"7-flap" perineal urethrostomy: an effective option for obese men with devastated urethras

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Introduction: *To present an updated experience using our previously reported lateral perineal "7-flap" technique for perineal urethrostomy (PU), highlighting its role in a variety of patients with advanced urethral stricture disease.*

Materials and methods: *All patients who underwent 7-flap PU from 2009-2013 were reviewed. PU was constructed by advancing a "7"-shaped laterally based perineal skin flap into a spatulated, amputated bulbomembranous urethra. The contralateral side of the amputated proximal urethra was then matured to the advanced perineal skin. Patients were stratified by body mass index (BMI) and outcomes were compared.*

Results: *Among 748 patients undergoing urethroplasty during the study period, 22 men (2.9%; mean age 61, range 31-80) received a 7-flap PU for advanced stricture disease (mean follow up 32 months). A majority of patients (14/22, 64%) were obese (BMI ≥ 30). Disease etiologies consisted primarily of lichen sclerosus (9/22, 41%) while 6/22 (27%) had failed prior urethral reconstructions elsewhere. Mean operative time was 108 min (range 54-214), mean estimated blood loss (EBL) was 76 cc (30-200), and all patients were discharged immediately after surgery. Urethrostomy creation was possible in all patients regardless of BMI (mean 33, range 22-43), and there were no differences with regards to EBL ($p = 0.71$), operative time ($p = 0.38$), or success rate ($p = 0.76$) in obese versus non-obese patients undergoing 7-flap PU. Nearly all patients (21/22, 95%) are voiding spontaneously on follow up without the need for any additional procedure.*

Conclusion: *In our updated experience, performance of 7-flap urethrostomy has resulted in durable long term success with acceptable performance in technically challenging cases.*

Key Words: 7-flap, perineal urethrostomy, surgical technique, urethral stricture, urethroplasty

Introduction

Creation of a perineal urethrostomy (PU) is an established procedure for the management of complex anterior and pan-urethral stricture disease.[1-6] Conventional PU incorporates an "inverted-U" incision in the perineum to create a urethrocutaneous anastomosis.[7] PU can be utilized for temporary urinary diversion in a first-stage urethral reconstruction or for a definitive urinary outlet in cases where an attempt at complex repair is either infeasible or undesired.[5,8]

Performance of PU can be technically challenging in patients with either a long skin-to urethra distance (e.g. obese patients) or those with more extensive stricture disease. We recently published an initial experience using "7-flap" perineal urethrostomy, a novel technique that allows the surgeon to expose the proximal urethra prior to creating a custom-tailored lateral skin flap for urethral attachment.[9] Here we present an update of our initial series with longer term

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follow up and further highlight the utility of 7-flap PU, particularly in obese patients.

Materials and methods

We performed a retrospective review of our institutional urethroplasty database and identified 22 patients that underwent 7-flap PU from 2009-2013. During the study period, we utilized the 7-flap PU as the definitive technique performed for urethral diversion. In addition to stratifying patients based on age and stricture etiology, we statistically analyzed the difference between obese and non-obese patients in terms of estimated blood loss (EBL), operative time, and operative success.

As described previously in our initial experience,[9] 7-flap PU is performed with the patient in the dorsal lithotomy position. A squared 7-shaped figure is marked on the perineum with the vertical base of the "7" on the midline. A single vertical perineal incision is made over the midline base of the "7," and the subcutaneous tissue and muscle are divided. A self-retaining retractor (e.g. Lone Star or Perineal Bookwalter) is employed to aid in dissection and circumferential mobilization of the bulbar urethra. In order to maximize urethral length, the urethra is then amputated at the distal bulb, as determined by cystoscopy or intraoperative exam. The pendulous urethral stump is oversewn with a 2-0 monocryl or PDS suture. A right lateral urethrotomy is made on the bulbar segment and extended toward the bladder until a 24-French bougie can easily be passed intravesically, Figures 1 and 2.

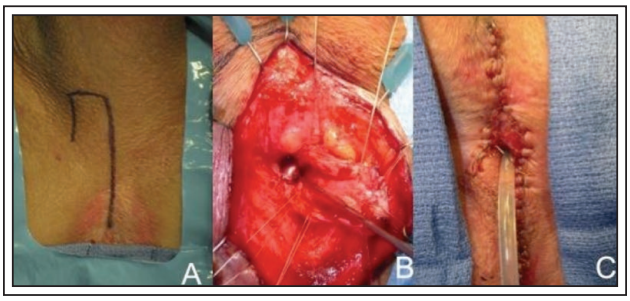

Figure 1. Intraoperative photographs of the "7-flap" perineal urethrostomy technique. The skin is marked pre-incision with a squared-off "7" with the base of the "7" in the midline of the perineum **(A)**. The urethra is exposed and divided, and the lateral aspect of the urethra is mobilized in preparation for attachment with the right-lateral perineal skin flap, which is not yet developed **(B)**. A 16-french catheter is left in place at the conclusion of the perineal urethrostomy procedure. The perineal "7-flap" can be seen extending into the PU at the 7 o'clock position **(C)**.

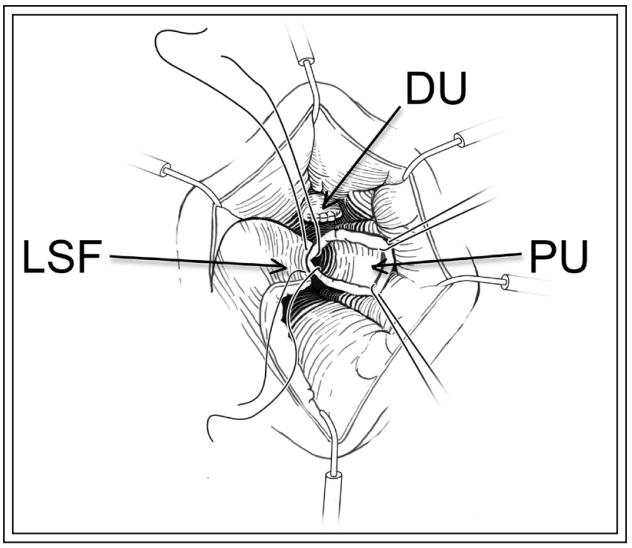

Figure 2. Diagram of the "7-flap" pull-down. The borders of the lateral perineal skin flap (LSF) represent a "7" shape that is utilized for perineal urethrostomy creation. After a midline incision is made, a full thickness LSF is advanced to the laterally incised apex of the proximal urethral segment (PU). The distal urethral stump (DU) is oversewn with absorbable suture. (LSF = lateral perineal skin flap, PU = proximal urethra, DU = distal urethral stump).

The squared right lateral side of the "7", which forms the perineal skin flap, is incised and developed with adequate thickness and rotated medially and proximally toward the bladder. The right lateral incision of the "7" can be lengthened toward the anus to enable tension-free reapproximation to a deeper proximal urethral edge. Interrupted 2-0 monocryl sutures are used to secure the skin flap to the right lateral urethrotomy, and then to mature the left lateral urethral stump to the left lateral perineal skin. Several more deep sutures are placed to close dead space and reduce tension. A 16-French Foley catheter is placed through the urethrostomy and into the bladder, and the procedure is concluded. Antibiotic ointment is applied at the suture lines, and gauze fluffs with a supportive undergarment are placed. The Foley catheter is removed one week postoperatively. Operative success was defined by the patients' ability to void spontaneously and free of obstructive symptoms without any additional postoperative instrumentation on follow up.

TABLE 1. **Preoperative characteristics and operative outcomes of patients undergoing 7-flap perineal urethrostomy**

"7-flap" perineal urethrostomy	**Number of patients n = 22 (%)**
Preoperative characteristic	
Obese (BMI ≥ 30)	10 (45)
Elderly (age ≥ 65)	6 (27)
Both	4 (18)
Neither	2 (9)
Stricture etiology	
Lichen sclerosis	9 (41)
Idiopathic with prior failed repair	3 (14)
Failed hypo- or epispadias repair	3 (14)
Infection	1 (4.5)
Catheter trauma	1 (4.5)
Other	5 (23)
Operative outcome	
Voiding spontaneously	21 (95)
Required postoperative instrumentation/reoperation	1 (5)

BMI = body mass index

Results

From 2009-2013, of 748 patients undergoing urethral reconstruction, 22 men (2.9%; mean age 61, range 31-80) underwent 23 7-flap procedures for advanced urethral stricture disease (mean follow up 32 months). The vast majority of patients (20/22, or 91%) were either elderly (age ≥ 65), obese (BMI ≥ 30), or both. The most frequently identified disease etiologies included lichen sclerosis (9/22, 41%) and prior failed urethral surgery for congenital anomaly or prior stricture (6/22, 27%), Table 1. Notably, none of the 22 patients had a history of radiation therapy.

Average EBL was 76 cc (range 30-200) while mean operative time was 108 minutes (range 52-214). All procedures were successful without intraoperative complications, and all patients were discharged home postoperatively without inpatient stay. Of the 22 patients who underwent 7-flap PU, 21/22 (95%) continue to void spontaneously without additional procedures. One morbidly obese patient (BMI 40) with a prior history of PU stricture failed and required reoperation with urethral scar excision and a repeat "7"-type perineal skin flap repair, which was successful. There were no significant differences between obese and non-obese patients in terms of EBL (80 cc versus 73 cc, p = 0.71), operative time (113 min versus 99 min, p = 0.38), or operative success (93% versus 100%, p = 0.46), thus indicating that the 7-flap technique is highly efficacious in this challenging group of patients, Figure 3.

Figure 3. Preoperative retrograde urethrogram of a 51-year-old patient, BMI 37, who had undergone multiple failed repairs for proximal hypospadias with buccal mucosal grafts. He underwent successful 7-flap perineal urethrostomy over 1 year ago and is now voiding spontaneously.

Discussion

Conventional approaches to PU

The traditional PU, originally described by Blandy[2] in 1968 is a well-reported scrotal flap technique that utilizes an inverted-U incision on the perineum to create a urethrocutaneous anastomosis. Barbagli recently reported a 70% success rate using a similar technique in a large, 30 year experience of 173 patients.[1] Despite its success in many patients, there are two important disadvantages of the conventional technique: 1) it requires the surgeon to estimate the length of skin needed to bridge the gap to the urethral stump before cutting skin, and 2) the flap itself cannot be easily lengthened intraoperatively in patients with a long skin-to-urethra distance or those with strictures that are more proximal than expected.[2]

Advantages of 7-flap PU

The 7-flap technique is now our standard procedure for definitive proximal urethral diversion. Our updated experience demonstrates that it offers an

TABLE 2. **Comparison of operative characteristics of non-obese and obese patients undergoing 7-flap perineal urethrostomy**

Intraoperative measures	Non obese (BMI < 30) n = 8 mean (range)	Obese (BMI ≥ 30) n = 14 mean (range)	p value
Stricture length (cm)	6.4 (2-15)	5.4 (1.5-10)	0.66
Estimated blood loss (mL)	72.5 (30-150)	80 (30-200)	0.71
Operative time (min)	99.1 (54-147)	113 (74-214)	0.38
Operative success	100%	92.9%	0.46

BMI = body mass index

optimal combination of flexibility and reliability. This remained true even in obese patients, Table 2, a population that has previously been shown to have a significantly higher rate of urethroplasty complications than non-obese patients.[10,11] Additionally, in cases begun with a vertical perineal incision for anticipated one-stage urethroplasty, the 7-flap can be employed if the surgeon decides intraoperatively that a primary repair is not likely to succeed and that urethral diversion (temporary or permanent) is needed. On the other hand, we have also had instances where intraoperative exposure of the stricture through the midline perineal approach caused us to change from the 7-flap technique to a standard one-stage technique.

Perhaps the greatest advantage afforded by using the 7-flap PU is the ability to customize the flap needed intraoperatively. The conventional "inverted-U" PU technique requires that the surgeon determine the length of flap prior to incision with extension of the height of the "U" being difficult anteriorly. The 7-flap is begun conservatively, but can be easily lengthened to the length of the perineal incision should more length be required. Despite a high number of patients with morbid obesity, we were able to bridge the gap between skin and incised urethral stump in all patients undergoing urethral diversion. In one complicated case (BMI 38), we employed a double "7-flap" with a "T" shaped perineal incision in order to bridge a particularly large skin-to-urethra distance without tension. The versatility offered by 7-flap PU prevents the need for more complex measures such as buccal mucosal grafting for previously-failed perineal urethrostomy.[12]

The tension-free nature of the repair also distinguishes 7-flap PU from conventional techniques; the crucial components of our procedure include distal bulbar urethral amputation with performance of a lateral urethrotomy. Amputation enables the surgeon to then shift focus toward proximal urethral mobilization, in order to limit the length of perineal flap needed. Division at the distal bulb allows for a generous proximal bulbar urethral flap that can be anastomosed to the perineal skin without tension. Once the urethra is fully mobilized, the right lateral urethra is then precisely opened to just the level that will allow easy passage of a 24 French bougie, indicating adequate urethral caliber at that level. It is important to note that during flap creation, a thick enough pedicle is necessary in order to preserve a cutaneous blood supply. Our technique obviates the need to bring a

TABLE 3. **Comparison of results of perineal urethrostomy series**

Study	Number of patients	Operative technique	Follow up, months (median, range)	Primary success rate (%)
Blandy 1971[14]	70	Traditional PU	NP (3-60)	89
Barbagli 200[91]	173	Traditional PU	62 (12-361)	70
Kulkarni 2009[15]	47	Traditional PU	52 (NP)	72
Myers 2012[13]	45	Traditional PU	31 (3-131)	83
Present series	22	7-Flap PU	30 (5-59)	95

NP = not provided; PU = perineal urethrostomy

bilateral perineal flap down to the level of a fixed urethral plate using difficult-to-place apical stitches.[13] However, our procedure does call for amputation of the bulbar urethra with distal urethral ligation which precludes the urethra to be tubularized in a 2nd stage procedure. The patient must be counseled regarding this important distinction prior to PU performance.

Use of this and other scrotal flap techniques remain a valuable adjunct for PU reconstruction of end-stage stricture patients. We have observed that scrotal tissues tend to remain healthy and useful even in hypospadias cripples and patients with extensive lichen sclerosis or urethral scarring. Although hair is often present on scrotal tissue, it tends to be sparse and well tolerated in the short, open lumen of the bulb. Our 95% success rate with 7-flap PU compares favorably with previously published rates ranging between 70%-89% in patients undergoing conventional PU, Table 3.[1,13-15]

We attribute the enduring success of this procedure to minimized perineal dissection, a surgeon-tailored flap size with urethral mobilization, and maximal preservation of the bulbar urethral blood supply.

Limitations

Despite our high rate of success, our study is limited by its retrospective design. Additionally, a direct comparison to conventional PU could not be performed since 7-flap PU was the standard technique performed at our institution. As none of our patients had a history of pelvic radiation, we were also unable to assess the feasibility of this procedure in such cases. Nevertheless, our updated, large experience with 7-flap PU demonstrates that it is a promising option with long term success, even in technically challenging patients.

Conclusions

The 7-flap PU is a simple, versatile, and highly effective option for urinary diversion in patients with complex urethral stricture disease. This technique has proven particularly valuable in obese patients whose anatomy may render traditional PU difficult, if not impossible.

Disclosures

Nathan R. Starke has no disclosures.
Jay Simhan has no disclosures.
Timothy N. Clinton has no disclosures.
Timothy J. Tausch has no disclosures.
J. Francis Scott has no disclosures.
Alexandra K. Klein has no disclosures.
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