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Reconstructive

Excision and Primary Anastomosis for Isolated, Short, Anastomotic Strictures in Transmen

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Background: Since the recommendation to perform excision and primary anastomosis (EPA) for isolated, short, anastomotic strictures in transmen, there have been no further reports about its results. This study aims to provide an updated and extended report about the results of EPA for the aforementioned indication.
Methods: Since 2002, data of all transmen in whom an EPA urethroplasty has been performed at Ghent University Hospital were collected in a database. Exclusion criteria for this analysis were age <18 years old, nonanastomotic strictures, and stricture length >3.0 cm. Postoperative complications were analyzed with descriptive statistics. Failure-free survival (FFS) was analyzed with Kaplan–Meier statistics. Need for further urethral manipulation was used as definition for failure. Potential predictors for failure were entered in a univariate Cox regression analysis.
Results: In total, 44 patients were included with a median (interquartile range) follow-up of 40 months (7–125 months). Complications after EPA urethroplasty were present in 12 (27%) of the patients and mainly involved low-grade complications (11/44, 25%). After 1, 2, and 5 years, the estimated FFS rate (SD) was 61% (7.8), 61% (7.8), and 47% (9.1). Stricture length (hazard ratio [HR], 2.11; P = 0.03), prior urethroplasty (HR, 3.53; P = 0.008), and extravasation at first voiding cystourethrography (HR, 3.00; P = 0.047) were identified as predictors for failure.
Conclusions: EPA for an isolated, short, anastomotic stricture in transmen is associated with low complication rates, but high failure rates. After 5 years, the estimated FFS rate is 47%. Stricture length, prior urethroplasty, and extravasation at first voiding cystourethrography are predictors for failure. *(Plast Reconstr Surg Glob Open 2020;8:e2641; doi: 10.1097/GOX.0000000000002641; Published online 6 February 2020.)*

INTRODUCTION

Over the last couple of decades, gender dysphoria has gradually become more apparent, which has led to an increasing focus on transgender health research.[1,2] It is estimated that 355/100,000 individuals consider themselves transgender and 9.2/100,000 would undergo gender-affirming therapy.[2] This gender-affirming therapy comprises holistic treatment regimens with several nonsurgical and surgical interventions, including genitourinary reconstruction.

In transmen, phalloplasty is considered the standard treatment option for genitourinary reconstruction, particularly in patients desiring both sexual function and the ability to void while standing.[1,3,4] However, phalloplasty procedures entail a remarkably high risk for complications, especially at the level of the neourethra.[1] Apart from urethral fistulas, which have been reported in up to 75% after phalloplasty, urethral stricture formation represents another important complication with incidence rates of 25%–58%.[1] These urethral strictures can occur throughout the entire length of the neourethra, although the anastomosis between the fixed and phallic part seems to be the most affected site.[1,3]

Despite these high incidence rates of urethral stricture formation after phalloplasty, only scarce data about its management have been reported and the available evidence is merely based on small, retrospective series with very heterogeneous patient cohorts.[3,5–8] In 2011, Lumen et al[3] described the largest patient series about urethroplasty after phallic reconstruction and analyzed the outcome of different techniques. Based on that experience, the authors made several treatment recommendations and advised to treat isolated, short (≤3.0 cm), anastomotic strictures with excision and primary anastomosis (EPA).[3] However, since that treatment recommendation, there

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have been no reports about the experience with this technique in this particular patient subgroup.

Against this background, the aim of this study is to provide an updated and extended report about the results of EPA for an isolated, short (≤3.0 cm), anastomotic stricture after phalloplasty in transmen.

MATERIALS AND METHODS

Patients

Since 2002, data of all transmen in whom an EPA urethroplasty has been performed at Ghent University Hospital were collected in a database. Since 2008, data were collected prospectively. This database contains extensive information about patient, stricture, phalloplasty, and perioperative characteristics. Surgery was performed by two surgeons (P.H. and N.L.). Patients <18 years old, patients with nonanastomotic strictures, and patients with strictures >3.0 cm were excluded from this analysis. Informed consent was obtained from all included patients, and the study was approved by the local ethics committee (UZG2008/234).

Creation of the Fixed Part of the Neourethra

In all patients, the fixed part of the neourethra was created in a standardized fashion in which the vestibular mucosa was tubularized around a transurethral drain (18Fr) up to the level of the clitoris. Afterwards, the clitoris and fixed part of the neourethra were tunneled toward the prepubic incision and the clitoris was sutured on the periost of the pubic bone.

Preoperative Work-up

Urethral stricture diagnosis was confirmed by urethrography, which also allowed assessment of stricture location and length. Thereafter, patients were planned for urethroplasty ≥3 months after phalloplasty and the latest transurethral intervention. In case of urinary retention, urinary derivation was ensured by a suprapubic catheter or perineostomy. One week preoperatively, patients were instructed to deliver a urine sample for urinary culture. In case of urinary tract infection, adequate antibiotics were started 24 hours before surgery and continued postoperatively. Otherwise, a single intravenous shot of cefazolin was routinely administered at the start of the operation.

Treatment Algorithm

At Ghent University Hospital, transmen presenting with an anastomotic stricture ≤3.0 cm were initially managed by one attempt of direct vision internal urethrotomy (DVIU), provided that there was no complete obliteration. In case of complete obliteration or failure of DVIU, EPA urethroplasty was performed.

Surgical Technique

Patients were installed in a standard lithotomy position (Fig. 1). A straight beniqué was inserted through the phallic meatus up to the stricture. Then, a transverse skin incision was made over the scar line at the base of the neophallus and dissection was pursued through the subcutaneous fat tissue. Thereafter, the stricture was longitudinally opened on the tip of the beniqué and further exposed through a bilateral stay suture. A 3Fr ureteral catheter was inserted through the created opening and moved up proximally, through the strictured area. Then, the stricture was further opened on this ureteral catheter up to the point of a normal urethral caliber. In patients with a perineostomy, the introduction of a second beniqué through the urethrostomy aids in identifying the proximal extent of the stricture, which is very helpful in case of a complete obliteration. Subsequently, the entire strictured segment was excised and both healthy urethral ends were spatulated. Thereafter, the phallic urethral end was mobilized until enough length was gained for anastomotic repair. The spatulated ends were anastomosed with interrupted resorbable 4.0 sutures over a 16Fr urethral catheter and the wound was closed in layers.

Postoperative Course and Follow-up

Patients were discharged from the hospital with the transurethral catheter in place. Generally, 14 days postoperatively, a pericatheter voiding cystourethrography (VCUG) was performed and in absence of contrast extravasation, the transurethral catheter was removed. In case of contrast extravasation, the transurethral catheter was maintained and a new VCUG was performed 1 week later.

Patients were followed after 3, 6, and 12 months and annually thereafter. Follow-up visits included history taking, physical examination, and uroflowmetry. In case of obstructive symptoms or a maximal flow rate <15 mL/s, additional urethroscopy and/or urethrography was performed.

Statistical Analysis

Baseline and perioperative characteristics were analyzed using descriptive statistics. Stricture length was recorded as measured peroperatively. Postoperative (<90 d) complications were categorized according to Clavien–Dindo.[9] Failure-free survival (FFS) was analyzed using Kaplan–Meier statistics. Herein, patients were censored at the moment of latest follow-up or at the time of death. A functional definition of failure was used: "stricture recurrence at the site of reconstruction warranting additional urethral intervention(s), including simple dilation."[9] Potential predictors for failure were entered in a univariate Cox regression analysis. All statistical tests were 2-sided, and *P* values <0.05 were considered statistically significant. Analyses were performed using SPSS 25.0.

RESULTS

In total, 44 patients were included in this study. Median [interquartile range (IQR)] follow-up was 40 months (7–125 mo). Baseline characteristics are represented in Table 1. Median (IQR) stricture length was 1.0 cm (1.0–1.1 cm), and most patients (28/44, 64%) underwent prior urethral interventions. The radial-free forearm flap phalloplasty

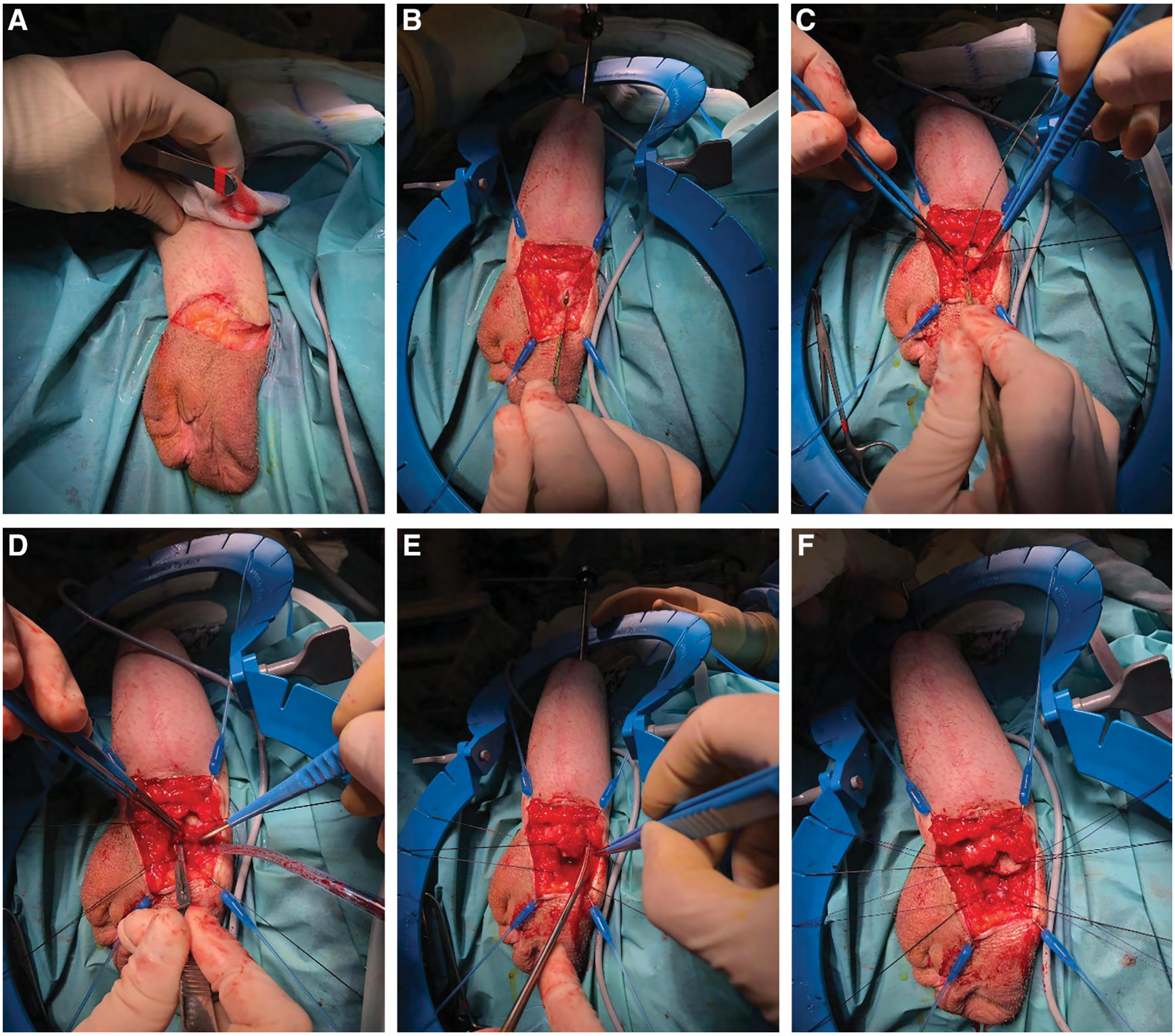

Fig. 1. Surgical technique. A, Skin incision at the base of the neophallus. B, Exposure of the surgical field with a Lone Star retractor and opening of the stricture on the tip of the beniqué. C, Further opening the stricture on the ureteral catheter. D, Resection of the entire strictured urethral segment. E, Mobilization of the phallic urethral end. F, Tension-free end-to-end anastomosis of the spatulated urethral ends.

(35/44, 80%) with a radial free forearm flap tube-in-tube neourethra (33/44, 75%) was the most common type of phalloplasty procedure. Wound or flap complications after phalloplasty were present in 41 (93%) patients and mainly involved wound dehiscence (21/44, 48%) or flap necrosis (18/44, 41%). The median (IQR) interval between the phalloplasty and the EPA urethroplasty was 10 months (6–22 mo). As additional analysis, the number of strictures >1.0 cm was compared between the different degrees of wound/flap complication after phalloplasty, but no statistically significant differences were found: 4/21 (19%) after wound dehiscence, 4/13 (31%) after partial flap necrosis, and 0/5 (0%) after complete flap necrosis ($P = 0.4$).

Perioperative characteristics are represented in Table 2. A complete obliteration was present in 18/34 (53%) patients with available data and 11/44 (25%) procedures involved concomitant fistula repair. Median (IQR) hospital and catheter stay were respectively 1 day (1–2 d) and 14 days (10–17 d). In 8 (20%) patients, there was contrast extravasation at the first postoperative VCUG. Complications after EPA urethroplasty were present in 12 (27%) patients and mainly involved low-grade complications [urinary tract infection (3/44, 6.8%), wound infection (3/44, 6.8%), hematoma (2/44, 4.5%), retention (4/44, 9.1%), and fistula (5/44, 11%)]. In 1 patient (2.3%), urinary retention required the placement of a suprapubic catheter.

In total, 19/44 (43%) procedures failed. After 1, 2, and 5 years, the estimated FFS rate (SD) was 61% (7.8), 61% (7.8), and 47% (9.1) (Fig. 2).

Stricture length [hazard ratio (HR), 2.11; $P = 0.03$], prior urethroplasty (HR, 3.53; $P = 0.008$), and extravasation at first VCUG (HR, 3.00; $P = 0.047$) were identified as predictors for urethroplasty failure (Table 3). As

Table 1. Baseline Characteristics

	Total (n = 44)
Median follow-up, mo (IQR)	40 (7–125)
Patient characteristics	
Median age, y (IQR)	31 (23–40)
Comorbidities, n (%)	
Smoking or cessation <1 y	3 (7.2)
Cardiovascular disease	0 (0)
Diabetes	1 (2.3)
Stricture characteristics	
Median stricture length, cm (IQR)	1.0 (1.0–1.1)
Concomitant fistula, n (%)	11 (25)
Prior urethral interventions, n (%)	
None	16 (36)
1 DVIU/dilation	7 (16)
>1 DVIU/dilation	4 (9.1)
Urethroplasty ± DVIU/dilation	17 (39)
Phalloplasty characteristics	
Type of phalloplasty, n (%)	
RFFF	35 (80)
ALT	9 (21)
Type of neourethra n (%)	
RFFF tube-in-tube	33 (75)
ALT tube-in-tube	5 (11)
Pedicled SCIAP flap	5 (11)
Free SCIAP flap	0 (0)
Other	1 (2.3)
Prior metoidioplasty, n (%)	6 (14)
Wound/flap complications, n (%)	
None	3 (6.8)
Wound dehiscence at the base	21 (48)
Partial flap necrosis	13 (30)
Complete flap necrosis	5 (11)
Venous congestion	2 (4.5)

ALT, anterolateral thigh; RFFF, radial free forearm flap; SCIAP, superficial circumflex iliac artery perforator.

Table 2. Perioperative Characteristics

	Total (n = 44)
UTI, n (%)	1 (2.3)
Preoperative urinary diversion, n (%)	
None	27 (61)
Suprapubic catheter	5 (11)
Perineostomy	12 (27)
Complete obliteration, n (%)	
No	16 (36)
Yes	18 (41)
Missing	10 (23)
Peroperative fistula repair, n (%)	11 (25)
Closure of the perineostomy, n (%)	
No	1 (2.3)
Yes, immediate closure	9 (21)
Yes, delayed closure	2 (4.5)
Median operation time, min (IQR)	63 (49–80)
Median hospital stay, d (IQR)	1 (1–2)
Median catheter stay, d (IQR)	14 (10–17)
Extravasation at first VCUG, n (%)	8 (20)
Postoperative complications (Clavien–Dindo), n (%)	
None	32 (73)
Grade 1	5 (11)
Grade 2	6 (14)
Grade 3	1 (2.3)

UTI, urinary tract infection.

additional analysis, success rates were plotted against stricture length and showed lower success in longer strictures with 0% success rate in strictures >2.0 cm (Fig. 3).

DISCUSSION

The aim of this study was to report the results of EPA for isolated, short, anastomotic strictures after phallic reconstruction in transmen, as there have been no reports about this since its recommendation in 2011.[3] To the best of our knowledge, this is the first study that scrutinizes the outcome of one particular urethroplasty technique in a homogeneous transmen patient cohort. The results are noteworthy and—in our opinion—of utmost importance for daily clinical practice.

Even though EPA represents a straightforward procedure with relatively low complication rates, it led to an important number of failures in this patient cohort. The 5-year FFS estimate was only 47%, a substantially inferior result compared with the 93% composite success rate after EPA in native males.[10] This discrepancy might be explained by a multitude of factors, all related to the differences between a neophallus and a native penis. First of all, the environment to perform a urethral reconstruction in is much poorer after phalloplasty because it consists of heavily operated tissues with a very tenuous

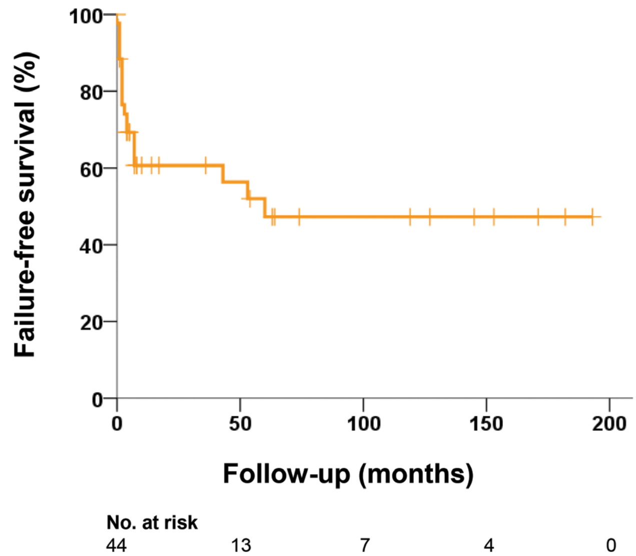

Fig. 2. Failure-free survival after excision and primary anastomosis for a short, anastomotic stricture in transmen.

Table 3. Univariate Cox Regression Analysis

	HR (95% CI)	*P*
Surgeon	0.92 (0.33–2.59)	0.9
Age	0.97 (0.92–1.02)	0.2
Stricture length	2.11 (1.09–4.09)	**0.03**
Concomitant fistula	0.48 (0.14–1.67)	0.5
Prior urethroplasty	3.53 (1.38–9.01)	**0.008**
Type of phalloplasty	0.50 (0.12–2.16)	0.4
Type of neourethra	1.27 (0.87–1.88)	0.2
Wound/flap complication after phalloplasty		
None (reference)	Reference	ref.
Wound dehiscence	0.46 (0.05–4.25)	0.5
Partial flap necrosis	1.60 (0.18–14.45)	0.7
Complete flap necrosis	1.18 (0.07–18.00)	0.9
UTI	0.41 (0.06–2.62)	0.3
Preoperative urinary diversion	0.92 (0.32–2.62)	0.9
Operation time	1.00 (0.98–1.02)	0.8
Extravasation at first VCUG	3.00 (1.02–8.86)	**0.047**

P values < 0.05 are highlighted in bold.
UTI, urinary tract infection.

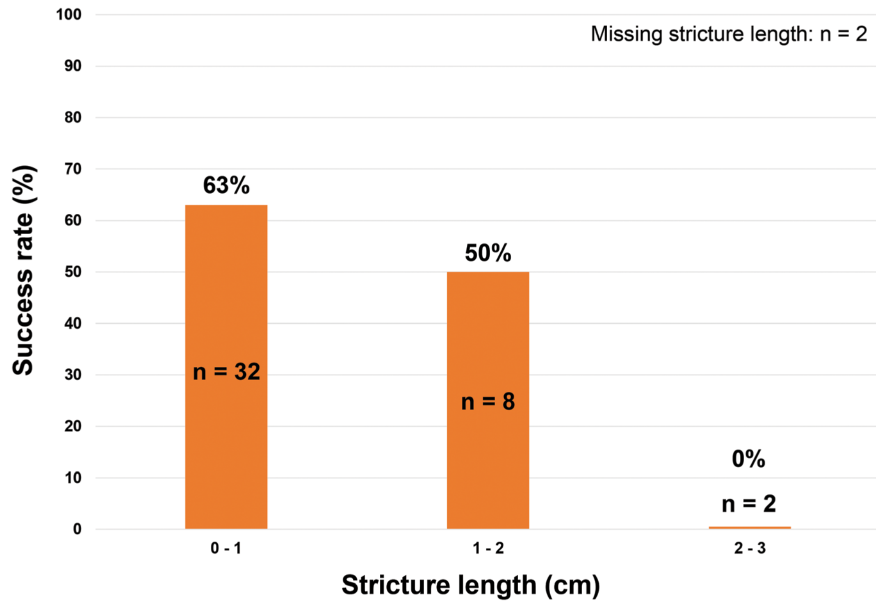

Fig. 3. Success rate according to stricture length.

vascularization.[1,3,4] Also, local wound healing problems and other complications after phallic reconstruction can lead to extensive fibrotic tissue, which further impedes the vascularization and complicates any reconstructive procedure at the neourethra.[3] Another explanation lies within the fact that the anastomosis between the fixed and phallic part of the neourethra is in fact a mucocutaneous junction and therefore prone to stricture formation.[3,11] After EPA, the strictured segment is indeed completely excised, but the new anastomosis remains a mucocutaneous junction and thus at risk for restricture formation. A third element that possibly explains the different outcome of EPA in transmen is represented by the differences in elasticity of a neourethra and a bulbar urethra of a native male. It is a well-known fact that a tension-free anastomosis is imperative for success after EPA, and, therefore, it is of utmost importance that both urethral ends can be mobilized sufficiently.[10] In the bulbar urethra, a gap of 2.5 cm can be bridged after thorough mobilization of both urethral ends, given its estimated length and elasticity of respectively 10 cm and 25%.[11–13] On the other hand, a neourethra is much more resistant to mobilization and extensive skeletonization of the phallic urethral end could in turn lead to ischemia of the anastomosis and threaten the outcome of the operation.[4] In our opinion, residual tension at the anastomosis is one of the main factors contributing to failure after EPA, also in our patient cohort, and especially in those with a higher stricture length. In these cases, it should be advised to switch to an alternative treatment strategy rather than forcing an end-to-end anastomosis.

In the univariate Cox regression analysis, stricture length, prior urethroplasty, and extravasation at first VCUG were identified as predictors for failure in this particular patient cohort. As described above, it makes sense that longer strictures are harder to treat with EPA: longer gaps require more mobilization and entail the risk of ischemia and residual tension at the anastomosis.[4] Based on this and the additional analysis, it should be advised not to perform EPA for strictures >2.0 cm and to only use it if a tension-free anastomosis can be obtained without excessive skeletonization. Second, prior urethroplasty implicates further scarring of the area to reconstruct and further deteriorates the vascular environment for EPA. Finally, as regards extravasation of contrast at the first VCUG, this could reflect the presence of a technical flaw or the presence of ischemia at the urethral ends. Considering this, it can be expected that these cases are particularly at risk for stricture recurrence, especially early after surgery.

The rather disappointing results of this study underline the importance of mitigating the risk of postphalloplasty stricture formation because these strictures are extremely challenging to treat. So far, it has been established that the use of periurethral or paravaginal tissue flaps is to be preferred to create the neourethra because they are associated with the lowest risk of stricture formation.[4] Also, it has been documented that preserving the vaginal cavity leads to more neourethral complications, and, therefore, a vaginectomy should be performed whenever possible.[4] Other studies have looked into the added value of gracilis flaps[4,8] and prelaminated neourethras,[4,12] although the true benefit of these modifications remains unclear and prelamination has even been associated to an extremely high stricture rate (88%) in a recent publication.[14] Given this background, it is clear that more studies about risk-lowering strategies will be needed to optimize the complex treatment of this unique patient population. Furthermore, considering the suboptimal results of EPA for this indication, all patients should be counseled accordingly and future research should look into better alternatives. Based on the data of Lumen et al,[3] it could be deducted that a 2-stage repair would be a valuable alternative, given its lower stricture recurrence rates (30%), although prospective, homogeneous data will be required to fully support this hypothesis.[3] Another possibility could be to perform a DVIU which entails a success rate of about 50%.[15] However, many of our patients underwent prior urethral interventions and a substantial number of them had a complete obliteration, which makes a DVIU impossible.

This study contains several limitations. Before 2008, all data were collected retrospectively, which implicates the risks of bias. Also, a functional definition of failure was used, whereas an anatomical definition could have led to more and earlier "failures."[16] However, to date, there is no consensus about the true or most appropriate definition of failure after urethroplasty.[17] The lack of functional data forms another limitation, although no patient-reported outcome measures have been validated for this specific patient population. Finally, the limited sample size may be considered a limitation as well, although this study represents the largest homogeneous transmen patient series so far that investigates the outcome of one particular urethroplasty technique for one particular indication.

CONCLUSIONS

EPA for an isolated, short, anastomotic stricture after phalloplasty in transmen is associated with low complication rates, but high failure rates. After 5 years, the estimated FFS rate is 47%. Stricture length, prior urethroplasty, and extravasation at first VCUG are predictors for failure.

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