Urethral Strictures Treatment in Transmasculine

Subjects: Surgery

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Genital gender-affirming surgery can be part of the transition process in transgender patients. The 2 standard options for transmasculine patients are phalloplasty and metoidioplasty. These complex procedures brings along the risk of complications such as fistulas or urethral strictures at the level of the neo-urethra. Urethral strictures pose a specific challenge to the reconstructive urologist, and studies that focus on the management of urethral strictures are scarce. This systematic review gives an overview of the known literature about strictures in transmasculine patients, the different treatments and the outcome .

Keywords: transmen ; transgender ; urethral stricture ; sex reassignment surgery

1. Introduction

Genital gender-affirming surgery (GGAS) can be part of the transition process in transgender patients. The two standard options for transmasculine patients are phalloplasty and metoidioplasty. In metoidioplasty, the hormonally enlarged clitoris is converted to a (small) neophallus [1], while phalloplasty comprises the construction of a neophallus with different types of flaps [2]. Most of the patients undergoing this type of surgery also undergo a urethral lengthening procedure, as they have a strong desire to void in a standing position [3]. This, in turn, brings along the risk of complications at the neo-urethra, such as fistulas or urethral stricture formation [4].

Urethral strictures pose a specific challenge to the reconstructive urologist, and studies that focus on the management of urethral strictures in transmasculine patients are scarce. The management of urethral stricture disease in cisgender men includes endoluminal treatment (dilatation, internal urethrotomy) and surgical reconstruction of the urethra (urethroplasty), using different techniques according to patient and stricture characteristics [5]. This management cannot simply be extrapolated to transmasculine patients, due to several differences such as anatomy, paucity of local tissue, precarious vascularization and stricture etiology.

2. Treatment of Urethral Strictures in Transmasculine Patients

2.1. Patterns of Strictures after GGAS

Time to stricture onset after metoidioplasty ranged from 12 to 17 months [6]. These strictures were mostly located at the anastomosis between the native and fixed urethra (33%), or the anastomosis between the fixed and pendulous urethra (33%). Stricture length after metoidioplasties was not reported. After phalloplasty, time to stricture onset ranged from 6 to 36 months [7][8][9]. In most studies, the anastomosis between the fixed part and pendulous part was the dominant stricture area. No strictures in the native urethra were reported.

Five studies reported on the presence of concomitant fistulas [7][10][9][6][11], which ranged from 0–50%. Six studies reported on previous stricture related interventions [7][10][9][6][11][12]. Two of these [10][6] reported on patients without any prior interventions, although Wilson et al. [10] remained unclear on the use of previous endoscopic procedures. In the study of Verla et al. [9], 25% (11/44) of patients had previous endoscopic procedures and 39% (17/44) had previous urethroplasty. Pariser et al. [11] reported that all nine cases (100%) underwent at least one DVIU prior to urethroplasty. Of these, 22% (2/9) also underwent previous urethroplasty. In the study of Lumen et al. [7], 36% (8/22) of patients underwent previous urethroplasty. Dabernig et al. [12] reported that all their six cases (100%) underwent previous endoscopic or open treatment but remained unclear on the types and numbers.

2.2. Patency Rates of Different Techniques

2.2.1. Minimally Invasive Procedures

Minimally invasive procedures (Otis, DVIU, meatotomy and HMS) were used as stricture management [7][8][10] after phalloplasty. In the series exclusively reporting on DVIU (n = 22) [7], a first DVIU yielded a patency rate of 46%, whereas three or more DVIUs in the same patient were never successful and could not yield any valuable patency. They also calculated a mean time to stricture recurrence of 3 (range 2–3) months and 9 (range 1–54) months after one DVIU for strictures in the pendulous urethra and anastomotic strictures between the pendulous and fixed urethra, respectively. In Lumen et al. [8], 8/118 (6.8%) of strictures were treated with meatotomy and 19/118 (16%) with HMS with a patency rate of 75% and 58% respectively. Wilson et al. [10] managed 1/4 (25%) strictures with HMS without recurrence. The treatment for one meatal stenosis was not reported.

Two out of twelve (17%) post-metoidioplasty strictures were managed with meatotomy and 3/12 (25%) with HMS, yielding patency rates of 50% and 67%, respectively [6].

2.2.2. Urethroplasty

Graft Augmented Urethroplasty (GAU)

Schardein et al. [13] treated all their nine strictures with a double faced buccal mucosa graft (BMG) in a dorsal inlay and a ventral onlay approach, reaching a 75% urethral patency rate (only eight included cases, one case had no information on follow-up). Wilson et al. [10] reported on the use of dorsal inlay BMG urethroplasty in 2/4 (50%) strictures without any recurrence. All of these were reinforced with a local fasciocutaneous flap to support blood supply. Pariser et al. [11] treated 8/9 (88.9%) strictures with ventral onlay BMG, and the other case (11.1%) was ventral BMG augmented anastomotic repair. This resulted in a urethral patency rate of 56%. They reported a mean time to stricture recurrence of 7 (range 1–21) months after their augmented BMG repair. Lumen et al. [8] used graft urethroplasty in 2/118 (1.7%) strictures with a 50% urethral patency. The type of graft was not specified.

Pedicled and Free Flaps

Local and distal flap reconstructions were used in three papers [8][6][12]. A labium minus flap was used in 1 out of 12 (8.3%) post-metoidioplasty cases without stricture recurrence [6]. Lumen et al. [8] described the use of a pedicled flap urethroplasty in 10/118 (8.5%) of cases (respectively seven and three neophallic skin and neoscrotal skin flaps). The overall patency rate of this technique was 60%. Dabernig et al. [12] performed a complete reconstruction of the pendulous urethra for multifocal strictures using radial forearm flaps in all their cases (six patients) with a urethral patency of 67%.

Anastomotic Repairs (AR)

Verla et al. [9] described the use of AR in all their reported strictures (44 cases), all located at the anastomosis between the fixed and pendulous part of the urethra. They reached a urethral patency rate of 57%.

Staged Repairs

Staged repairs were discussed in two studies [8][6]. After metoidioplasty, this technique was used in 6/12 (50%) cases, yielding a patency rate of 33% [6]. After phalloplasty, staged Johanson urethroplasty was used in 33/118 (28%) cases with a 70% urethral patency [8]. Temporary perineal urethrostomy before urethral reconstruction was performed in 21/118 (18%) cases with a reported urethral patency rate of 38%. Another 10/118 (8.5%) cases underwent a first stage of a planned staged Johanson urethroplasty, or had a current perineal urethrostomy and were awaiting further treatment. One of the patients with a temporary perineal urethrostomy opted to maintain this state to avoid any further complications.

2.3. Postoperative Complications

Lumen et al. [6] reported that none of the patients experienced a grade 3 Clavien-Dindo (CD) complication after their various techniques for metoidioplasty. They did not report on the number of grade I and II complications. Verla et al. [9] reported that 5/44 (11%) patients experienced a CD grade I complication, 6/44 (14%) CD grade II and 1/44 (2.3%) a CD grade III complication after AR. The grade I and II complications involved urinary tract infections (UTI's), wound infections, fistulas, hematomas and retention. The CD class III case involved insertion of a suprapubic catheter for urinary retention. Pariser et al. [11] described a CD grade II complication in 1/9 (11%) after their graft urethroplasties. This involved a mild rhabdomyolysis. Dabernig et al. [12] reported having no postoperative complications after their full free flap reconstructions (0/6).

2.4. PROMs and Satisfaction

Schardein et al. [13] stated that 7/8 (88%) patients (only those with available data included) were able to void while standing, and reported a mean postoperative International Prostate Symptom Score (IPSS) of 3.1 (range 0–11) and an

IPSS-QoL of 0.9 (range 0–3). However, they did not provide any preoperative data. On a global response assessment question (GRA), 6/8 (75%) patients reported a marked improvement, 1/8 (13%) a moderate improvement and 1/8 (13%) a slight improvement. Dabernig et al. [12] stated that all patients (six cases) reported an improvement in their mental well-being, and stated that they would undergo the procedure again if they would have to. However, these parameters were not assessed preoperatively.

3. Summary

Transmasculine patients are more likely to choose a phalloplasty rather than a metoidioplasty, resulting in a higher absolute number of documented phalloplasty related stricture cases. Another reason might be the fact that urethral complications (strictures/fistulas) are less likely after a metoidioplasty than after a phalloplasty, given the less elaborated reconstruction and the less invasive type of tissue transfer. However, Waterschoot et al. reported urethral complications after metoidioplasty in 19%, whereas after phalloplasty this is in the same range [14].

For meatal stenosis repair after phalloplasty, Lumen et al. [8] treated eight meatal strictures with a meatotomy yielding a patency rate of 75%. The other 10 were treated with a pedicled flap repair (five cases) or a staged repair (five cases), but separate outcomes were not reported. Due to these small patient numbers, no conclusions can be drawn on the preferred technique in this type of patient. However, different local factors can influence the choice of the technique that is performed. For example, if the patient is satisfied with a hypospade meatus, a meatotomy can be a straightforward and relatively simple solution. Otherwise, more complex options, such as a local flap urethroplasty or a staged repair might be necessary.

When considering strictures at the pendulous urethra after metoidioplasty, three different surgical techniques were reported. Lumen et al. [6] performed a HMS, staged urethroplasty and labium minus flap urethroplasty in respectively one, one and two patients with a 100% patency rate [6]. So, it appears that strictures at the pendulous urethra after metoidioplasty are treatable, although larger studies are needed to confirm these results and to better understand the outcomes of each type of surgery. Here, again, multiple techniques for stricture treatment are possible depending on several patient and stricture characteristics.

Regarding pendulous strictures after phalloplasty, DVIU (11) has been attempted in only three cases with recurrence in two patients. In cisgender men, DVIU is not recommended for penile strictures, and based on the very limited experience, DVIU seems to have a limited role in the treatment of pendulous strictures in transmasculine individuals [15].

Lumen et al. [8] reported 28 strictures at the pendulous urethra. These were most commonly treated with a staged urethroplasty or a temporary perineal urethrostomy. However, separate outcome data per stricture location could not be obtained from this study. Another option is an RFFF as a complete urethral substitute, as described by Dabernig (REF invoegen). As this is an extensive and complex procedure with (additional) visible scarring at the forearm, this technique should be reserved in case (almost) the entire pendulous urethra is strictured and scarred. However, given the low patient numbers and high risk of bias, no definitive recommendations can be made on the ideal treatment of strictures at the pendulous urethra.

Strictures at the anastomosis between the fixed and pendulous urethra were most frequently reported (125/224 strictures) (**Table 1**). The commonly used techniques in this anatomic region were AR, GAU with BMG, DVIU and HMS in respectively 44, 10, 19 and 16 strictures [7][8][13][10][9][6]. A patency rate of 75% (6/8 cases) and 100% (2/2 cases) was seen after GAU with BMG [13][10]. The success rates after DVIU, AR and GAU are respectively 37% (7/19) and 57% (25/44) at this location [7][9]. In cisgender males, DVIU is a potential first-line treatment for short and primary bulbar strictures, with a patency rate ranging between 26% and 77% being found after a single session [16]. Furthermore, Lumen et al. [7] showed that the shorter the time interval between phalloplasty and DVIU, the higher the risk of urethral stricture recurrence. Therefore, DVIU could be a potential first-line option as well for short (<3 cm) and primary anastomotic strictures that occur in the long run after phalloplasty [7].

Table 2. Intervention and outcomes of included studies. DVIU (Direct Vision Internal Urethrotomy), HM (Heineke Miculicz), BMG (Buccal Mucosal Graft). CD (Clavien-Dindo), EPA (Exision and Primary Anastomosis) FtM (Female to Male), NA (Not Applicable), NR (Not Reported), IQR (Inter Quartile Range).

Author and Year	Mean/Median Age at Urethral Procedure (Months)	Stricture Time to Onset (Months)	Stricture Localization	Previous Endoscopic Procedures	Previous Meatotomy/Meatoplasty	Previous Urethroplasty	Urethrotomy (Otis/DVIU/Meatotomy/HM Stricturoplasty)	Augmented Urethroplasty with Graft	Augmented Urethroplasty with Local Flap	Primary Anastomotic Repair	Staged Urethroplasty with or without Augmentation	Definitive Preineal/Scrotal Urethrostomy	Perioperative Complications (Clavien Dindo)	Stricture Recurrence	Postoperative Complications
Lumen et al. 2020 [6]	30 (IQR:24–40)	9 (IQR: 12–17)	1/12 (8.3%) Anastomosis Native–Pars fixa, 4/12 (33.3%) Anastomosis Pars fixa–Pars pendulans, 4/12 (33.3%) Pars pendulans, 3/12 (24.9%) Meatal, 1/12 (8.3%) Panurethral	None	None	None	2/12 (17%) Meatotomy, 3/12 (25%) HM	None	1/12 (8.3%) Labium Minus flap (pan-urethral stricture)	None	6/12 (50%)	None	No CD ≥3, Lower grades not reported	1/3 (33.3%) after HM, 1/2 (50%) after meatotomy, 2/6 (33.3%) after staged repair, 0/1 (0%) after local flap repair	No Clavien Dindo complications ≥ 3, Lower NR
Verla et al. 2020 [9]	31 (IQR: 23–40)	10 (IQR: 6–22)	44/44 (100%) Anastomosis Pars fixa–Pars pendulans	11/44 (25%)	None	17/44 (39%)	None	None	None	44/44 (100%) EPA	None	None	11% CD 1, 14% CD2, 2.3% CD3 (Placement of suprapubic catheter)	19/44 (43%) After EPA repair	11% of patients CD I, 14% of patients CD II, 2.3% of patients CD III (placement of SPC) (3/44 (6.8%) UTI, 3/44 (6.8%) Wound infection, 2/44 (4.5%) Hematoma, 4/44 (9.1%) Retention, 5/44 (11%) Fistula)
Schardein et al. 2020 [13]	37 (range: 28–59)	NR	9/9 (100%) Anastomosis Pars fixa–Pars pendulans	NR	NR	NR	None	9/9 (100%) Double faced BMG	None	None	None	None	NR	2/8 (25%) after BMG repair, 1 case no information on follow-up	NR
Wilson 2016 [10]	32 Yo, 47 Yo	NR	2/4 (50%) Anastomosis Pars fixa–Pars pendulans, 1/4 (25%) Pars pendulans, 1/4 (25%) Meatal	NR	None	None	1/4 (25%) HM, 1/4 (25%) intervention not reported	2/4 (50%) BMG, both reinforced with fasciocuteaneous flap	None	None	None	None	NR	0/2 (0%) after BMG with flap, 0/1 (0%) after HM, 1 case no information on intervention or outcome	NR
Pariser 2015 [11]	39 (range: 26–56) Including cis gender patiënt	NR	9/9 (100%) Anastomosis Native–Pars fixa	9/9 100%	None	2/9 (22.2%)	None	1/9 (11.1%) Excision with dorsal anastomosis with ventral onlay BMG; 8/9 (88.9%) Incision with ventral onlay BMG	None	None	None	None	1/9 of patients CD1 (11.1%)	4/9 (44.4%) after BMG	1/9 of patients CD1 (11.1%) Mild rhabdomyolysis

Although AR is often associated with an excellent patency rate in cisgender men (93–97%), these favorable outcomes were not reached in transmasculine patients. These differences in success rates between cisgender and transgender patients could be explained by different facts. In general, vascularization is compromised at the proximal and distal end of the reconstructed skin urethra, due to the anatomy of free and pedicled skin flaps [17]. The new connection is one between the mucosal tissue and skin, which could explain the formation of more scar tissue after healing. Furthermore, safely mobilizing the neo-urethra without further compromising its vascularization is hardly possible, which makes it very difficult to create a tension free anastomosis. This is in contrast to cisgender men, in which a pure mucosal anastomosis is feasible, and mobilization of the urethra is much easier without compromising the vascularization, due to the natural curve it contains. Thus, as suggested by Verla et al. [9], probably only very short anastomotic strictures (<2 cm) with a peri-operatively assessed and good vascularization might be treated successfully with this technique, provided that a tension free anastomosis can be made. Based on the data of Lumen et al. [6] and Schardein et al. [13], a BMG or two stage urethroplasty might be a valuable alternative when there is any doubt on the quality of the tissue or tension of the anastomosis, but comparative studies are needed to confirm these results. Despite the lack of native supportive tissue (corpus spongiosum) for fixating a local flap or graft, Schardein et al. [13] showed a 78% (7/9) success rate after double-face BMG urethroplasty, with a median follow-up of 31 months. We hypothesized that the interposition of well-vascularized fatty tissue, analogous to the martius flap to support the ventral graft in the double-face BMG urethroplasty, could be the reason for this good surgical outcome. Finally, a patency rate of 100% in two patients was seen after staged augmented urethroplasty, as a result of the increased healing time after the first stage and therefore the possibility of tubularization on a well-vascularized graft bed in the second stage, at least 3 months later [6]. However, the long-term survival rates of grafts in this population still need to be studied, especially given the observation in cisgender men where grafts tend to result in lower success rates after long-term follow-up [18].

For strictures at the anastomosis between the fixed and native urethra, we only have data from two studies with small sample sizes. A 100% (1/1) recurrence was seen after HMS [6] and 44% (4/9) had a stricture relapse after ventral onlay BMG urethroplasty [11]. In this last study, no supportive tissue was used to optimize the vascularization of the BMG, which could have had an impact on graft survival rates.

Lumen et al. reported a 25% recurrence rate after meatotomy (8 cases), 42% after HMS (19 cases). About half of the cases remain patent after both a free graft or pedicled flap urethroplasty. However, a patency rate of 70% was reported after a staged urethroplasty repair. Unfortunately, we cannot draw any conclusions based on these results, as the indication for each technique remains unclear. [8].

In cisgender patients, the dartos layer and the bulbospongious muscle are more developed compared to transgender men who thus lack this extra protective layer that could potentially provide bulk and vascular support to stricture repairs, in the region of the anastomosis between the fixed and pendulous urethra. In addition, the vascularization, as already mentioned above, is compromised and a very thin layer to cover these strictures gives a potentially higher risk of developing fistulas. Verla et al. [19] reported a similar rise in fistulization rate after stricture repair in failed hypospadias cases. Due to the ill developed dartos layer and often numerous previous procedures, only a thin layered coverage can be performed after stricture repair in these cases.

Author and Year	Mean/Median Age at Urethral Procedure (Months)	Stricture Time to Onset (Months)	Stricture Localization	Previous Endoscopic Procedures	Previous Meatotomy/Meatoplasty	Previous Urethroplasty	Urethrotomy (Otis/DVIU/Meatotomy/HM Stricturoplasty)	Augmented Urethroplasty with Graft	Augmented Urethroplasty with Local Flap	Primary Anastomotic Repair	Staged Urethroplasty with or without Augmentation	Definitive Preineal/Scrotal Urethrostomy	Perioperative Complications (Clavien Dindo)	Stricture Recurrence	Postoperative Complications
Lumen 2011 [8]	37.6 (range: 19–65) Including cis gender patients	Overall median 23.5 (range: 13.5–31.2) 24.4 (meatal), 35.3 (pars pendulans) 13.5 (anastomosis pars pendulans - pars fixa), 28.1 (pars fixa)	18/118 (15.3%) Meatal, 28/118 (23.7%) Pars pendulans, 48/118 (40.7%) Anastomosis Pars fixa–Pars pendulans, 15/118 (12.7%) Pars fixa, 9/118 (7.6%) Multifocal	NR	NR	NR	8/118 (6.8%) Meatotomy, 19/118 (16.1%) HM	2/118 (1.7%) Free graft (type not reported)	10/118 (8.5%) Pedicled flap urethroplasty (3/10 were neo-scrotal pedicled flaps, 7/10 were neophallic skin flaps)	14/118 (11.9%) EPA	33/118 (28.0%) Johanson staged urethroplasty, 21/118 (17.8%) Perineostomy followed by urethral reconstruction, 10/118 (8.5%) Still at first stage of stage urethroplasty or perineal urethrostomy and awaiting further treatment	1/118 (0.8%)	NR	2/8 (25%) after meatotomy, 8/19 (42.1%) after HM, 6/14 (42.9%) after EPA, 1/2 (50%) after free graft, 4/10 (40%) after pedicled flap, 10/33 (30.3%) after staged repair, 13/21 (61.9%) after perineostomy with urethral reconstruction	NR
Lumen 2009 [7]	33 (range: 20–52) Including cis gender patients	20 (range: 1–90)	19/22 (86.4%) Anastomosis pars pendulans–Pars fixa 3/22 (13.6%) Pars pendulans	None	None	8/22 (36.4%)	32/32 (100%) DVIU (total of 32 procedures), (15/22 had 1 incision, 6/22 had 2 incisions, 1/22 had repetitive incisions) including cisgender patient	None	None	None	None	None	NR	12/22 (56.2%) after 1 DVIU	NR
Dabernig 2006 [12]	35.1 (range: 22–65) Including cis gender patients	NR	6/6 (100%) Pan-urethral	Yes, but percentage not reported	NR	Yes, but percentages not reported	None	None	6/6 (100%) complete urethral reconstruction using RFFF	None	None	None	None	2/6 (33.3%) after complete free flap reconstruction	None

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