The use of penile fasciocutaneous island flaps in the repair of complex anterior urethral strictures in Kumasi, Ghana

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Purpose: To evaluate the stricture characteristics of patients undergoing single-stage penile fasciocutaneous island flap ventral onlay urethroplasty and the surgery outcomes.

Methods: A prospective, cross-sectional study of all patients undergoing penile fasciocutaneous island flap ventral onlay urethroplasty for complex anterior urethral strictures at the Komfo Anokye Teaching Hospital between December 2011 and December 2018. A database of stricture characteristics, postoperative complications and outcome of repair was kept prospectively for all patients. Patients were reviewed at three, six, and twelve months postoperatively and yearly thereafter. A successful outcome was a peak flow rate > 15 ml/s, a patent urethra on retrograde urethrogram (RUG), restoration of a normal stream of urine with at most one attempt at urethral calibration or internal urethrotomy postoperatively. Data was entered into SPSS 17.0 for analysis.

Results: Forty-seven patients were operated on over the study period. The median age was 48.0 years (range: 2.5–82 years) and mean stricture length was 6.3 ± 3.8 cm. The majority (25; 53.2%) of patients had strictures involving both the penile and bulbar urethra. Catheterisation was the aetiology in 36 (76.6%) of the strictures, whilst urethritis was the cause in nine (19.1%). The average duration of surgery was 149.2 minutes and the overall success rate at first surgery was 85.1%. There were eight (17.0%) cases of wound haematoma, six (12.8%) of surgical site infections and two (4.3%) of urethrocutaneous fistula. Three patients (6.4%) had urethral diverticulum and seven (14.9%) had stricture recurrence.

Conclusion: Single-stage penile fasciocutaneous ventral onlay flap urethroplasty for complex anterior urethral strictures is appropriate in selected cases with a high success rate.

Keywords: anterior urethral strictures, penile fasciocutaneous flaps, ventral onlay urethroplasty, single-stage urethroplasty, complex urethral strictures

Introduction

Managing urethral strictures entails numerous treatment options such as dilation, direct vision internal urethrotomy (DVIU) and reconstructive surgical procedures.[1]

The use of flaps or grafts is required in patients with longer and complex anterior urethral strictures.[1,2] Staged urethroplasty which is also an option of treatment in such cases is associated with increased morbidity, financial burden, and problems with psychosocial adjustment.[3]

Complex anterior urethral strictures have been defined widely to include bulbar strictures not amenable to resection and primary anastomosis and those involving the penile urethra.[4]

Penile skin flaps were the transplanted tissue of choice for complex anterior urethral strictures until the 1990s when buccal mucosa grafts became popular.[5] Despite this shift, the penile fasciocutaneous flap (FCF) still retains its usefulness in situations of compromised blood supply in the graft bed, such as occurs in dense spongiofibrosis from recurrent strictures.[6,7] Thus, the technique is a viable alternative to buccal mucosa grafts as a first-line treatment for complex anterior urethral strictures.

Penile FCF harvested from the distal penile skin is the gold standard for flap urethroplasty. It has the advantages of being hairless, long flap length, highly vascularised pedicle, and it is applicable even in the circumcised male with outstanding cosmetic outcomes.[8] Circular fasciocutaneous penile flap[9] and the Q flap[10] hold greater advantages over the longitudinally designed Orandi flap, in that they are consistently hairless and approximation of the skin edges is simple.

The reported incidence of complications of adult penile fasciocutaneous flap urethroplasty ranges from 8–20%.[11] Such complications include penile oedema, haematoma formation, wound infection, urethrocutaneous fistula, penile skin necrosis, urethral diverticulum and stricture recurrence.[12-14]

The objective of this study was to evaluate the stricture characteristics of patients undergoing single-stage penile fasciocutaneous island flap ventral onlay urethroplasty and the outcomes of the surgery at the Komfo Anokye Teaching Hospital, Ghana.

Materials and methods

Study type

This was a prospective, cross sectional hospital-based study of all patients undergoing penile fasciocutaneous island flap ventral onlay urethroplasty for complex anterior urethral strictures at the Komfo Anokye Teaching Hospital by a single surgeon. The study involved 47 male patients who were operated on between December 2011 and December 2018.

Preoperative evaluation

Preoperative evaluation included history taking, physical examination, laboratory investigations such as full blood count, blood urea and creatinine, urinalysis, urine culture and sensitivity. Imaging studies performed included retrograde urethrogram (RUG) and voiding cystourethrogram (VCUG) when necessary. Preoperative uroflowmetry and urethrocystoscopy were not performed routinely.

Any urinary tract infection diagnosed was treated before surgery. All patients had suprapubic urinary diversion whilst awaiting surgery and they were all undergoing urethroplasty for the first time.

Inclusion criteria

1. Patients with any length of partial stricture involving the penile urethra.

2. Patients with long (> 3 cm) partial bulbar urethral strictures not amenable to excision and primary anastomotic urethroplasty.

Exclusion criteria

1. Patients with multiple urethral strictures requiring other urethroplasty techniques beside FCF urethroplasty.

2. Patients with complete obliterative urethral strictures.

3. Patients with pelvic fracture associated urethral injury (PFUI).

Surgical procedure

Patient positioning was supine for penile urethral strictures and lithotomy for bulbar urethral strictures. For peno-bulbar urethral strictures, the lithotomy position was preferred. All the surgeries were done under spinal anaesthesia.

The method described by Jack McAninch[9] to harvest the distal circular penile skin flaps (Figure 1) was used. The penis was degloved and a stricturotomy incision starting from the immediately patent distal urethra over 14fr urethral catheter was made taking care not to go outside the urethral mucosa (Figure 2). Scrotal transposition of the flap was done in cases of bulbar strictures (Figure 3) and in cases of concomitant penile and bulbar strictures, the penis was invaginated through the perineal wound. This allowed the strictures to be dealt with in continuity similar to the method described by Kulkarni et al.[15] (Figure 4).

The flap was then sutured to one side of the urethral plate, turned over and sutured to the contralateral edge of the urethra over the urethral catheter (Figures 5 and 6). 5/0 vicryl sutures in continuous and watertight fashion were used in suturing the flap to the urethral plate.
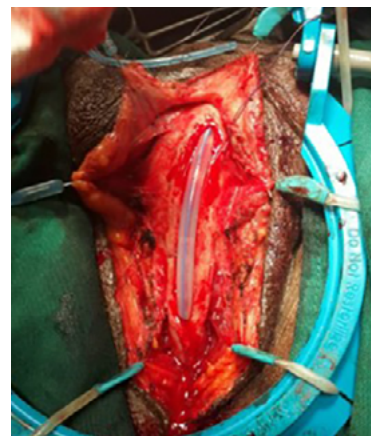

Figure 1: Circumcising incisions 20 mm apart

Figure 2: Stricturotomy over a catheter to lay open the urethral plate
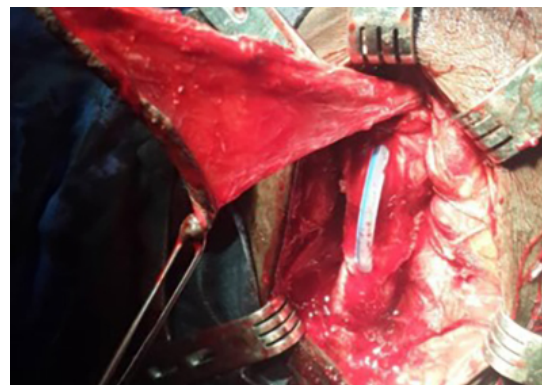

Figure 3: Scrotal transposition of the flap

Figure 4: Invagination of the penis via the perineal wound in concomitant bulbar and penile urethral strictures
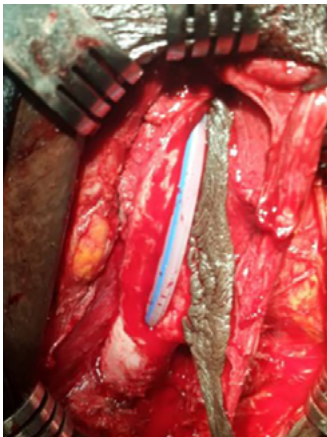
Figure 5: Suturing the flap to one edge of the urethral plate

Figure 6: Flap turned over and being sutured to the contralateral edge over the catheter

Postoperative management

The urethral catheter was left in situ for six weeks with continuous bladder drainage through the suprapubic catheter. Antibiotic cover was given in the postoperative period. Patients were reviewed at three, six and twelve months postoperatively at the clinic and yearly thereafter telephonically.

Evaluation of outcomes

A successful outcome was defined as peak flow rate > 15 ml/s, a patent urethra on RUG, patient satisfaction with urine stream or restoration of normal stream of urine with at most one attempt at urethral calibration or internal urethrotomy postoperatively.

Statistical analysis

Demographic and clinical data were extracted from the main urology database. Data was exported from Epidata 3.1 version to PASW Statistics for Windows, Version 18.0. Chicago and SPSS Inc. for final analysis.

Basic statistical methods were used to calculate proportions, means and corresponding standard deviations on variables such as patients' age, stricture characteristics, and outcome of surgery. Discrete variables were analysed by means of frequencies and tables.

Informed consent and ethical approval

Informed consent was obtained from all patients prior to recruitment into the study. The surgical procedure as well as its benefits and complications were explained to them in a language they could understand. They were also offered the right to refuse or withdraw from the study and assured that their decision not to participate in the study was not going to affect the provision of health care to them. All patients who participated in the study signed informed consent after the researchers had provided responses to all their concerns.

Results

Demographics

Forty-seven patients met the inclusion criteria and were operated on during the study period. The median age was 48.0 years (range: 2.5–82 years) and the majority (40.4%) were 40–59 years old. Four (8.5%) were less than 20 years old, 14 (29.8%) were between 20–39 years old, nine (19.1%) were between 60–79 years old and one (2.1%) was above 80 years old.

Stricture characteristics

The mean stricture length was 6.3 ± 3.8 cm. The majority (25; 53.2%) of patients had strictures involving both the penile and bulbar urethra followed by stenosis of the fossa navicularis (10; 21.3%) as shown in Table I. There was one (2.1%) patient with four separate strictures, five (10.6%) with three strictures and the majority (23; 48.9%) had two separate strictures as shown in Table I. Catheterisation caused 36 (76.6%) of the strictures, whilst urethritis was the cause in nine (19.1%) of the strictures. Urethral trauma and radiation therapy caused one (2.1%) stricture each (Table I). The average duration of surgery was 149.2 minutes (range: 40–383 minutes) and the average period of follow-up was 58.6 months (range: 18–108 months).

Outcome

The overall success rate at first surgery was 85.1%. This rose to 93.6% after secondary repairs in four patients whose repair failed at first attempt. Secondary procedures included DVIU in two patients and diverticulectomy in the other two.

There were eight (17.0%) cases of wound haematoma, six (12.8%) of surgical site infections, two (4.3%) of urethrocutaneous fistula, one of glans dehiscence and one patient had penile shortening and

Table I: Aetiology, location and number of strictures

Characteristic	Frequency (%) *n* = 47
Aetiology	
Catheter-related	36 (76.6)
Urethritis	9 (19.1)
Trauma	1 (2.1)
Radiotherapy	1 (2.1)
Total	47 (100)
Location of stricture	
Bulbar	3 (6.4)
Fossa navicularis	10 (21.3)
Penile	9 (19.1)
Peno-bulbar	25 (53.2)
Total	47 (100)
Number of strictures	
1	18 (38.3)
2	23 (48.9)
3	5 (10.6)
4	1 (2.1)
Total	47 (100)

chordee. Three patients (6.4%) had urethral diverticulum and seven (14.9%) had recurrence of their stricture disease. There was no case of penile torsion.

Discussion

In this study, the median age was 48.0 years and the highest incidence of urethral stricture occurred between 20–59 years representing 70.2% of the study population. The relatively young age of patients with urethral stricture disease is consistent with the trend in West Africa.[3,16,17] Catheterisation (76.6%) was the commonest aetiology of urethral strictures in this study followed by urethritis (19.2%) (Table I). Catheterisation was mostly for surgery or as part of the management of critically ill patients. Although urethritis is the commonest cause of urethral strictures in the sub-region, this was a study of only patients with complex anterior urethral strictures which normally do not result from the infective causes. Urethritis is known to cause focal urethral strictures as compared to complex multifocal strictures in this particular subset of patients.[17-20]

The patients with catheter-associated urethral strictures had no history of urethritis and had worn a latex urethral catheter or had traumatic urethral catheterisation within one year of presentation. This suggests either poor quality of the catheter material used, or inappropriate urethral catheterisation technique.

More than half (53.4%) of the patients had extensive anterior urethral stricture disease involving both the penile and bulbar urethra (Table I). Most of the patients (61.6%) had multiple strictures (Table I). This is probably because most of these strictures were catheter-related. Catheter-related strictures are notorious for their multifocal nature as was observed by Lumen et al.[21] This was also the case in the urethral stricture epidemics of the early 1980s from siliconised latex catheters post open-heart surgeries.[21-23]

Buccal mucosal grafts may have many advantages over penile skin leading to their widespread use in recent years. They are readily available and easily harvested and have a rich submucosal vascular plexus that facilitates good take. In addition, buccal mucosa is nonhirsute and, unlike penile skin, has an epithelial surface that is naturally well-suited to a wet environment. Penile skin flaps on the other hand, are also nonhirsute, have reliable axial vascular supply, and can be well mobilised to cover long urethral defects. Hence, the relatively long length (mean = 6.3 ± 3.8 cm) influenced the decision to use penile skin flaps for repair.

All the patients in this study had ventral onlay flap urethroplasty which is the traditional approach. However, in recent times, a dorsal approach is being favoured to reduce the incidence of complications such as sagging, sacculation and diverticulum formation[24] which is attributable to the lack of mechanical support for the flap.[25]

The circular penile FCF urethroplasty has good and long-lasting success in the treatment of complex anterior urethral strictures.[26] The long-term stricture-free survival rates have been reported to be 84% and 79% at five and ten years respectively.[27] In this study, at a mean follow-up of 58.6 months (range: 18–108 months), the overall success rate at first surgery was 85.1%, rising to 93.6% after secondary procedures in four patients whose repair failed at first

attempt. Secondary procedures included DVIU in two patients and diverticulectomy in the other two.

Conclusion

Single-stage penile fasciocutaneous ventral onlay flap urethroplasty for complex anterior urethral strictures is appropriate in selected cases with a high success rate in our environment and reduces the morbidity associated with staged urethroplasty.

Limitations of the study

The success rate of penile fasciocutaneous flap urethroplasty has been shown to deteriorate with time. This being a short to medium term study will require further follow-up to establish its durability in the long term.

Conflict of interest

The authors declare that they have no competing interests.

Funding source

None.

Ethical approval

Written informed consent was obtained from the patients for publication of these cases and the accompanying images.
Permission was also granted by the Research and Development Unit of the Komfo Anokye Teaching Hospital (KATH IRB/AP/021/22) for this study.

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