

A retrospective analysis of delayed complications of urethroplasty at a tertiary care centre

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Abstract Urethroplasty is commonly performed worldwide by reconstructive urologists and such a large scale practice is often faced with numerous complications, yet “complication based analysis” still persists as a gray area. Our study aims to provide an evaluation of long-term post-urethroplasty complications, after the five commonly practiced procedures, at our centre. 302 male patients with urethral strictures due to various etiologies were assessed preoperatively via retrograde urethrogram, urethrosonogram, and uroflowmetry. They were then subjected to different urethroplasty techniques viz. tunica albuginea urethroplasty (TAU), U-shaped prostatico-bulbar anastomosis (USPBA), dorsal buccal mucosa graft urethroplasty, skin substitution urethroplasty and Dartos flap urethroplasty. Postoperatively, patients were assessed at regular intervals, regarding the occurrence of complications. The overall complication rate was 21% at 5 years follow-up, with the majority during the initial 2 years. Infection and restenosis were the major long-term complications (12%). Maximum complications were seen in patients, who underwent TAU and USPBA simultaneously followed by Dartos flap urethroplasty and minimum were seen with TAU. In conclusion, a meticulous post-urethroplasty follow-up reveals a wide range of long-term complications. The complication rate differs in accordance with the etiology, site and length of stricture as well as the reconstructive technique.

Keywords Urethroplasty · Delayed complications · Complication-based analysis

Introduction

Urethral stricture disease is a condition better discussed and least suffered. Numerous treatment modalities, ranging from dilatations, internal urethrotomies to open urethroplasties have been advocated for this complex entity. However, the results have not matched the sustained efforts in this regard. Despite the multi-modality approach, numerous studies have clearly acknowledged that urethroplasty forms the backbone to optimize the results for this vexing condition [1, 2].

Such a large scale practice of urethroplasties is often faced with numerous complications; yet, there have not been extensive studies and “complication based analysis” still persists as a gray area in this regard. Man-made barriers in the form of anatomical division of the urethra into anterior and posterior segments, stricture heterogeneity with respect to the site and etiology as well as the varied reconstructive techniques in vogue and the patient characteristics, such as age and associated co-morbidities, form the major limitations for this analysis.

Our study attempts to bridge this gap of knowledge, by presenting an evaluation of post-urethroplasty complications, as encountered on a long-term follow-up after the five commonly practiced procedures, at our centre.

Materials and methods

The study was a retrospective analysis, carried out over a period of 10 years from 1999 to 2009. A total of 302 male

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patients of stricture urethra with various etiologies, having undergone 314 single-staged urethroplasties were included. Those patients with congenital and recurrent strictures or those managed without surgical reconstruction were excluded from the study.

A detailed preoperative assessment included careful history-taking and physical examination; followed by stricture evaluation via retrograde urethrogram, urethrosoundogram, and uroflowmetry.

If any patient had chronic retention of urine or complete outflow obstruction not amenable to per urethral drainage (a single attempt), a urinary diversion in the form of suprapubic cystostomy, was done, for a minimum of 6 weeks.

Complex cases included the combined strictures of both the anterior and posterior urethra and the posterior urethral strictures with false passages resulting from multiple attempts of urethral instrumentation before the patients were referred to our centre.

These patients were subjected to different surgical techniques based on the data collected from the above-mentioned investigations by taking into consideration the most appropriate procedure, considering the site of stricture as well as the degree of luminal narrowing and peri-urethral fibrosis, as obtained from these studies [3–6]. In case of any disagreement, the decision taken by RKM was considered final. The list of procedures included 95 tunica albuginea urethroplasty (as a tubularized segment) (TAU), 108 U-shaped prostato-bulbar anastomosis (USPBA), 40 dorsal buccal mucosa graft urethroplasty (DBMG), 28 skin substitution urethroplasty (SSU) and 31 dartos flap urethroplasty (skin dartos flap repair) (DFU). 12 patients with both anterior and posterior strictures were subjected to TAU and USPBA simultaneously [3–6].

All patients received antibiotics both pre and post operatively (based on their urine cultures or as per our institutional protocol), so that they were free of urinary tract infection (UTI) on the day of operation. Irrespective of the type of procedure, all surgeries were performed by the same surgeon (RKM). Standard techniques for

urethroplasty were followed, including meticulous tissue handling, water tight closure and careful high lithotomy position.

Post-urethroplasty, a per-urethral silicon catheter was kept for 3 weeks in case of simple strictures and for 6 weeks in complex strictures.

Before discharge, all patients were subjected to sonourethrography and uroflowmetric examination. Patients were then scheduled for regular follow-ups at every 3 months for the first 6 months, at every 6 months between 0.5 and 2 years and then annually thereafter. At the first appointment, all patients underwent a retrograde urethrogram, and investigations on subsequent follow-up visits were individualized based on the symptoms. Retrograde urethrograms were repeated only for those patients who were symptomatic or falling in the fair/poor groups, as per our result assessment criteria. Besides these regular follow-ups, all were also instructed to report immediately as and when required at the appearance of any bothersome symptom in the postoperative period.

At every postoperative visit, leading questions were put forth to patients regarding the appearance of any complication.

Success was gauged-based on our result assessment criteria, with good and fair results considered as successful (Table 1) [3–6].

Results

Most of our patients were young with a mean age of 35.5 years (range 15–65 years). Mean duration of follow-up was 64 months (range 18–92 months). Patient attrition is a well-recognized entity as regards long-term follow-up and we were not exempt from it but we had sufficient data (82% patients) at the end of 5 years to substantiate our study.

Of all the etiologies encountered, traumatic strictures were the most numerous, accounting for 54% of all cases, followed by 27% iatrogenic (post-instrumentation and catheterization), 15% infective and 4% idiopathic.

Table 1 Postoperative result assessment criteria

	Good	Fair	Poor
Retrograde urethrogram	Good caliber	Partial narrowing at stricture site	Persistent stricture
Urethrosoundogram	Patent and distensible lumen	Patent lumen with decreased distensibility	Stricture present
Uroflowmetry (ml/s)	$Q_{\max} > 20$	Q_{\max} 15–20	$Q_{\max} < 15$
Patient satisfaction	Satisfactory voiding, no instrumentation needed	Satisfactory voiding, but required few dilatations	Not satisfied, not voiding or voiding with thin stream, need multiple dilatations or repeat surgery

Table 2 Complications based on etiology

S. no.	Complication (etiology)	UTI (7%)	Restenosis (5%)	Impotence (2%)	Incontinence (2.5%)	UCF (urethrocutaneous fistula) (1%)	Wound dehiscence (2.5%)	Ejaculatory problems (1%)	Chordee (2%)
1.	Pelvic trauma (16.5%)	6 (3.6%)	6 (3.6%)	3 (1.8%)	5 (3%)	1 (0.6%)	4 (2.4%)	1 (0.6%)	2 (1.2%)
2.	Post-instrumentation (29.5%)	1 (5.8%)	1 (5.8%)	0	1 (5.8%)	0	0	1 (5.8%)	1 (5.8%)
3.	Post-catheterization (25%)	6 (9.3%)	4 (6.2%)	1 (1.5%)	1 (1.5%)	1 (1.5%)	1 (1.5%)	1 (1.5%)	2 (3%)
4.	Infection (34%)	7 (15.2%)	3 (6.5%)	1 (2%)	1 (2%)	1 (2%)	2 (4.3%)	0	1 (2%)
5.	Unknown (1.6%)	1 (8.3%)	0	0	0	0	1 (8.3%)	0	0

Although the most common stricture location was the membranous urethra (35%), the bulbar (30%) and penile (27.5%) urethrae were equally affected and 7.5% patients had multiple urethral strictures.

Average stricture length measured intraoperatively was 3.2 cm, ranging from 2.5 to 12.5 cm, while strictures shorter than 2 cm were infrequent.

An overall 21% complication rate was encountered at 5 years of follow-up; however, more significantly, majority of these were experienced during the initial 2 years. Infection and restenosis were the major long-term complications, constituting 12% of the entirety of the spectrum.

Evaluation of complications based on the primary etiology (Table 2) showed a favorable outcome for post-

traumatic strictures, with a 16.5% complication rate, as compared to a 34% rate for infective etiology.

Complications when correlated with the length of stricture showed a directly proportional increase in complication rates with increasing stricture length (Fig. 1). Stricture-site-based complication analysis showed a high complication rate for multiple strictures followed closely by bulbar and penobulbar junction (PBJ) strictures as shown in Table 3.

Maximum complications were seen in patients who underwent TAU and USPBA simultaneously (41.5%) followed by Dartos flap urethroplasty (skin dartos flap repair) (35.5%) and minimum complications were seen with TAU (14.7%).

Post-procedural complications are depicted in Table 4.

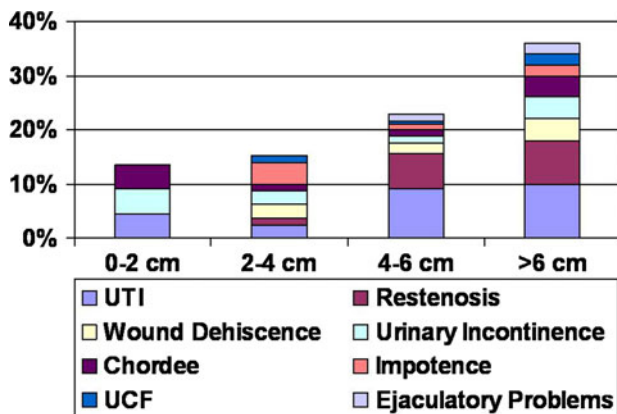


Fig. 1 Complications related to stricture length

Table 3 Complications based on stricture site

S. no.	Complication (site of stricture)	Infection (7%)	Restenosis (5%)	Impotence (2%)	Incontinence (2.5%)	UCF (1%)	Wound dehiscence (2.5%)	Ejaculatory problems (1%)	Chordee (2%)
1.	Penile (21%)	6 (8%)	4 (5%)	1 (1.5%)	1 (1.5%)	0	1 (1.5%)	1 (1.5%)	2 (1.5%)
2.	Bulbar + PBJ (26.5%)	9 (10%)	5 (4%)	2 (2.4%)	2 (2.4%)	1 (1.2%)	2 (2.4%)	1 (1.2%)	2 (2.4%)
3.	Membranous (18.5%)	6 (5%)	5 (4%)	2 (1.7%)	3 (2.5%)	1 (0.8%)	3 (2.5%)	1 (0.8%)	1 (0.8%)
4.	Multiple (39%)	1 (5%)	1 (5%)	1 (5%)	1 (5%)	1 (5%)	1 (5%)	0	1 (5%)

Discussion

Urethral stricture remains a complex and perplexing problem as regards the management and morbidity despite vast improvements in radiological imaging as well as surgical expertise. Every surgical procedure has its own specific set of complications. However, urethroplasty should be given special importance as its complications present vividly, as regards the type of complication as well as timing of presentation. One can enumerate a long list of post-urethroplasty complications, but most specific and significant complications of this surgery usually have a delayed presentation [7].

Table 4 Urethroplasty procedure based complications

S. no.	Complication (procedure)	Infection (7%)	Restenosis (5%)	Impotence (2%)	Incontinence (2.5%)	UCF (1%)	Wound dehiscence (2.5%)	Ejaculatory problems (1%)	Chordee (2%)
1.	TAU (14.7%)	5 (5.2%)	3 (3.2%)	1 (1%)	2 (2%)	1 (1%)	1 (1%)	0	1 (1%)
2.	USPBA (19.5%)	6 (5.5%)	4 (3.7%)	3 (2.7%)	2 (1.8%)	1 (1%)	2 (1.8%)	1 (1%)	2 (1.8%)
3.	SSU (32%)	3 (10.7%)	2 (7%)	1 (3.5%)	1 (3.5%)	0	1 (3.5%)	0	1 (3.5%)
4.	Buccal mucosa (22.5%)	4 (10%)	3 (7.5%)	0	1 (2.3%)	0	1 (2.3%)	0	0
5.	Dartos flap (35.5%)	3 (10%)	2 (6.5%)	1 (3.2%)	1 (3.2%)	1 (3.2%)	1 (3.2%)	1 (3.2%)	1 (3.2%)
6.	TAU + USPBA (41.5%)	1 (8.3%)	1 (8.3%)	0	0	0	1 (8.3%)	1 (8.3%)	1 (8.3%)

Although numerous studies have been published regarding post-urethroplasty complications, they have all been typecast in relation to the specific surgical procedure or the urethral segment affected.

Mangera et al. [8] in their systematic study have reported the outcomes of various techniques for graft augmentation urethroplasty for anterior urethral strictures, but this too is a site-specific study.

Complications in relation to the major stricture etiologies gave the key to a critical appraisal of the surgical approach and eventual outcome of urethral strictures.

Numerous studies support the occurrence of complications after urethral injury following a pelvic fracture, due to the injury itself rather than the surgical technique [9–11], laying the onus on the root cause—the etiology. We encountered complications in 28 patients with post-traumatic strictures, viz. infection, restenosis, impotence, incontinence, urethrocutaneous fistulae, wound dehiscence, chordee and ejaculatory disturbances, with rates acceptable in comparison to other studies [12–15].

Infection and restenosis were the most frequent complications encountered by us, more so in the case of post-catheterization strictures, whereas impotence, incontinence, urethrocutaneous fistulae, wound dehiscence and ejaculatory disturbances were seen in the odd case.

Nevertheless, adequate and strict indications for urinary catheterization, skilled urethral catheter insertion and consideration of suprapubic catheter placement whenever prolonged catheterization is anticipated, should decrease the incidence of these iatrogenic strictures, which often tend to be multifocal or panurethral [16], and thus more difficult to treat.

A high rate of infection (15.2%) and restenosis (6.52%) was seen in the follow-up of inflammatory strictures, correlating with other similar studies [13]. None of the patients, however, faced any ejaculatory problems.

Stricture length and site are important parameters guiding the reconstructive urologist in the selection of the most appropriate surgical technique. However, the importance of these entities becomes exacerbated when compared with the postoperative outcome in terms of the

severity as well as number of encountered complications. Our study clearly depicted a directly proportional relationship between the initial stricture length and the post-urethroplasty complications, whereas the maximum complications were encountered in the cases of strictures at multiple sites.

Over the years, with the enhancement of surgical expertise, a wide variety of reconstructive techniques have been enunciated and practiced worldwide, with varying degrees of success as well as postoperative complications.

End-to-end anastomosis is an excellent, safe and successful technique for the strictures of the bulbar urethra of 2 cm or less [17]. End-to-end anastomosis of penile strictures or bulbar strictures of more than 3 cm may lead to shortening of the urethra and penile curvature at erection [18]. So they are treated by substitution urethroplasty using vascularized genital skin or free grafts. Adequate mobilization and tension-free spatulated anastomosis are mandatory for a successful repair. Spatulation is important in overcoming any narrowing that may occur at the repair site. The lowest re-stricture rate and the lowest complication rate are achieved with anastomotic urethroplasty [19–21]. USPBA is advantageous over others owing to the fact that the procedure markedly decreases the chance of restenosis and impotence in patients of posterior urethral stricture [4, 6]. In this technique, a complete “O”-shaped ring anastomosis is avoided, which may be a cause of stenosis, as well as sutures from 2 to 10’ o’clock positions. By avoiding too many sutures, chances of restenosis are reduced and also by avoiding sutures from 2 to 10 o’clock, the chances of injury to neurovascular bundles at 1 and 11 o’clock positions are significantly minimized, implying a less chance of impotence and restenosis [4, 6].

Substitution urethroplasty can be performed using either vascularized genital skin or free graft. Flaps are considered to be more reliable because they have their own blood supply. The comprehensive description of penile microcirculation by Quartey led to the dominance of flaps in 1980s and early 1990s [22–24]. This seemed theoretical since current studies could not establish superiority of flaps over grafts in terms of re-stricture rate [25]. The dissection

was extensive and redeployment of dartos tended to cause penile deforming and scarring. With the advent of buccal mucosa, there was a renaissance of the graft in urethral reconstruction.

Buccal mucosa remains an ideal graft because it has a thick mucosa and thin strong lamina propria, is elastic, and is well vascularized [26] and is ideal when sufficient preputial skin is not available. In fact, Dubey et al. [27] have shown that flaps have similar success rates, but a higher complication rate than grafts.

For choosing a well-tailored substitution urethroplasty technique, three decisive factors must be considered: type of the flap, vascular supply of the flap, and the transfer mechanism of the flap [28]. Complications of the substitution urethroplasty increase in the long run and anastomotic repair is preferred if feasible [29].

The reconstruction of anterior urethral strictures by using locally available tissue like tunica albuginea in a single-stage procedure, is a frequently performed procedure at our centre. Owing to similar histological composition and orientation of fibers of the tunica albuginea of the corpora cavernosa and corpus spongiosum, this procedure becomes easy to perform, and more feasible for long strictures with low complication rate [17, 30].

We do acknowledge that ours may not be a totally ideal study and moreover, being a single centre experience, larger and longer term, multicentre studies are needed to outline the overall complications of urethroplasty, for a wider spectra of procedures, in different stricture settings.

Conclusion

A meticulous post-urethroplasty follow-up reveals the presence of wide range of complications in the long term. Serious complications albeit similar to those reported elsewhere were encountered, their numbers differing in accordance with the etiology, site and length of stricture as well the reconstructive technique.

Thus, a thorough evaluation of impact of urethroplasty procedures must necessarily incorporate these parameters.

Conflict of interest None.

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