored an ALT. Notably, a TWT ALT is only desirable in patients with minimal thickness of subcutaneous tissues, but in our experience can be offered for patients with subcutaneous thickness of >1 cm, but no greater than 1.5 cm. For those patients who desire the ability to urinate while standing and are not candidates for a TWT design, a composite flap is offered using an ALT flap for the shaft combined with an ulnar forearm free flap for the neourethra. If patients do not have the specific goal of being able to stand and urinate and wish to avoid potential urologic complications, then shaft-only phalloplasty is offered. In these cases, patient preference rules and the options include the lower abdomen, RFFF, and ALT. For patients who desire shaft-only phalloplasty with the use of an ALT, an increased subcutaneous thickness of up to 2 cm is acceptable.

Surgical Considerations

Recipient Vessels

If the phalloplasty is performed as a free flap, the deep inferior epigastric artery is used as the recipient artery in an end-to-end fashion. Recipient veins used are the deep inferior epigastric vein (DIEV) and the ipsilateral greater saphenous vein (GSV).[11] We routinely place an implantable Doppler device around one of the venous anastomoses to aid in differentiating clinical signs of early venous congestion from an expected degree of postoperative swelling due to flap tubularization.

Urethral Extension and Staging

In TWT cases performed for the goal of standing urination, a 3.5 to 4.5 cm urethral extension is included with the flap. This is longer than the urethral extension typically described for single stage or metoidioplasty-first phalloplasty.[12] This is because the "Big Ben method" brings the phallic urethra to a prepubic position, whereas in the other types of phalloplasty, the pars fixa urethra (bulbar urethra) is extended to that location through tissue rearrangement of native genital tissue.

Flap Harvest: RFFF

The fasciocutaneous RFFF is harvested as previously described in the literature.[13–15] If present, we routinely ligate the communicating H-branch (the deep cubital vein)

between the cephalic vein and the venae commitantes (VC) of the radial artery and perform two separate venous anastomoses (DIEV to VC; GSV to cephalic). We take care to include all proximal radial artery perforators to maximize flap perfusion. Our technique precludes use of venous contributors to the basilic system due to the routing of this urethral segment to a prepubic position.[11]

Flap Harvest: ALT

If performing an ALT, we will routinely perform preoperative computed tomography (CT) angiogram (CTA) to assist in surgical planning. The laterality of the ALT donor site is selected based on the level of takeoff of the lateral femoral circumflex artery (LFCA) and the presence of adequate distal perforators. By selecting the side with a higher take off of the LCFA, pedicle length is optimized to decrease the likelihood of converting to a free tissue transfer. Due to the large size of the flap needed for phalloplasty, we include as many distal perforators as possible. The presence of adequate distal perforators allows for inclusion of the thinner subcutaneous fat layer of the distal thigh. In contrast to the literature, we prefer to place the urethral skin paddle on the lateral aspect of the thigh due to the inferior and lateral angle of entrance of the ALT perforators into the flap.[16] In cases where there is undue tension on the pedicle on flap transposition, we convert to a free tissue transfer, using the same recipient vessels as discussed above. If needed, the flap is thinned to avoid excessive bulk and/or undue intraphallic pressure upon tubularization. For this study, the subcutaneous thickness of the ALT was measured on preoperative CT scan. Measurements were recorded at 11 and 16 cm proximal from the maximal convexity of the lateral femoral condyle. To achieve consistent measurements, the intercondylar eminence of the tibia was used as radiographic landmark. Two measurements were used as the mid-thigh fat distribution has more variability between individuals and it has been our experience that intraoperative debulking is mostly required in the proximal part of the flap.

Perioperative Management

We attempt to limit intravenous fluids to ~2.5 L and allow for intraoperative boluses of phenylephrine. Given the tenuous strains placed on vascularity by design of a TWT flap, edema due to third spacing of fluid into the phallus is not well tolerated. The phallus is kept at a 90-degree angle surrounded by a cloud of fluffed kerlix gauze in mesh underwear at all times. A vulvar bolster is placed to minimize edema and a urinary catheter is left in the native urethra. Decongestive retrograde phallic massage with each flap check further assists in decreasing postoperative tissue edema. If edema becomes excessive and threatens flap perfusion and diuresis is insufficient, then sutures along the ventral aspect of the phallus are released at the bedside.

Patients remain admitted to hospital for 6 to 7 days and are on bedrest until postoperative day 3. Low molecular weight heparin is administered on postoperative day 1 and continues throughout the duration of hospital stay. On postoperative day 3 prior to mobilization, we perform a lower extremity duplex scan. Phallus positioning at 90 degrees is maintained for 4 weeks and the patient is only allowed to sit when using the bathroom. Ambulation is limited for 4 to 6 weeks.

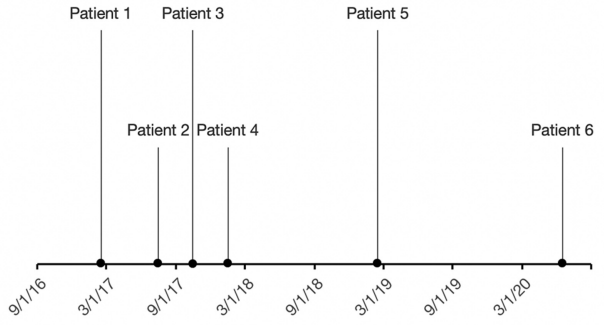

Fig. 1 Timeline of partial flap loss cases following phalloplasty in a single surgeon's experience from September 2016 to August 2020.

Table 1 Patient demographic data

n = 76	Mean	SD	Range
Age	35.46	11.85	17–71
BMI	26.20	3.62	19.16–37.00
ASA class	1.70	0.58	1–3

Abbreviations: ASA class, American Society of Anesthesiologists physical status classification; BMI, body mass index; SD, standard deviation.

Results

76 gender affirming phalloplasties were performed by the senior author between September 2016 and August 2020 (►**Fig. 1**). Patients had an average age of 35.5 years, a mean BMI of 26.2, and a mean ASA class of 1.7 (►**Table 1**). The most common phalloplasty design performed was the RFFF TWT (57%), followed by shaft-only pedicled ALT (12%) (►**Table 2**). The average flap area across all phalloplasties was 210.59 cm^2 (standard deviation [SD] = 34.19); the average flap dimensions for each flap design can be found in ►**Table 2**. The average number of perforators for ALT flaps was 2.23. The average subcutaneous thickness of ALT flaps was 5.08 mm distally and 6.76 mm proximally; 4/23 (17%) ALT flaps did not have suitable CT scans available for measurement. Interestingly, 8/23 (35%) patients had no difference in subcutaneous fat thickness between proximal and distal. Of the 23 ALT flaps in the study, 2 were delayed for vascular concerns with flap shaping and transposition delayed 5 days from flap elevation. 62/76 (81.5%) patients received intraoperative phenylephrine. The average intraoperative fluid volume given for all patients was 2728 mL (SD = 875 mL).

6 patients suffered PFL (7.9%) (►**Table 3**), 5/6 (83%) patients were RFFF TWT design, and 1/6 (17%) patients were pedicled ALT TWT. All cases of PFL occurred in TWT cases; no cases of PFL occurred in shaft-only phalloplasty.

Table 2 Phalloplasty flap designs and dimensions

$n = 76$	%	#	Mean flap area (cm^2)	Mean maximum flap length (cm)	Mean maximum flap width (cm)
RFFF SO	7.9%	6	213.17	15.33	13.92
RFFF TWT	57%	43	210.27[a]	15.77[a]	16.05[a]
ALT pedicle TWT	9.2%	7	229.50[a]	16.29[a]	16.71[a]
ALT pedicle SO	12%	9	202.61	14.72	13.67
ALT free TWT	3.9%	3	246.83[a]	17.00[a]	17.67[a]
Abdominal	5%	4	137.50	10.00	12.00
ALT composite	5.3%	4	240.75	15.75	15.25

Abbreviations: ALT, anterolateral thigh flap; RFFF, radial forearm free flap; SO, shaft-only design; TWT, tube-within-a-tube design.
[a]Flap area was calculated to include the 3.5 × 4 cm urethral extension for all TWT phalloplasties; maximum length includes the urethral extension for all TWT phalloplasties.

There were no statistically significant differences in age, BMI, ASA class, intraoperative phenylephrine use, intraoperative fluid volume, flap dimensions (including flap length, flap width, flap area, or ALT thickness), or perforator number between the non-PFL group and the PFL group by independent t-test (►**Table 4**). The single patient who suffered PFL in the ALT group was debulked during their initial surgery, however, so were 11/22 (50%) in the non-PFL group. There were no outlying medical comorbidities among patients with PFL.

Two cases of PFL occurred in the setting of a postoperative day 1 flap take back requiring revision of venous anastomoses. In three of the RFFF, the PFL occurred at the distal radial border of the flap (►**Fig. 2A**); two patients (one ALT and one RFFF) had PFL of the urethral extension (►**Figs. 3** and **4**). Three patients had partial thickness and two patients had full-thickness tissue loss. All RFFF PFL with partial-thickness tissue loss was managed with excision of necrotic tissue ± full-thickness skin grafting (►**Fig. 2B**). In the two cases with full-thickness tissue loss, Integra (Integra, Princeton, NJ) was used prior to skin grafting to add additional bulk to the reconstruction (►**Fig. 2C–D**). One of these patients failed subsequent full-thickness skin grafting requiring a secondary grafting procedure. The RFFF and ALT TWT cases involving necrosis of the urethral extension were managed with excision of the necrotic urethral segment and marsupialization at a more superior level (►**Fig. 3**). In the RFFF patient, the radial border exhibited signs of hypoperfusion and wound break down, which led to subsequent need for complete unfurling of the urethral segment (►**Fig. 4A–B**). The patient was offered a staged urethral reconstruction with buccal graft but decided to convert to a shaft only phalloplasty with excision of the viable urethral skin paddle (►**Fig. 4C**).

Discussion

PFL in gender affirming phalloplasty is a complication that exists clinically, but despite this is minimally described in the literature. The overall rate of PFL in our study cohort of 7.9% is comparable to rates reported in recent studies. The morbidity imparted by PFL will be dictated both by the location and the extent of the tissue loss. Reflecting on the results of our retrospective cohort study, we have identified the following potential factors contributing to PFL:

Macrovascular Insult Leading to Secondary Microvascular Ischemia

About 33.3% (2/6) of our cases of PFL required take back in the immediate postoperative period for acute venous congestion of the flap. It is likely that the intermittent ischemia and damage to the flaps' vascular system in this setting contributed to the complication of PFL. These cases of PFL occurred in the acute postoperative period (days). Potential etiologies of acute venous thrombosis following phalloplasty include technical error, positioning with excessive hip flexion, compressive seroma/hematoma, or excessive postoperative swelling leading to compression of the vascular pedicle.[17,18]

Primary Microvascular Ischemia

The remaining 66.7% (4/6) of cases of PFL occurred in the subacute/intermediate postoperative period (days to weeks) when postoperative swelling and flap edema peak. These cases appeared to be due to intrinsic microvascular arterial ischemia of the flap. Three of these cases were observed following RFFF; the other following pedicled ALT. Potential etiologies leading to primary microvascular ischemia following gender affirming phalloplasty are discussed below.

In the RFFFP group, we hypothesize the following three etiologies: 1. Flap dimensions well beyond the angiosome of the radial artery. Clinically, it has been shown that the dimensions of a flap designed in one angiosome can be extended to include the anatomic territory of the adjacent angiosome. The size of the radial forearm flap needed for phalloplasty extends partially into the angiosome of the ulnar artery and well into the angiosome of the posterior interosseous artery (PIA).[19] In the authors' experience, it is this extension into the angiosome of the PIA (the distal and radial flap border) that is most at risk of PFL. 2. Absence/failure to incorporate proximal perforator(s) when present. 3. Suboptimal positioning of the flap on the donor forearm. In patients with a smaller forearm

Table 3 Patient characteristics for cohort with PFL

Patient	Age	BMI	ASA class	Medical comorbidities	Flap type	Flap area (cm^2)[a]	Intra-op phenylephrine?	Location and extent of PFL	Management
1	43	29.81	2	Asthma, GERD, history of PE	RFFF TWT	214	Yes	Partial-thickness partial flap necrosis at distal radial border	–Debridement of shaft –Integra placement –FTSG from left groin to phallus
2	44	23.36	2	Hyperlipidemia, hypertension	RFFF TWT	214	Yes	Partial-thickness partial flap necrosis at distal radial border	–Debridement of shaft –STSG from left thigh to phallus
3	51	23.87	2	Asthma, GERD, pulmonary nodule, migraines	ALT pedicled TWT	288	No	Full-thickness partial flap necrosis of 4 cm of proximal urethral extension, partial-thickness partial flap necrosis of shaft	–Debridement of proximal urethra and orifice –Debridement and closure of shaft
4	30	29.0	1	None	RFFF TWT	230	Yes	Partial-thickness partial flap necrosis at distal radial border (distal third of phallus measuring 3.5cm in width)	–Debridement of shaft –STSG from right thigh to phallus
5	36	23.77	2	Bipolar disorder, IBS, recurrent UTIs	RFFF TWT	186.5	Yes	Full-thickness partial flap necrosis of 15% of flap along entire seam (distal radial and proximal radial aspects)	–Debridement of shaft –Integra –FTSG from left groin to phallus
6	20	21.3	2	Psoriatic arthritis, asthma	RFFF TWT	189	Yes	Full-thickness partial flap necrosis of middle third of shaft, 2 cm of proximal urethra	–Debridement of urethra –Re-do urethroplasty with marsupialization of neourethra at penile base –Debridement and closure of shaft

Abbreviations: ALT, anterolateral thigh flap; ASA class, American Society of Anesthesiologist physical status classification; FTSG, full-thickness skin graft; PFL, partial flap loss; RFFF, radial forearm free flap; STSG, split-thickness skin graft; TWT, tube-within-a-tube design.

[a]Flap area was calculated to include the 3.5×4 cm urethral extension for all TWT phalloplasties; maximum length includes the urethral extension for all TWT phalloplasties.

Table 4 Statistical comparison between non-PFL and PFL patient groups

	Non-PFL cohort	PFL cohort	*p*-Value
Mean age	35.30	37.30	0.69 (NS)
Mean BMI	26.3	25.19	0.49 (NS)
Mean ASA class	1.64	1.83	0.44 (NS)
Intra-op phenylephrine	57/70 (81.4%)	5/6 (83%)	0.91 (NS)
Intra-op fluid volume	2737.71	2616.67	0.75 (NS)
Mean flap area[a]	209.76	220.25	0.48 (NS)
Mean maximum flap length[a]	15.32	16.33	0.25 (NS)
Mean maximum flap width[a]	15.46	15.50	0.96 (NS)
Mean proximal flap thickness (ALT)	6.81	6.00	–[b]
Mean distal flap thickness (ALT)	5.14	4.00	–[b]
Mean perforators (ALT)	2.23	3.00	–[b]

Abbreviations: ALT, anterolateral thigh flap; ASA class, American Society of Anesthesiologists physical status classification; BMI, Body mass index; PFL, partial flap loss; TWT, tube-within-a-tube design.
[a]Flap area was calculated to include the 3.5 × 4 cm urethral extension for all TWT phalloplasties; maximum length includes the urethral extension for all TWT phalloplasties.
[b]Unable to perform statistical analysis on PFL group $n = 1$.

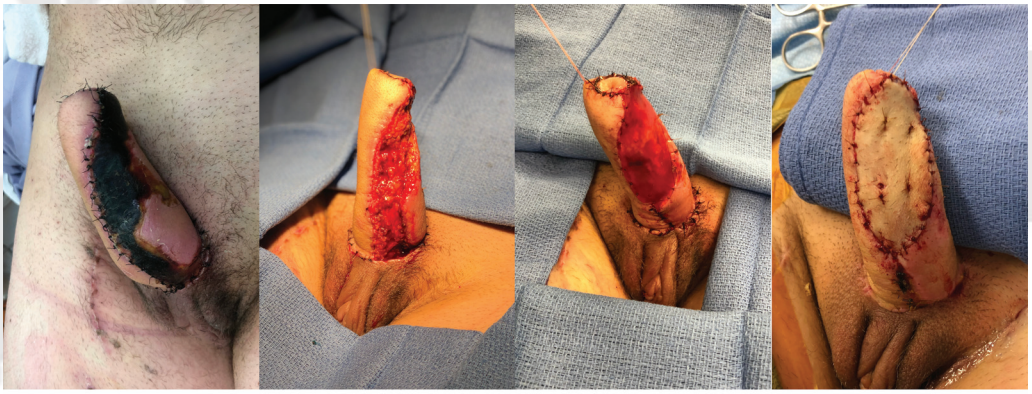

Fig. 2 Surgical management of partial flap loss (PFL) following radial forearm free flap phalloplasty. (**A**) PFL along the radial border of the phallus; (**B**) Status post debridement of necrotic tissue; (**C**) Status post Integra placement; (**D**) Status post full-thickness skin grafting. Copyright Dr. Jens Berli.

circumference (<15 cm), standard positioning of the design with the urethra on the least hair-bearing area on the ulnar forearm may position the flap relatively too radial, leading to necrosis of the distal most radial aspect of the flap. We now routinely perform electrolysis on the ulnar border of the forearm toward the dorsal aspect in those particular patients. This assures that the radial artery is situated on the radial side of the deepithelialized strip. We hypothesize that this minimizes risk of localized arterial insufficiency at the radial distal border by having the radial artery be more centrally located in the flap.

In 4/5 cases of PFL following RFFF, microvascular arterial ischemia led to loss of the radial-most aspect of the flap (►**Table 3**).[11,17,20] Another potential solution to minimize risk of PFL in this area of the RFFF is to supercharge the arterial inflow by including the PIA in flap harvest, as suggested by De Wolf et al.[21] Perforators of the PIA reliably supply the dorsal radial forearm tissue.

In the ALT group, we believe the following four etiologies to play a predominant role: 1. Flap dimensions beyond perfasomes supplied by perforators of the LFCA. 2. Inadequate number of perforators/failure to include them. Designing the flap as far distal on the leg as possible aids in achieving a pedicled flap of thin and pliable soft tissue but preselects for the (typically) smaller distal perforators. CTA and hand-held Doppler exam are helpful to decrease the risk of excluding critical perforators located proximally. 3. Excessive thinning can lead to areas of flap ischemia if damage occurs to the subcutaneous vascular plexus. In our experience, however, judicious thinning of the subscarpal fat can improve overall flap perfusion by decreasing tension on the flap once tubed. The location of the lateral femoral cutaneous nerve always necessitates judicious intraoperative thinning to preserve sensory innervation as the nerve runs in the deep subcutaneous tissues just above the fascia.[22] We inform all patients undergoing ALT TWT that their sensory outcome is

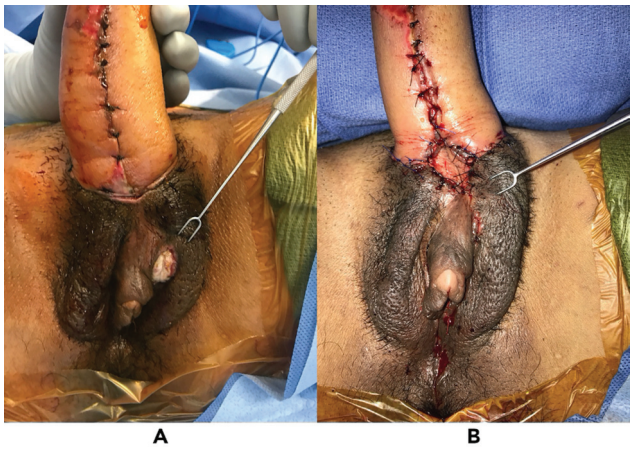

Fig. 3 Surgical management of partial flap loss of the proximal urethral extension in an anterolateral thigh flap phalloplasty. (**A**) Visible ischemic urethral flap; (**B**) Status post marsupialization at a more superior location. Patient developed a fistula after the second stage and after repair thereof is now urinating without issues. Copyright Dr. Jens Berli.

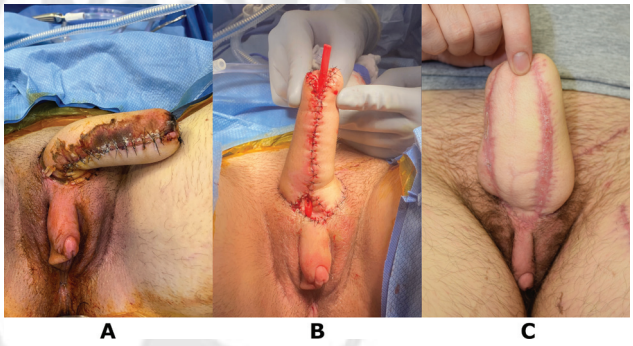

Fig. 4 Surgical management of partial flap loss of the proximal urethral extension in radial forearm free flap phalloplasty, in which the urethra was entirely unfurled. (**A**) Phallus with superficial epidermolysis at radial border and necrosis of urethral extension; (**B**) Attempt at marsupialization of urethra at a superior location; (**C**) Appearance after complete unfurling of urethral segment. Copyright Dr. Jens Berli.

at risk should they require significant intraoperative debulking. 4. Failure to delay an ALT flap when perfusion appears borderline. In our series, two ALT flaps required delay and return to the operating room 5 days later for flap shaping and transposition. In both cases, the entire flap was viable with no tissue loss.[17,18,20]

Management of Partial Flap Loss by Location of Tissue Loss

PFL can affect any anatomic area of the phallus. In our experience, this was most commonly the radial border in the RFFF cohort and the urethral extension in the ALT cohort. It is possible that other surgeons may find different areas of the flap to be affected depending on a variety of factors such as patient selection, flap design, flap orientation, and surgical technique. Our management of PFL varies according to the segment of tissue that is involved. Notably the authors do not routinely use laser angiography to assess flap perfusion. We inspect all corners of the flap intraoperatively for bleeding. If there is concern involving the buried aspects of the flap then intraoperative laser angiography is used. For the shaft, unless the area can be excised and primarily closed, it is the authors preference to let the area of concern demarcate and leave it as a biological dressing. This allows the tubularized construct to start healing and gain more integrity.

Partial Shaft Loss

Partial loss of the shaft is mainly an aesthetic concern and follows general reconstructive principles: letting the tissue "declare" itself while preventing infection. This is followed by adequate debridement of devitalized tissues and reconstruction. Depending on the thickness of area involved, this can be approached with healing by secondary intention or skin grafts in partial-thickness cases ± dermal substitutes in cases with full-thickness tissue loss. In our series, the use of Integra has proven to be a useful adjunct to anecdotally allow for improved tissue pliability and final cosmesis. Our preferred technique for full-thickness shaft tissue loss is to use Integra, followed by full-thickness skin grafts to add bulk and avoid secondary contracture, which can lead to the formation of a volar chordae.

Notably, we have not found partial shaft loss on the ventral surface of the phallus (the radial border of the flap) to be a contraindication to prosthesis placement following successful reconstruction. Two patients who underwent the above reconstruction for PFL of the shaft have since successfully received an inflatable erectile prosthesis.

Partial Urethral Loss

Partial loss of the urethra has functional consequences. In this series, one patient who underwent ALT TWT and one patient who underwent RFFF TWT had PFL of a portion of the urethral extension. This area was excised and the urethra was marsupialized at a higher level. This scenario makes secondary urethral reconstruction more difficult. The ALT patient developed a fistula after second stage surgery that ultimately required an additional repair. Despite this, the patient is now urinating well. The RFFF patient elected to convert to shaft-only phalloplasty and forego attempts at future urethral lengthening to avoid the higher risk of fistula and stricture. The authors believe one major benefit of performing phalloplasty in a staged fashion, as described by the St. Peter Andrology Institute, is that it allows for independent management and the resolution of any flap related complications involving the urethra prior to undertaking further urologic reconstruction.[23]

Several limitations are present in this study. This is a retrospective cohort with a small sample size and overall low rate of PFL. Therefore, the study is certainly underpowered to make definitive statistical conclusions. Importantly, as the authors gained increasing experience with gender affirming phalloplasty, modifications were introduced to minimize both flap take backs and rates of PFL, introducing the variable of surgeon experience.

Conclusion

In a series of 76 phalloplasties, we have observed a 7.9% rate of PFL found in the TWT cohort with no cases of PFL

demonstrated in shaft-only phalloplasty. PFL can result in aesthetic sequelae when the shaft tissue is involved, and functional urologic sequelae when the urethral extension is involved. Management of these complications requires additional surgical intervention. There is a need to further delineate and minimize risk factors for PFL in gender affirming phalloplasty.

Conflict of Interest
None Declared.

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