Distal penile fasciocutaneous flap for stricture disease of anterior urethra

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ABSTRACT
Objectives: To develop curative treatment for complex stricture disease involving anterior urethra.
Materials and Methods: Twenty patients with a median age of 35 years with history of repeated optical internal urethrotomies >5 underwent surgery. Stricture site and length were evaluated by Retrograde and Antegrade urethrogram. Stricture calibration was done by retrograde ureteric catheter insertion of variable sizes. Onlay or tubular was flap applied over partial or blind stricture respectively ranging from 5cm to 15cm.
Results: The period of follow up was 24 months. Complications like patchy necrosis of penile skin (3) external meatal stenosis (2), Fistula (1) stricture at anastomotic site (1) and post void dribbling (5) were noted. The patient’s quality of life improved following surgery.
Conclusion: Distal penile fasciocutaneous flap is an effective tool for recurrent stricture disease involving anterior urethra.

Key words: fasciocutaneous flap (FCF), optical internal urethrotomy, retrograde, antegrade, urethrogram.

INTRODUCTION
Complex anterior urethral strictures are challenging cases even for the experienced urologist. Stricture disease causes great suffering to the affected person because of its recurrent nature. Direct perineal trauma, urethral catheterization, urethral instrumentation and sexually transmitted diseases commonly lead to stricture formation. Some cases may be idiopathic, like straddle injury in childhood, forgotten later on in adulthood1. However urethral stricture if left untreated may lead to voiding dysfunction, urinary tract infection, bladder thickening, bladder diverticulum, urethral diverticulum and urinary fistula.

The distal penile circular fasciocutaneous flap technique of urethroplasty was first reported in 1993 by McAninch2. Short bulbar stricture may be cured with a single optical internal urethrotomy. In those patients where optical internal urethrotomy fails, end-to-end anastomotic urethroplasty is highly successful when stricture length is <2 cm. There is no general consensus on the management of long complex stricture involving the anterior urethra. However, one-stage repair is preferred over the traditional management, of two-stage repair. With the advancement in tissue transfer technique, free grafts made of skin or mucosa and pedicled flaps or combined approaches are practiced today.

We used distal penile FCF technique because of its advantages. It is close to the urethra, hairless and reliable, and stricture lengths of up to 15 cm can be managed. The main advantage is that the operation involves only one area and there is no second wound involving other part of the body like mouth in case of oral mucosal graft. This technique is also suitable for previously circumcised men. Here we present our experience with 20 patients in whom FCF technique was used for radical treatment of stricture disease involving the anterior urethra.
MATERIALS AND METHODS
A series of 20 male patients, with the age range of 12 years to 50 years, circumcised and uncircumcised, were included in the study. The patients with diseased prepuce skin like lichen sclerosus (Balanitis xerotica obliterans) and history of hypospadias surgery were excluded from our study.

The patients were evaluated using relevant history and focused physical examination to assess the number of surgical procedures done in the past and the availability of healthy penile skin. Stricture site and length were evaluated by antegrade and retrograde urethrogram. Urethral stricture was considered blind when it did not allow 3 Fr. ureteric catheters to pass during cystourethroscopy. Distal penile fasciocutaneous onlay or tubular flaps were applied over partial or blind strictures respectively ranging from 5 to 15 cm in length.

Neourethra made over silicon catheter was selected according to patient’s age. Corrugated drain was removed the next day and the silicon catheter removed on 20th post-operative day. The patients were followed up every three month for two years. Clinical evaluation was undertaken through questions about the caliber and force of stream and radiological by urethrogram. Urethroscopy was also performed where indicated.

RESULTS
Twenty patients were included in the study. Their ages ranged from 12 to 50 years, with a mean age 35 years. The peak age incidence of 85 % (17/20) was between 20 to 45 years.

Among the 20 patients, 18 were with partial strictures and two were with blind strictures. All patients had undergone repeated internal urethrotomies (> 5 times) in the past and one patient had also received end-to-end bulbar urethral anastomosis.

18 patients were with strictures involving the penile part of the urethra and 2 were with strictures at bulbar level. Eighteen strictures involving penile part of the urethra ranged 8-15 cm in length while two strictures involving the bulbar part of urethra were 5 cm in length.

The onlay flap was applied in 18 patients with partial strictures while the tubularized flap was prepared and applied in two patients with blind strictures. The duration of surgery was 2-3 hours. The post-operative period was uneventful. The catheter was removed on 20th post-operative day. The patients were able to void satisfactorily and were followed up for three month for 2 years. Three patients developed patchy necrosis of penile skin on 6th post-operative day which healed with dressing only. Two patients developed external meatal stenosis that responded to dilatation and one patient developed a fistula that healed with catheterization. One developed stricture at anastomotic site, and required optical internal urethrotomy. Five patients complained of post-void dribbling. In one patient with tubularized flap, ischemia was observed. Apart from these complications, all patients were voiding satisfactorily with adequate caliber and force of stream. The final success rate of our study was 95% at the end of two years, with one optical internal urethrotomy.(Figures 1 & 2)

DISCUSSION
Treatment of stricture disease of urethra is among the oldest medical practices. It is reported that in approximately 600 BC Indians and Egyptians used wood, papyrus, feathers and metals as urethral dilators or as hollow stents to overcome urinary obstruction. Even now the treatment of complicated and extensive urethral stricture disease is a challenging task and tests the skill of the urological surgeon.

Even at present there is no widely accepted, standard approach for repair of long and complicated stricture disease of anterior urethra. With the advancement in tissue mobilization techniques, a variety
We preferred the distal penile fasciocutaneous flap because it is hairless, of tissues such as full thickness penile skin pedicled flaps, penile skin grafts, scrotal skin flaps, and bladder, buccal colonic and lingual mucosal grafts have been used for urethral reconstruction. However, no single technique or single tissue is appropriate for all cases. The ideal characteristics of tissue used for reconstruction urethroplasty include the following:

1. Simple, safe
2. Reliable, reproducible
3. Causesless morbidity to the donor site
4. Vascularity is adequate
5. Physical characteristics of flap/graft compatible with recipient site.

We preferred the distal penile fasciocutaneous flap because it is hairless,

Table 1. Complications of Fasciocutaneous Flap

<table>
<thead>
<tr>
<th>Complications</th>
<th>No. of Patients</th>
<th>Total Patients</th>
<th>% Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patchy necrosis</td>
<td>3</td>
<td>20</td>
<td>(3/20) 15</td>
</tr>
<tr>
<td>Ext. Meatal stenosis</td>
<td>2</td>
<td>20</td>
<td>(2/20) 10</td>
</tr>
<tr>
<td>Fistula</td>
<td>1</td>
<td>20</td>
<td>(1/20) 5</td>
</tr>
<tr>
<td>Stricture at anastomotic site</td>
<td>1</td>
<td>20</td>
<td>(1/20) 5</td>
</tr>
<tr>
<td>Requiring urethrotomy</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post void dribbling</td>
<td>5</td>
<td>20</td>
<td>(5/20) 25</td>
</tr>
<tr>
<td>Tubularized Flap Ischemia</td>
<td>1</td>
<td>20</td>
<td>(1/20) 5</td>
</tr>
</tbody>
</table>

Table 2. Different kind of etiologies in complicated strictures

<table>
<thead>
<tr>
<th>Etiology of Strictures</th>
<th>No. of Patients</th>
<th>Total no. of Patients</th>
<th>% Age</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trauma RTA</td>
<td>2</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>Instrumentation</td>
<td>11</td>
<td>20</td>
<td>55</td>
</tr>
<tr>
<td>Idiopathic</td>
<td>2</td>
<td>20</td>
<td>10</td>
</tr>
<tr>
<td>Infection</td>
<td>1</td>
<td>20</td>
<td>5</td>
</tr>
<tr>
<td>Catheterization</td>
<td>4</td>
<td>20</td>
<td>20</td>
</tr>
</tbody>
</table>

Figure 1. Ascending urethrogram revealing complicated stricture involving anterior urethra

Figure 2. Ascending urethrogram after fasciocutaneous flap application
character leads to post-graft contracture and stricture formation. In contrast to free genital skin graft, flaps do not develop contracture due to their continued blood supply. In our two years of follow up we did not observe flap deterioration leading to stricture formation. In only one case, stricture at the site of union of flap end with normal urethra – anastomotic site – was observed.

The complications reported in the literature are different from our observations. Olajide et al. described the commonest complication as infection: wound infection (9.1%), urosepsis (3.6%) and epididymoorchitis in (8.1%). They also reported recurrence of stricture in 1.8% requiring substitution urethroplasty, fistula in 3/55 (which closed spontaneously on conservative therapy) and urethral diverticulum in 3/55. However, the overall success rate was 93%.

Zaki M. reported scrotal oedema(3/30), infection (2/30), transient neuropathy (1/30), flap ischemia (1/30), fistula (1/30), chordee(2/30) and stricture recurrence (1/30). However, the success rate in his series was 94.4% which included a single urethrotomy.

When compared to our series the minor complications are almost similar but we have not encountered infective complications or transient neuropathy. Moreover, the average duration of surgery in our series was 160 minutes. It is worth mentioning that surgery is performed in lithotomy position. There is a higher chance for the development of neuropathy if the lithotomy position is prolonged up to 4-5 hours.

Reliable, durable causing less morbidity to donor site, and having adequate blood supply. It can be prepared with a length of 5 to 15 cm according to the stricture involving the anterior urethra extending from external urinary meatus upto the membranous urethra. Jill Buckley and Jack McAninch described similar characteristics of penile fasciocutaneous flap in their experience.

Free genital skin grafts can also be used for short strictures > 5 cm but their deterioration over time leading to progressive fibrosis is a major disadvantage. The pedicled flap has its superiority because of its continuous blood supply and the rarity of reports of deterioration over time leading to stricture formation.

In other series oral mucosa and even Tunica albuginea had been used for pan-urethral strictures, with the authors claiming comparable success, but we have reservations regarding other urethroplasty approaches.

Oral mucosa graft urethroplasty is the current reference standard for short strictures > 5 cm, although long term studies are lacking. In long strictures, extensive graft harvesting from both cheeks as well as the lower lip is required, leading to bleeding and post operative morbidity. However, oral graft harvesting of any size is not without complications. In one series, 50% of the patients had donor site pain worse than expected, 26% had perioral numbness lasting longer than six months and 9% of the patients had permanent changes in mouth opening.

Moreover, increased age of patient, poor oral hygiene, long term tobacco use, leukoplakia and dental prosthesis are presumed contraindications for oral mucosa graft.

Penile fasciocutaneous flap technique is used for all types of strictures especially for long strictures > 5 cm, the only important contraindication being lichen sclerosis. Plastic surgeons involved in oral mucosal grafting accept that skin is easy to harvest but its keratinized
Moreover, our long experience in hypospadias surgery contributed to the short learning curve and the limited operative time. It may also explain why we did not observe injuries related to the lithotomy position like peripheral nerve injury or thromboembolic events. It may also explain why we did not encounter infective complications. It has been reported that penile skin flap urethroplasty has the highest post-operative incidence of sexual dysfunction when compared to primary urethral anastomosis and buccal mucosal grafting. It was attributed to extensive fibrosis in periurethral tissues and extensive genital dissection.

In our series and after two years of follow up, we have not observed such an incidence of sexual dysfunction. Christian et al. also reported that sexual function was preserved in all his cases. We are of the view that the best results of fasciocutaneous flaps are obtained when they are used as onlay reconstruction, as has also been reported in other series. Post-void dribbling was observed in 25% of the cases, which is comparable to other series. However, some degree of post-void dribbling may occur after any kind of substitution urethroplasty. Even other patients also complain of this problem. It may be attributed due to the lack of appropriate flap width leading to redundancy and sacculation. However, further experience in this field may decrease the occurrence of this bothersome complication.

Despite all the success, with results up to 95%, substitution urethroplasty is a delicate and prolonged procedure, associated with complications. It is necessary to develop some medicine to prevent stricture formation and experimental work is underway on animal models.

CONCLUSION
Distal penile fasciocutaneous flap is a straightforward procedure in skilled hands. It can be used for any length of stricture but is optimal for those longer than 5 cm or for multiple anterior urethral strictures. The application of onlay reconstruction is preferable to tubularized flap whenever possible. Non-hirsute nature, predictable blood supply, adequate mobility, acceptable donor site cosmesis and preservation of sexual function are the main characteristics of penile fasciocutaneous flap. We advocate distal penile fasciocutaneous flap technique as an important and effective tool for radical treatment of stricture disease of anterior urethra where extensive spongiofibrosis is associated.

REFERENCES
1. Waxman SW, Morey AF. Management of urethral strictures. The lancet 2006 Apr 29;367(9520):1379-80