

Original Article | **Experience with Penile Circular Fasciocutaneous Flap in the Treatment of Long Anterior Urethral Strictures**

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ABSTRACT

Objective: To evaluate our experience with penile circular fasciocutaneous flap urethroplasty for the repair of long penile and bulbar strictures.

Patients and Methods: Between February 2003 and April 2005, a total of 21 circumcised patients with a mean age of 39 (range 11 – 79) years underwent penile circular fasciocutaneous flap urethroplasty for urethral strictures involving the penile and bulbar tracts. The average stricture length was 7 cm. Follow-up included retrograde urethrography at 3 weeks, 3 months and 12 to 18 months, and thereafter when needed, and evaluation of the urinary flow. The mean follow-up was 25.6 months (range 7 to 44 months). The clinical outcome was defined as success when the patient had a good urinary stream, a post void residual urine <50 cc, a peak urinary flow speed >20 ml/sec, a normal and smooth caliber of the urethra as shown on retrograde urethrography and no urinary tract infection.

Results: Our initial success rate was 86% (18/21 patients). An immediate successful outcome was achieved in 15/21 (71%) patients. Three patients had an unsatisfactory urinary stream in the immediate post-operative period which resolved after a single dilation or optical urethrotomy. With a mean follow-up of 26 months 2 patients developed a stricture at the proximal site of the repaired urethra necessitating resection and re-anastomosis. One patient with lichen sclerosus developed recurrence of the stricture and was subjected to suprapubic cystostomy, then further staged reconstruction was done. Immediate post-operative complications were encountered in 4 patients in the form of secondary hemorrhage, ischemia and sloughing of the penile skin, urethrocutaneous fistula which closed spontaneously and a decreased sensation at the lower limb in one patient each.

Conclusion: Circular fasciocutaneous flap urethroplasty is a highly effective single-stage method of reconstructing long urethral strictures. It provides ample tissue for urethral substitution.

Keywords : Urethral stricture, flap, urethroplasty.

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INTRODUCTION

Urethral stricture disease due to trauma, iatrogenic injury, infection, inflammation and idiopathic causes requires surgical repair. Although an end-to-end anastomosis following resection of the diseased tissue is feasible for short, localized strictures, additional tissue is often necessary for longer segments¹.

Substitution urethroplasty is the mainstay of treatment for long and multiple urethral strictures. Free skin, a mucous membrane graft, and vascularized flaps from the genital area have been used for decades².

The optimal management of anterior urethral stricture that does not respond to en-

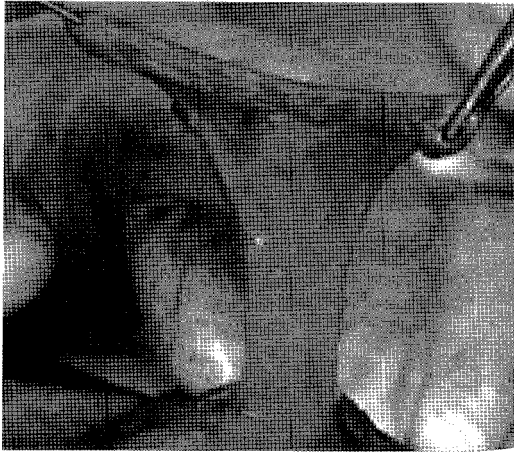


Fig. 1: Intraoperative photo showing the flap with its pedicle

doscopic urethrotomy or is found to be unsuitable for excision and anastomotic repair remains controversial. Genital skin island onlay flaps or buccal mucosal grafts are presently the most dependable single stage procedures used for strictures more than 3 cm in length³.

The penile circular fasciocutaneous flap method, which was first described by McAninch in 1993⁴, has become the gold standard for reconstructing complex urethral strictures⁵. A circumferential island of distal penile skin or foreskin is mobilized on a vascularized pedicle for urethral substitution. The distal penile skin is hairless, flexible and well-vascularized, and therefore full circumferential flap harvesting is possible with excellent post-operative cosmetic results, even in previously circumcised men.

We reviewed the application and outcome of circular fasciocutaneous flap urethroplasty in 21 patients at our institution.

PATIENTS AND METHODS

Between February 2003 and April 2005, 21 previously circumcised patients with a mean age of 39 years (range 11–79 years) presented to our department with long urethral strictures. They underwent substitution urethroplasty using a transverse penile fasciocutaneous

flap. The average stricture length was 7 cm. The urethral stricture was post-gonorrheal in one patient, catheter-related in 10, post-traumatic in 2 and idiopathic in 5 patients. In 2 patients it was due to failed hypospadias repair (perineal in 1 patient and penoscrotal in the other) and in one patient due to lichen sclerosis (Table 1).

Technique

The patients were first placed in the supine position. When necessary, they were placed in the high lithotomy position after flap harvesting to avoid compartment syndrome. A circumferential incision was done approximately 5 mm proximal to the corona. A flap width of 20 mm was needed to produce a final urethral lumen of approximately 26 F in the adult, while a flap width of 15 mm was obtained for reconstruction of the urethra in pediatric patients.

Superficial dissection was started by incising the thin dartos fascia superficial to the thick tunica dartos pedicle. The dartos fascia was elevated with the penile skin along the shaft of the penis, protecting the subdermal vascular plexus and preventing skin necrosis. The dorsal penile fasciocutaneous flap was elevated by starting dissection above the neurovascular complex and tunica albuginea which was exposed and preserved. Injury to the dorsal neurovascular bundles must be avoided to prevent hyperesthesia of the glans and distal foreskin. After complete elevation of the flap it was split in the mid-ventral plane. Thus, the circular configuration was converted into a longitudinal strip of skin, which was then rotated anticlockwise for transfer to the ventral surface of the penis. (Fig. 1)

Exploration of the penile urethra was done to detect the stricture segment. The urethra and corpus spongiosum were incised along the entire length of the stricture until a 28F bougie passed easily through the incised urethra into the bladder. A ventral incision of the strictured segment was done and the remnant of the fibrosed area was excised, leaving the remnant of the urethral mucosa

Table 1: Etiology of strictures in 21 patients

Etiology	No. of Patients	%
Post-gonorrhea	1	5%
Post-catheterization	10	48%
Idiopathic	5	24%
Hypospadias	2	9%
Posttraumatic	2	9%
Lichen sclerosus	1	5%
Total	21	100%

as a urethral plate. Then the flap was sutured by running, continuous, water-tight sutures. Urethral anastomosis was achieved using 5 or 6-zero monofilament polyglyconate along each flap edge. Spongioplasty was performed following urethral anastomosis. A 16F silicone Foley catheter was placed. Suprapubic cystostomy was performed.

For distal penile strictures previous penile degloving provided adequate urethral exposure, while in proximal repair the flap as well as the penis were passed through a scrotal tunnel to be exposed through the perineal incision (perineopenile approach). It is important to avoid twisting or placing excessive tension on the flap.

Most patients were discharged from hospital on the 8th post-operative day. The urethral catheter remained in place for 3 weeks. Peri-catheter retrograde dynamic urethrography was performed and when it showed good healing without extravasation the catheter was removed followed by clamping of the suprapubic cystostomy tube, and after the establishment of free voiding the suprapubic catheter was removed.

Follow-up included retrograde dynamic urethrography at 3 months, at 12 to 18 months and thereafter when needed. The urinary flow speed was recorded as reported subjectively by the patients and objectively by uroflowmetry. Clinical outcome was defined as success when there was a good stream, a post-void residual

urine <50 cc, a peak urinary flow speed >20 ml/sec, a normal and smooth caliber of the urethra on retrograde urethrography and absence of urinary tract infection. Failure was usually implied by recurrent obstructive voiding symptoms, such as decreased force of the stream, dysuria and incomplete emptying as confirmed by retrograde urethrography leading to the necessity for more than one post-operative procedure such as dilation, internal optical urethrotomy or repeat open urethroplasty.

RESULTS

The operative time ranged from 100 to 280 (mean 198.6) minutes. In 15 cases the post-operative as well as the follow-up periods were uneventful. Table 2 shows the success and complication rates. Hospitalization ranged from 10 to 21 days (mean 14 days). Twelve patients (those who needed combined penile degloving and a perineopenile approach) needed a single unit of blood transfusion. The mean follow-up was 26 (range 7 to 44) months.

In 15/21 patients (71%) the post-operative period was uneventful. In the immediate post-operative period, 3 patients developed difficulty in voiding with unsatisfactory results on uroflowmetry and were treated successfully by dilation in 2 and optical urethrotomy in one patient. Thus, the initial success rate was 86% (18/21). With a mean follow-up of 26 months 2 patients

Table 2: Results of operations

Results	No. of Patients	%
Initial Success	15	71%
Total success	18	86%
Complications:	4	19%
- Necrosis of penile skin	1	
- Fistula	1	
- Hemorrhage	1	
- Nerve compression	1	

developed stricture at the proximal site of the repaired urethra, necessitating resection and re-anastomosis; they fared well post-operatively. The patient with lichen sclerosus developed recurrence of the stricture and was subjected to suprapubic cystostomy; then further staged reconstruction was done. Thus, the medium-term success (mean follow-up of 26 months) was 71% (15/21). Complications were encountered in 4 patients: secondary hemorrhage occurred in one case and was managed conservatively. Necrosis of the penile skin proximal to the flap developed in one patient. A urethrocutaneous fistula seen in one patient healed spontaneously. Decreased sensation in the lower limb occurred in one patient and resolved after 5 days.

DISCUSSION

Our results are comparable with the results of McAninch⁶ who introduced this technique and achieved a 79% initial success and 95% long-term success. His initial success for onlay repair was 87% (47/54 cases), for tubularized repair 50% (7/14 cases). Our initial success was 71% which may be attributed to the small number of patients and the relatively short stricture segment (7 cm in our series compared to 9 cm in the series of McAninch). A second factor which might have had an influence on our more positive initial result is the fact that McAninch used a transverse penile circular fasciocutaneous flap as a tube which carries a high complica-

tion rate of recurrent stricture. In our series we did not use it as a tube, but as a patch only with preservation of the urethral plate. Comparing our initial result to that of McAninch with respect to onlay repair, his result is superior. Patients with complete obliteration of the urethral lumen, where preservation of the urethral plate was not possible, were excluded from this study and were subjected to a staged operation.

We obtained good early results by preserving the urethral plate in 15 patients with long, dense or multiple strictures of the anterior urethra.

Recurrence of the stricture may be attributed to graft failure at the distal anastomosis, where the corpus spongiosum is less vascular, due to poor graft bed vascularity⁷. On the other hand, graft failure at the proximal anastomosis is probably attributable to disease understaging during surgery⁸. Moreover, the proximal anastomosis is deep in the bulb and technically it is a more difficult site in which to ensure epithelium-to-urothelium placement⁷.

In the series of McAninch many recurrences seem to have developed within the scrotal portion of the urethra, and so it is critical to emphasize adequate exposure and accurate suture placement in this area. When the proximal part of the stricture was deep under the scrotum in our patients, we used the

perineopenile approach where we approached the degloved penis and the flap through the perineal incision and did the anastomosis in a wider field.

Circular fasciocutaneous flap urethroplasty is ideal for long strictures in the distal urethra, where the decreased substance of the corpus spongiosum may jeopardize graft viability. Pre-operative sonourethrography allows accurate stricture measurement, which has proved valuable for guiding procedure selection⁹. A major advantage of the circular fasciocutaneous penile skin flap is its versatility, since it can be used in all areas of the urethra, from the membranous area to the meatus. The flap may also be divided between 2 disparate stenotic areas.

Dissection as well as the creation of the flap must be very meticulous to avoid necrosis of the penile skin proximal to the flap which may occur when the vascular supply of the subdermal plexus is compromised. Although this problem is the most notorious complication on the first post-operative day, it usually passes without sequelae, and creeping of the penile skin will occur and healing by secondary intent will be the ultimate result.

Dissection of the pedicle of the flap should be complete up to the root of the penis to avoid tethering or angulation of the penis and to give the flap adequate length.

To prevent pseudo-diverticulum formation we rarely use penile skin flaps of more than 20 mm width when performing onlay reconstruction. The combined flap plus urethral plate circumference targeted is approximately 26F in adults. When the urethral plate is preserved, a smooth contour is usually shown on post-operative radiography with a flap of 18 to 20 mm width. Hematoma, which may result from the open corpus spongiosum on

either side of the urethral anastomosis, may be prevented by closing the spongiosum with a running absorbable suture. A perineal Jackson-Pratt drain is often helpful.

Based on our experience we conclude that the transverse penile fasciocutaneous flap technique is a good alternative for reconstruction of the urethra in patients with long urethral strictures. The technique can be used not only in patients with an intact prepuce, but also in circumcised patients. Given the complexity of the problem, this procedure should be performed by experienced surgeons to achieve satisfactory final results.

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