

REVIEW

Urethral Complications After Transgender Phalloplasty: Strategies to Treat Them and Minimize Their Occurrence

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Radial forearm free flap phalloplasty (RFFP) is the current standard of care for most FTM gender confirmation surgeries. This procedure is associated with a rate of urethral stricture as high as 51%, which falls only to 23–35% even among the most experienced contemporary surgeons. While some modifications have been proposed to combat this high complication rate, it still remains a major source of lasting morbidity. The method involves literature review of RFFP literature. Lowest stricture rates are found when neourethra is made with a long, meticulously constructed tube of well-vascularized perivaginal/periurethral and labia minora tissue. In cases of urethral stricture, urethroplasty is required in 94–96% of patients. Surgery should be delayed until all acute inflammation has subsided. Urethroplasty is technically challenging and fails in up to 50% of cases. Repeated surgery or salvage urethral exteriorization procedures, which can leave the patient with lifelong perineal urethrostomy, are often required. Patient and physician knowledge regarding the high burden and poor treatment options for urethral stricture after phalloplasty is incomplete, and patient acceptance of this reality is crucial for honest understanding of the potential complications of this increasingly common but extremely complex surgery. Clin. Anat. 00:000–000, 2017. © 2017 Wiley Periodicals, Inc.

Key words: urethral stricture; transsexualism; urethra; surgical flaps

INTRODUCTION AND INCIDENCE

Urological complications, generally including urethral fistula and urethral stricture, are common after female to male gender confirmation surgery. Early descriptions during the 1980s reported all-cause complication rates as high as 80% after phalloplasty (Matti et al., 1988) but this has fallen to 35–41% more recently (Doornaert et al., 2011; Frey et al., 2016). Nevertheless, the problem persists: a meta-analysis of 11 forearm phalloplasty reports showed very high stricture + fistula rates from 20 to 77%, with a mean of 51%, in 665 reported patients (Amukele et al., 2003). Diligent efforts to decrease these complications could result in still lower rates, as a 27% rate of just urethral stricture was recently reported by Chen and Crane (Massie et al., 2017) after forearm phalloplasty. The same group reported even lower post-forearm phalloplasty urethral stricture rates of 21% in a partially overlapping series, also recently published (Ascha et al., in press).

These seeming decreases in rates over time could be cause for celebration, but the reality is that when the recently-reported low stricture rate of 21% is added to that group's reported fistula rate of 15% and their meatal stenosis rate of 14%, an "all cause" urological complication rate of 36% is seen even in the best hands (Ascha et al., in press)—not very different from the 35 to 41% rate reported in the past (Doornaert et al., 2011; Frey et al., 2016). This high rate of complication must be well understood by patients and practitioners

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TABLE 1. Urethral Stricture, Urethral Fistula, and Meatal Stenosis Rates After Forearm Phalloplasty in Selected Literature

Source	All cause complication %	Fistula %	Stricture %	Meatal Stenosis %
Older Series				
Gilbert 1995 [10]	28			Vaginal flap covered by gracilis
Bouman 1987 [14]		70%		Labia minora urethroplasty
Matti 1998 [1]	80			
Fang 1999 [7]		41	14	Prelaminated, osteocutaneous
Rohrmann 2003 [8]		58	52	48%/52% overall got urethroplasty
Recent Series				
Doornaert 2011 [2]	41			Update of Matti 1998, largest series
Callens 2015 [15]	40			Mostly forearm, non transgender
Neuville 2016 [16]			35	58% forearm and the rest local thigh, suprapubic or inguinal flaps.
Ascha [6]		15	21	14

alike. Diligent efforts to reduce this number through innovations in surgical technique must continue.

INCIDENCE AND IMPACT

As in most modern reviews, this report will concentrate on forearm phalloplasty, although other techniques will be discussed when appropriate. Reviewing the literature is complicated by the fact that some authors do not separate the incidence of urethral strictures from that of urethral fistulas. This is important as urethral strictures are generally more severe than fistulae, or cases of meatal stenosis alone. Strictures can cause lasting morbidity, and usually require either urethroplasty (with a high predicted failure rate) or temporary/permanent perineal urethrostomy. Fistulas are much less morbid as they sometimes heal spontaneously; when they don't they can be repaired with a high expected success rate. Meatal stenosis can generally be cured by a minor meatoplasty surgery. The rate of urethral complication in selected reports is summarized in Table 1.

T1

FISTULAE

Some fistulas heal within three months when the urinary stream is diverted with a suprapubic urinary catheter. Thus, placement of a suprapubic tube is suggested for all patients at the time of initial surgery (Ascha et al., in press); 17–35% of fistulas appear to heal without further surgery (Doornaert et al., 2011; Fang et al., 1999).

URETHRAL STRICTURES

While the definition of urethral stricture versus the lesser entity of "meatal stenosis" is imprecise, meatal stenosis should be thought of as a very short distal narrowing that can be treated by minor meatoplasty, with no major consequences for patient urination and with expected high success rates. Most true urethral strictures require surgery. In a large Belgian series, strictures that did not require surgery were found in only 6% of patients; 17% of all patients in that series

required urethral stricture surgery, but these 54 patients needed 101 surgeries, meaning that those patients underwent an average of two surgeries during the observation period reported. This could indicate use of first and second stage Johanson urethroplasty, or failure of initial attempts at stricture repair requiring redo surgery (Doornaert et al., 2011).

ASSOCIATIONS WITH HIGHER STRICTURE RATES

In past years, Rohrmann (Rohrmann and Jakse, 2003) attempted to decrease stricture rates using a proximal vaginal flap 3.5 cm in length, further lengthened by tubularized labia majora and periurethral/paravaginal tissues. Unfortunately, this technique was associated with high stricture rates, causing the authors and others to conclude that creating the urethra out of mobilized vaginal tissue was not ideal.

METHODS TO DECREASE STRICTURES

Recent innovations in vascularized paravaginal tissue flaps, additionally covered by bulbospongiosus muscle proximally and non-epithelialized paravaginal tissue flaps, have appeared to decrease urethral stricture rates after forearm phalloplasty (Massie et al., 2017). Patients for whom these flaps were not available and therefore did not undergo vaginectomy at the time of phalloplasty had 2.5-fold higher urethral stricture rates (37% stricture in perivaginal flap patients rising to 67% in those without perivaginal flaps). In general, tubularized periurethral/paravaginal urethral tissue flaps are associated with the lowest stricture rates, with small numbers reported except by Massie (Massie et al., 2017). In one series, a complicated form of vaginal labia minora flap "wrap" decreased the stricture rate from 37 to 22% (Kim et al., 2010).

Early attempts to improve fistula rates after vaginal flap urethroplasty by covering with gracilis flaps resulted in lower rates of stricture than the 67% reported by Rohrmann (Rohrmann and Jakse, 2003) but still the stricture/fistula rates was 28% (Gilbert et al., 1988). A recent small study of a specialized

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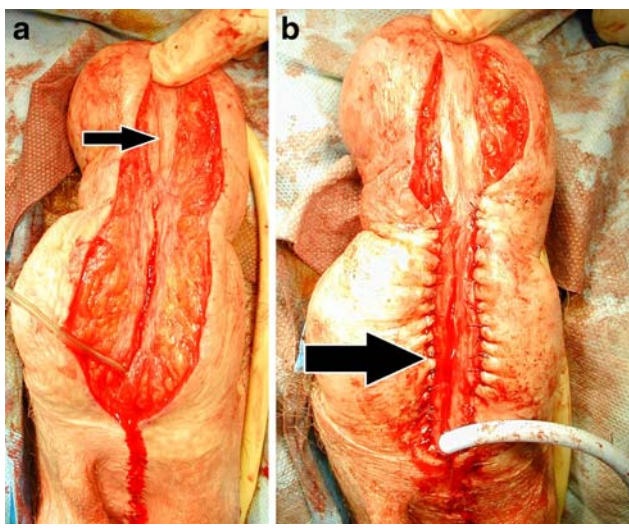


Fig. 1. A: First stage Johanson urethroplasty of a penile location long stricture in a phalloplasty patient, after incision of the entire strictured urethra. Arrow marks urethral plate created after ventrally incising urethra. **B:** First stage Johanson urethroplasty after closing the lateral phalloplasty skin to the proximal urethral plate (Arrow). Distal defects remain in which buccal grafts can be placed to widen the urethral plate if desired. [Color figure can be viewed at wileyonlinelibrary.com]

prelaminated group of forearm phalloplasty patients suggested that adding a gracilis flap decreased fistula rates from 63% ($n = 11$)% to 0% ($n = 4$) (Salgado et al., 2016). The literature indicates that this technique has not been widely adopted among practitioners, probably because of its uncertain benefit and added surgical time/morbidity, but nonetheless it appears promising.

URETHROPLASTY

The treatments of urethral stricture after phalloplasty are generally the same as those for native male urethral repair: dilation, anastomotic and first stage Johanson without intention of second stage (urethral exteriorization), and first/second stage Johanson with buccal or skin grafts in the first stage. Attempts at scar modulation with botulinum toxin (Botox) have also been attempted (Song et al., 2011). Repairs can be bolstered by local flap overlay of the urethroplasty but this can be challenging, as the neogenital tissues are already made of local and free flap tissue. One mandate is to delay any urethral repair until all acute inflammation has subsided, as long as six months after initial phalloplasty (Song et al., 2011).

Urethroplasty after phalloplasty is notoriously difficult owing to the poor blood supply of the neourethra and surrounding tissue. Also, standard urethroplasty techniques were developed to treat the native male urethra, and could be inadequate for reconstructing a phalloplasty neourethra. For example, first and second stage Johanson urethroplasty can fail in phalloplasty owing to poor take of the buccal/skin graft, lack of tissue elasticity

to tubularize the graft, and lack of covering tissue to pull medially over the repair. Anastomotic urethroplasty can fail because of difficulty in mobilizing the urethra to cover the strictured urethral gap, and because of poor blood supply to the neourethra, which is usually in the "watershed" vascular zone far from the phalloplasty blood supply.

Some experts advocate Johanson-type urethroplasty for longer strictures and anastomotic urethroplasty for shorter strictures (Figs. 1–3). This principle of using anastomotic urethroplasty in phalloplasty strictures is partially derived from the premise of repeating anastomotic urethroplasty after it has been attempted following cis-male pelvic fracture urethral distraction (PFUD). Presumably, when anastomotic urethroplasty fails in cis male PFUD patients and phalloplasty patients alike, it is because of distal (urethral) flap necrosis owing to a poor antegrade blood supply. It has been proven that redoing the failed PFUD anastomotic urethroplasty works well and it is presumed reasonable to treat short phalloplasty

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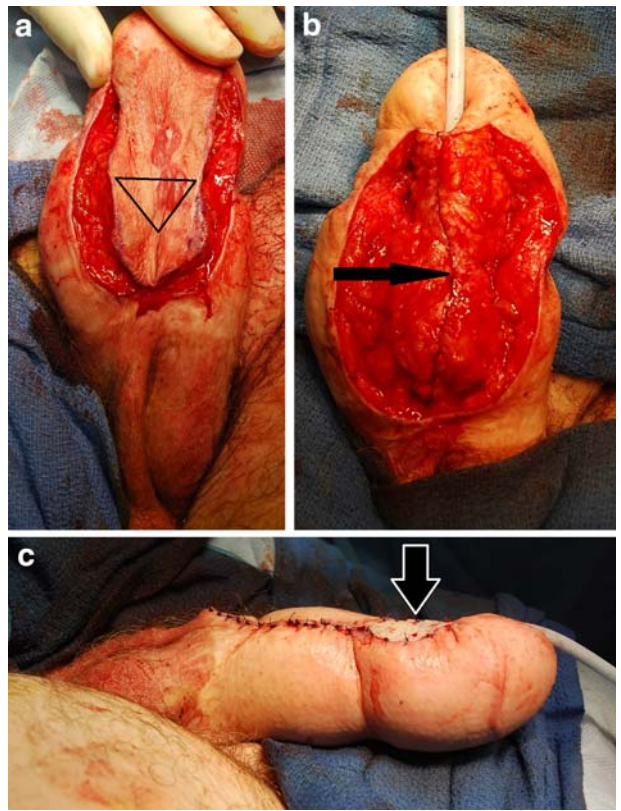


Fig. 2. A: Second stage Johanson urethroplasty. A wide urethral plate is chosen and incised laterally (marked with V). **B:** Second stage Johanson urethroplasty. The urethral plate is tubularized and closed using fine 5-0 PDS suture in multiple layers (arrow). **C:** Second stage Johanson urethroplasty. The final result after tubularization. At the distal portion where inadequate phalloplasty skin is available for tensionless closure, a small split thickness skin graft is placed (arrow). [Color figure can be viewed at wileyonlinelibrary.com]

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Fig. 3. Surgical approach for partial anastomotic urethroplasty of an anastomotic, proximal, short urethral stricture. A wide-open proximal urethral stump is seen, and this will be sutured ventrally to a wide-open portion of the distal urethra in Heineke-Mikulicz fashion. Arrow indicates area of maximum stricture, with wide-open urethra easily seen proximally (below). All photos were taken with consent of the patient and are used with Ethics Committee approval/waiver. [Color figure can be viewed at wileyonlinelibrary.com]

strictures the same way by repeating anastomotic urethroplasty after initial failure, when possible.

First stage Johanson urethroplasty without plans for second stage (basically, formation of a perineal urethrostomy through which the patient will void indefinitely) is the option with highest success rates. However, this has poor patient acceptance because of the desire to stand while voiding. Patients who have this surgery will need to sit to void afterwards, for life. This surgery is usually curative and could be especially well-indicated in cases of coexistent stricture and fistula. First stage Johanson urethroplasty with skin/

buccal grafts can be used to construct a larger urethral plate, which can allow successful closure in the second stage, with uncertain long-term success rates. However, the failure rate of this procedure in cis-male penile urethroplasty is as high as 44% at 6.5 years (much higher than that reported for other cis-male urethroplasty techniques) (Kessler et al., 2003).

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