



Original Article

## An Audit of Management of Male Urethral Stricture and Its Outcome at A Tertiary Care Hospital in Eastern India: A Retrospective Study

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### ABSTRACT

**Background:** Urethral stricture is a common disease affecting mankind since the evolution. It leads to obstructive voiding symptoms. The management of male urethral stricture is one of the oldest problems known to urology. There are various modalities of management ranging from simple dilatation, directly visualized internal urethrotomy, resection and primary end to end anastomosis and single stage or multiple staged urethroplasties with local flap or various grafts. We report an audit of surgical management of urethral stricture in adult males in our institution.

**Methods:** This study was performed in our institution from January 2023 to March 2025. Patients were managed either by simple dilatation, DVIU, resection and end to end anastomosis and single stage or multiple staged urethroplasties with local flap or various grafts. Preoperative, operative and postoperative follow-up data were evaluated.

**Results:** A total number of 106 patients with mean age 38.6 years were included in this study. Mean stricture length, as measured by preoperative ASU was 6.3 cm (range 0.8-15 cm). Location of strictures were penile, penobulbar, bulbar, panurethral, and bulbomembranous in 16(15.1%), 14(13.2%), 36(40%), 29(27.4%), and 11(10.4%) cases respectively. Traumatic, inflammatory, iatrogenic and idiopathic causes are 30(28.3%), 29(27.4%), 24(22.6%) and 23(21.7%) cases respectively. Most common presentation was poor urinary stream. In this study, total of the 30 cases of traumatic strictures, 19 remained in the bulbar region (anterior urethra) and remaining 11 were associated with pelvic fracture urethral distraction defect at bulbomembranous junction. 19 (17.9%) with traumatic anterior urethral stricture underwent either excision and primary end to end anastomosis (EPA) urethroplasty or buccal mucosal graft urethroplasty (BMGU). 11 (10.4%) with pelvic fracture urethral injury (PFUI) underwent progressive perineal urethroplasty with excision and primary end to end anastomosis (EPA). 17(16%) patients of non-obliterative short segment bulbar urethral stricture ( $\leq 1.5$ -2 cm) was managed with directly visualized optical internal urethrotomy (DVIU). 29 patients with inflammatory urethral stricture involving pan anterior urethra underwent either Kulkarni's urethroplasty or staged procedure. 24 patients with iatrogenic urethral stricture underwent either excision and primary end to end anastomosis or augmented anastomotic urethroplasty. 23 patients with idiopathic stricture underwent Barbagli's Dorsal onlay urethroplasty or staged procedure. In our study 59 patients had long segment penile, penobulbar or panurethral stricture. 46 patients among them underwent single stage buccal mucosal graft urethroplasty (BMGU), thirteen 13 patients underwent staged urethroplasty.

**Conclusions:** Urethral stricture is debilitating disease affecting quality of life and reconstruction of urethra continues to be challenging for the reconstructive surgeon. The treatment option of urethral stricture disease depends on various factors like etiology, location, length, density of the stricture (spongiofibrosis) and the presence of local adverse factors. The goal of treatment of urethral stricture should be to provide sufficient permanent patency of the urethra to void urine without difficulties.

Single stage reconstruction urethroplasty is preferable than staged procedure if not otherwise contraindicated.

**Keywords:** Urethral stricture, buccal mucosal graft, urethroplasty, complications.

## INTRODUCTION

Urethral stricture disease is one of the most common urological problems in male worldwide specially in underdeveloped countries. Urethral strictures are fibrotic narrowing composed of dense collagen and fibroblast. These narrowing hinders urine flow and if severe and persist for prolonged period without correction results in backward pressure and dilatation of both upper and lower urinary tracts that ultimately leads to dilatation of proximal urethra, prostatic ducts, decompensation of the ureterovesical junction, reflux, hydronephrosis and deterioration of renal function or renal failure. Acute or chronic prostatitis is a common complication of urethral stricture. The bladder muscle may become hypertrophic, and increased residual urine may be noted. A decrease in urinary stream is the most common complaint. Spraying or double stream, post void dribbling, urinary frequency and mild dysuria may also be initial complaints. Induration in the area of stricture may be palpable. Periurethral abscess and urethrocutaneous fistula may also present. The bladder may be palpable or overflow incontinence is present if there is a chronic retention of urine. It has an incidence rate as high as 0.6% in some susceptible populations<sup>1</sup>. Urethral stricture disease with varied etiologies is common among men<sup>2</sup>. Meta-analysis of the literature has shown that most anterior strictures are iatrogenic (33%), idiopathic (33%), and to a lesser extent, trauma (19%) and inflammation (15%)<sup>3</sup>. Management of anterior urethral strictures poses a continuing urological challenge. The treatment option of urethral stricture disease depends on various factors like etiology, location, length, depth and density of the stricture (spongiofibrosis), multiplicity, proximity to sphincteric mechanism and the presence of local adverse factors. The goal of treatment of urethral stricture is to provide sufficient permanent patency of the urethra to void urine without difficulties. There are many treatment options for short anterior urethral stricture ( $\leq 2$  cm), ranging from simple urethral dilatation, directly visualized optical internal urethrotomy, excision of stricture segment and primary end to end anastomosis (EPA). Long segment anterior urethral strictures that are not suited for end-to-end anastomosis (EPA) managed by single stage with graft or local flap and staged urethroplasty. Although augmented anastomotic urethroplasty recently gives good results for these types of strictures, the material for reconstruction (flap or graft) and location the urethral surface (ventral or dorsal) has become continuous issue<sup>4-6</sup>. Long segment anterior urethral stricture that required substitution urethroplasty uses penile skin flap, split and full thickness skin graft that can be harvested from scrotum, penis, extragenital sites, tunica vaginalis, bladder mucosa, colonic mucosa, buccal mucosa or lingual mucosa depending upon availability, feasibility, presence or absence of balanitis xerotica obliterans, and surgeon preference or expertise etc.

Buccal mucosa graft (BMG) becomes an ideal urethral substitute because it contains no hair, flexible, easy to harvest, resistance to infection, compatibility with a wet environment, thick epithelium with a thin but well-vascularized lamina propria, allowing easy inosculation and survival. Buccal mucosal graft (BMG) also offers an inherent resistance to BXO.

We performed this study to retrospectively review the spectrum of anterior urethral stricture. We also reviewed the management options, efficacy and complications associated with each procedure performed.

## MATERIALS AND METHODS

This retrospective study was conducted in the department of Urology, R G Kar Medical college, Kolkata, India, after taking clearance from institutional ethics committee. This study was performed from January 2023 to March 2025. All patients who underwent operative management for urethral stricture disease during this period were included in this study except those are mentioned in exclusion criteria. Preoperative evaluation in all patients included detailed history documenting international prostate symptom score (IPSS), prior operative intervention, history of extra-marital sexual exposure, recurrent urinary tract infection, urethral discharge, trauma and history of any acute or chronic urinary tract obstruction leading to suprapubic cystostomy. In physical examination, we looked for circumcised status, any surgical scar, health of preputial skin and oral mucosa. Urinalysis, complete hemogram, coagulation profile, serology, blood biochemistry, renal function test, other routine investigations, ultrasonography of KUBP region along with post-voided residual, ascending urethrography (ASU), micturating cystourethrography (MCU), urethroscopy, uroflowmetry (specially Q-max) and in some cases sonourethrogram when indicated are done.

### Exclusion criteria

Patients with severe co-morbidity, uncorrected coagulation profile, pediatric age group, and complex urethral stricture particularly malignant urethral stricture, urethrocutaneous and rectourethral fistula.

An intraoperative urethroscopy (retrograde± antegrade) was performed with rigid/flexible cystoscope or semirigid ureteroscope to access the stricture characteristics (length, condition of urethra, any obliterative lumen). Non obliterative (guide wire passed) short segment bulbar urethral stricture ( $\leq 1.5$ -2 cm) was treated with directly visualized optical internal urethrotomy (DVIU). Patients with short segment post traumatic urethral stricture ( $\leq 2$  cm) managed with excision of stricture segment and primary end to end anastomotic urethroplasty (EPA). Patients with long segment bulbar urethral

stricture treated by dorsal onlay buccal mucosal graft urethroplasty (BMGU) as described by Kulkarni or Barbagli dorsal onlay BMGU. Patients with long segment penile and panurethral stricture underwent either single stage BMGU or Johansson staged urethroplasty <sup>7</sup>. In first stage strictured part of the urethra was laid open and urethral margin sutured with skin margin. After 6 months second stage urethroplasty was performed with dorsal inlay BMG. In single stage reconstruction for penile or panurethral strictures options are Kulkarni's technique dorsal onlay BMGU or Barbagli's dorsal onlay BMGU. In all urethroplasty cases 16 fr silicon catheter was inserted through the urethra into the urinary bladder. Intraoperative parameters studied were operative time and blood loss. The patient was ambulated on the first post operative day and first dressing done at 48 hours and was discharged from the hospital after 3-5 days of surgery with catheter. All patients received broad spectrum antibiotics (injectable) from 1 hour before induction of anesthesia and were kept on oral antibiotics till removal of catheter. All patients had been advised to report for any wound related complications. The catheter was left in situ for 3 weeks. After 3 weeks, retrograde peri-catheter urethrography was carried out and when no extravasation was found urethral catheter was removed. In case of extravasation per urethral catheter was kept one week more. All patients were followed at 3 monthly intervals for 1 year and then 6 monthly for 2 years and then annually. At each visit, patients were assessed for symptoms, urine culture and sensitivity, ultrasound to assess post void residual urine and uroflowmetry. The average follow up period of the study population was 18 months. Symptomatic patients with recorded poor maximum urinary flow rate ( $Q_{\max} < 15$  ml/s) and plateau curve in uroflowmetry during follow up underwent ASU+MCU and urethroscopy. Patients with redevelopment of stricture that required any surgical intervention was considered as failure.

#### Statistical analysis

Data related to preoperative parameters, surgical procedure and postoperative follow-up were processed and analyzed using SPSS (Statistical Package for Social Sciences) software. We used unpaired t-test to detect the difference between the intervention arms. The categorical data were analyzed by Fisher's test. The p value  $< 0.05$  was considered significant.

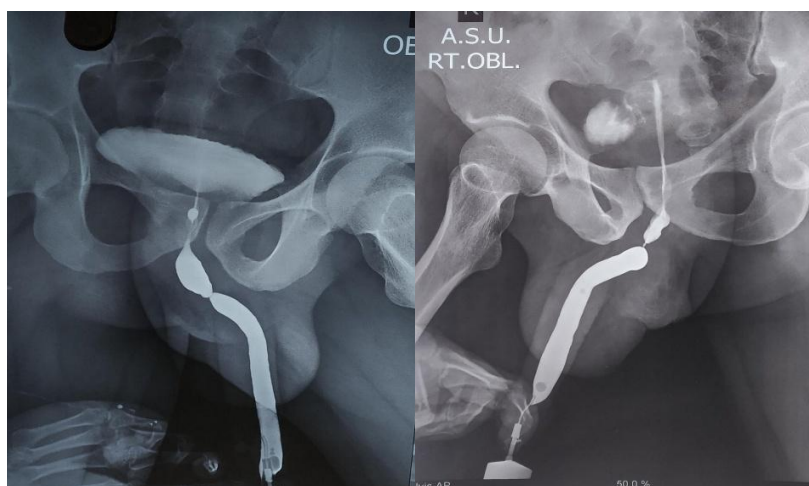


Figure 1

Figure 2

**Figure 1:** ASU showing small less than 5 mm proximal bulbar urethral stricture treated by DVIU.

**Figure 2:** ASU showing less than 1 cm tight stricture in proximal bulbar urethra treated with excision and primary end to end anastomosis.





Figure 3

Figure 4

Figure 5

Figure 3: ASU showing 2 cm distal bulbar urethral stricture treated with dorsal onlay buccal mucosal urethroplasty.

Figure 4: ASU showing pan anterior urethral stricture treated with staged urethroplasty

Figure 5: Johansson stage one urethroplasty with laid opened urethra and no. 16 all silicon catheter

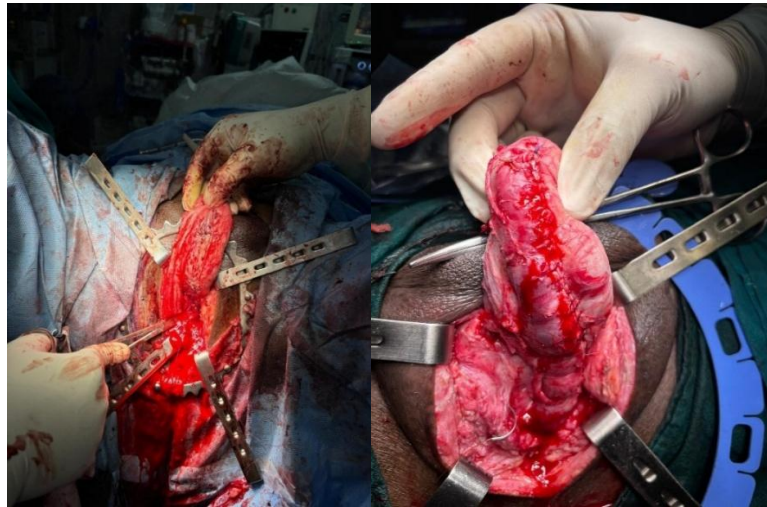


Figure 6

Figure 7

Figure 6: Dorsolaterally placed onlay BMG graft in Kulkarni's technique.

Figure 7: After tubularization in Kulkarni's technique

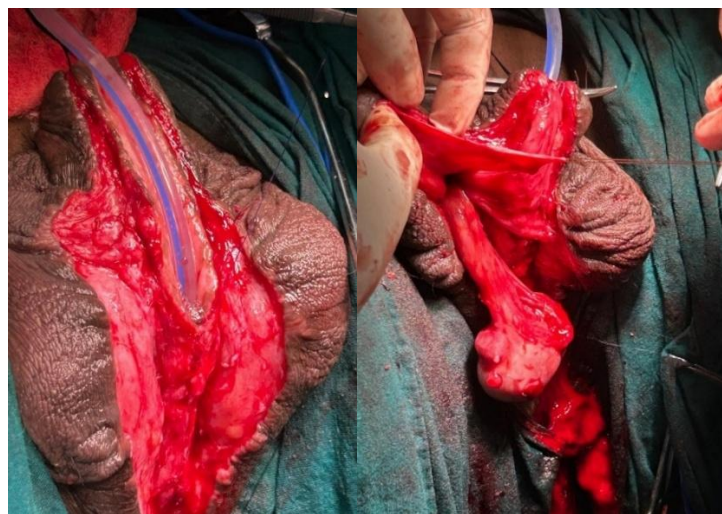


Figure 8

Figure 9

Figure 8: Tubularization begins in second stage urethroplasty after first stage BMG graft placement.

Figure 9: Placement of tunica vaginalis flap after tubularisation in second stage urethroplasty.

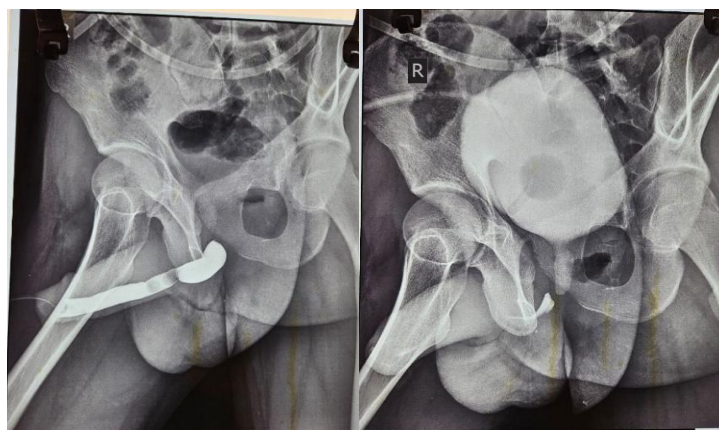


Figure 10

Figure 11

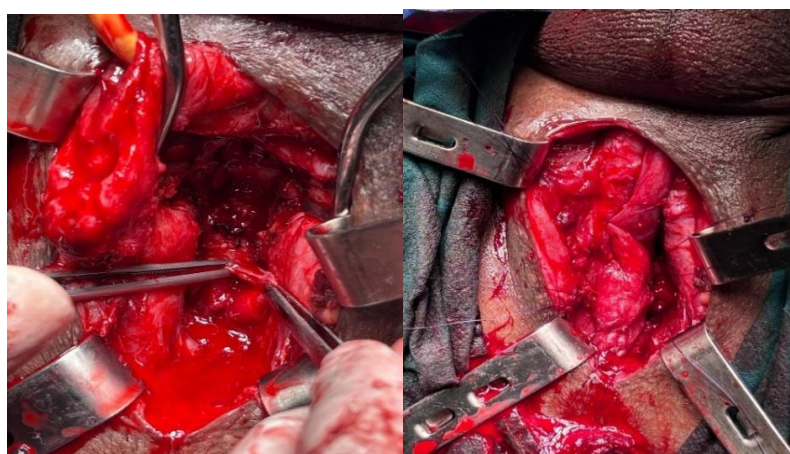


Figure 12

Figure 13

Figure 10,11,12 and 13: showing pelvic fracture urethral distraction defect treated with anastomotic urethroplasty.

## RESULTS

A total number of 106 patients with mean age 38.6 years (range 26 to 67 years) were included in this study. Patients in the age group of 40-59 years were most commonly affected by urethral stricture (53 patients, 50%) (Table 1). Mean stricture length, as measured by preoperative ASU was 6.3 cm (range 0.8-15 cm). Location of strictures were penile, penobulbar, bulbar, panurethral, and bulbomembranous in 16(15.1%), 14(13.2%), 36(40%), 29(27.4%), and 11(10.4%) cases respectively. Traumatic, inflammatory, iatrogenic and idiopathic causes are 30(28.3%), 29(27.4%), 24(22.6%) and 23(21.7%) cases respectively. Most common presentation was poor urinary stream. In this study, total of the 30 cases of traumatic strictures, 19 remained in the bulbar region (anterior urethra) and remaining 11 were associated with pelvic fracture urethral distraction defect at bulbomembranous junction. Nineteen patients 19 (17.9%) with traumatic anterior urethral stricture underwent either excision and primary end to end anastomosis (EPA) urethroplasty or buccal mucosal graft urethroplasty (BMGU). Eleven patients 11 (10.4%) with pelvic fracture urethral injury (PFUI) underwent progressive perineal urethroplasty with excision and primary end to end anastomosis (EPA). Seventeen 17(16%) patients of non - obliterative short segment bulbar urethral stricture ( $\leq 1.5$ -2 cm) was managed with directly visualized optical internal urethrotomy (DVIU). Twenty-nine (29) patients with inflammatory urethral stricture involving pan anterior urethra underwent either Kulkarni's urethroplasty or staged procedure. Twenty-four (24) patients with iatrogenic urethral stricture underwent either excision and primary end to end anastomosis or augmented anastomotic urethroplasty. Twenty-three (23) patients with idiopathic stricture underwent Barbagli's Dorsal onlay urethroplasty or staged procedure. In our study fifty-nine 59 patients had long segment penile, penobulbar or panurethral stricture. Forty-six 46 patients among them underwent single stage buccal mucosal graft urethroplasty (BMGU), thirteen 13 patients underwent staged urethroplasty.

During post operative period twelve patients (11.3%) developed mild wound infection, managed successfully with the change in antibiotics as per culture sensitivity report and dressings. Five patients (5%) developed urethrocuteaneous fistula and managed conservatively. No patients developed diverticulum, sacculation formation, urinary incontinence, erectile dysfunction and lower extremity injury. Graft harvesting site complications: all patients experienced mild post-operative pain managed by good analgesia. Facial swelling was reported five (11%) patients but no patients experienced damage to stenson's duct. Lip paresthesia developed four (9%) patients and two (4%) patients reported restriction in mouth opening but resolved within one month post operatively. No patients needed blood transfusion.

**Table 1: Etiology of urethral stricture according to the age group (n= 106). Values are presented as number (%).**

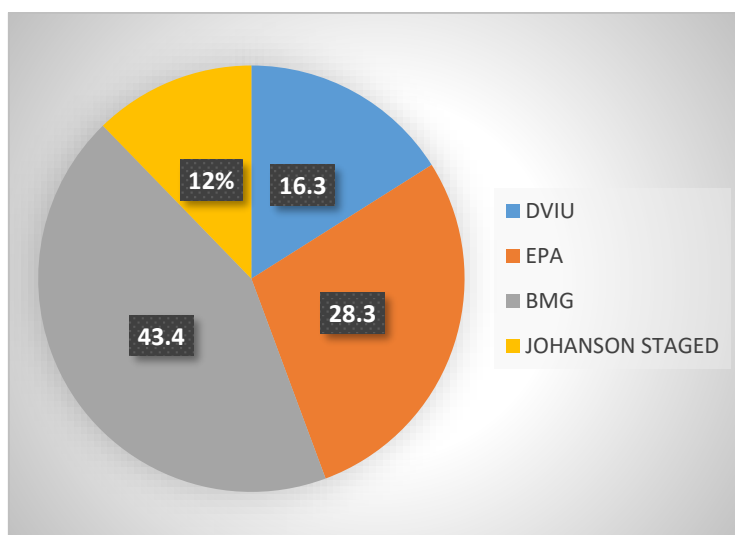
Age group(years)	Total number of cases (n=106)	Etiology of urethral stricture			
		Traumatic (n=30)	Inflammatory (n=29)	Iatrogenic (n=24)	Idiopathic (n=23)
20-39	35(33)	11(31.4)	9(25.7)	8(22.9)	7(20)
40-59	53(50)	17(32.1)	14(26.4)	11(20.8)	11(20.8)
60-79	18(17)	2(11.1)	6(33.3)	5(27.8)	5(27.8)
	106(100)	30(28.3)	29(27.4)	24(22.6)	23(21.7)

**Table2: Location and length of stricture**

Location of stricture	Length of stricture(cm)	Number of patients(n=106)
Penobulbar (PB)	4-9 cm	14(13.2%)
Panurethral (PU)	8-15 cm	29(27.3%)
Bulbar (B)	0.8-7 cm	36(40%)
Penile (P)	5-8 cm	16(15.1%)
Bulbomembranous (BM)	2-6 cm	11(10.4%)

**Table 3: Procedures undertaken to correct urethral strictures**

Procedure	Total no of cases(%)
DVIU	17(16%)
EPA	30(28.3%)
BMG	46(43.4%)
JOHANSON STAGED	13(12.3%)

**Figure 14: showing different modalities of treatment given in urethral stricture disease in this study**

## DISCUSSION

The term 'Urethral stricture' is specially used for narrowing or obliteration of lumen of anterior urethra due to scarring of urothelium and/or corpus spongiosum so that the lumen will not accommodate instrumentation without disruption of the urethral mucosal lining. A stricture involving the urethra that is surrounded by corpus spongiosum is considered an anterior urethral stricture, and the associated scarring may be associated with a scarring process involving the spongy erectile tissue of corpus spongiosum (spongiofibrosis). Posterior urethral stricture is not included in the definition of 'urethral stricture'. Posterior urethral injury (PUI) and posterior urethral stenosis are more appropriate terms. Posterior urethral stenosis is an obliterative process in posterior urethra that has resulted in fibrosis and is generally the effect of distraction or avulsion in the area caused by either trauma (pelvic fracture) or radical prostatectomy and is called 'Distraction Defect'. Urethral stricture disease has various etiologies. In developed countries post traumatic and post instrumentation are common causes of stricture but in underdeveloped country post inflammatory particularly balanitis xerotica obliterans the most common cause of stricture and they are long segment and panurethral. Catheter induced inflammatory stricture is also produced long segment urethral stricture.

Urethral stricture disease has a great impact on patient's quality of life. Urethral strictures are a frequent source of lower urinary tract disorders in adults. Management of urethral stricture is complex and requires careful evaluation<sup>8</sup>. Substitution



urethroplasty with buccal mucosal graft is most commonly performed technique particularly for long segment stricture and become standard of care. In our audit, patients in the age group of 40-59 years were most commonly affected by urethral stricture disease (53 cases, 50 %). The average age of our patients was similar to other studies <sup>9-11</sup>. In this age group, the most common cause of urethral stricture was traumatic followed by inflammatory and iatrogenic which was in contrast to another study where idiopathic was the main cause of stricture in patients younger than 45 years <sup>11</sup>. Seventeen 17(16%) patients of non-obliterative short segment bulbar urethral stricture ( $\leq 1.5$ -2 cm) was managed with directly visualized optical internal urethrotomy (DVIU). The EPA urethroplasty is usually reserved for bulbar urethral stricture of short segment. In our study, EPA was done in 30 urethral strictures, and success rate was 93.3 % and redo surgery was done in 6.7 % cases. This result was similar to a report by Barbagli et al. where success rate was 92.31% after 6 months postoperatively <sup>12</sup>. The dorsal onlay urethroplasty was popularized by Barbagli et al. in 1998; it involves the dissection of urethra from corpora cavernosa and its rotation of 180°. In our study, 46 patients had undergone dorsal onlay and had success rate 84.8 % evaluated at three months follow up. This success rate is similar (85 to 89 %) to other reports <sup>13,14</sup>. 32 patients had undergone the Kulkarni urethroplasty with success rate of 90.6% as three patients had to undergo redo-surgery due to short segment stricture. Panurethral and long segment penile stricture can be managed as single-stage or staged procedures. Kulkarni et al. showed that the success rate of dorsal buccal mucosal graft urethroplasty by one-sided mobilization as 92% and mean stricture length in their series was 4.2 cm for bulbar urethral stricture and 10 cm for pan urethral stricture <sup>13</sup>. In the dorsal onlay technique, the conventional circumferential dissection of whole anterior urethra risks the vascularity of the urethra, which may be important if the meatus is involved with the disease and the distal most urethra is extremely dissected, such is seen with concomitant balanitis xerotica obliterans. In dorsolateral onlay approach ( Kulkarni urethroplasty ) urethra is mobilized in one side, which maintain vascular integrity of urethra. It also preserves the one-sided bulbar artery in addition to maintaining the native lateral vascularity in the meatus and distal urethra. Furthermore, by using this approach, we did not find post-operative chordee in any case. As the urethra is not completely mobilized off the corpora; hence, graft size is more appropriate, preventing chordee. Results of DVIU is satisfactory in short-term follow up in 70-80% of patients, but long-term success rate is much lower. The procedure has several advantages like requirement of minimal anesthesia, sometimes only topical anesthesia combined with sedation or local anesthesia, easily repeated if stricture recurs, less operative time, very safe and with very few complications.

## CONCLUSION

Urethral stricture is debilitating disease affecting quality of life and reconstruction of urethra continues to be challenging for the reconstructive surgeon. The treatment option of urethral stricture disease depends on various factors like etiology, location, length, depth and density of the stricture (spongiofibrosis), multiplicity, proximity to sphincteric mechanism and the presence of local adverse factors. The goal of treatment of urethral stricture is to provide sufficient permanent patency of the urethra to void urine without difficulties. Single stage reconstruction urethroplasty is preferable than staged procedure if not otherwise contraindicated. A stricture should not be considered “cured” until it has been observed for at least one year after therapy, since it may recur at any time during that period. Our study is comparable to other available studies.

## Funding

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## Conflicts of Interest

The authors declare no conflicts of interest.

## REFERENCES

1. Santucci RA, Joyce GF, Wise M. Male urethral stricture disease. *J Urol*.2007;177(5):1667-74.
2. Lumen N, Hoebeke P, Willemsen P, de Troyer B, Pieters R, Oosterlinck W. Etiology of urethral stricture disease in the 21<sup>st</sup> century. *Journal of Urology*. 2009; 182(3):983-7.
3. Pansadoro V, Emiliozzi P. Iatrogenic prostatic urethral strictures: classification and endoscopic treatment. *Urology*. 1999;53(4):784-9.
4. Berglund RK, Angermeier KW. Combined buccal mucosa graft and genital skin flap for reconstruction of extensive anterior urethral strictures. *Urology*. 2006;68(4):707-10.
5. Kumar MR, Himanshu A, Sudarshan O. Technique of anterior urethroplasty using the tunica albuginea of corpora cavernosa. *Asian Journal of Surgery*. 2008;31(3):134-9.
6. Barbagli G, Sansalone S, Djinovic R, Romano G, Lazzeri M. Current controversies in reconstructive surgery of anterior urethra: a clinical overview. *International Brazilian Journal of Urology*. 2012; 38(3): 307-16.
7. Johanson B: Reconstruction of male urethra in strictures. *Acta Chir Scand*. 1953; 179:19.
8. Gallegos MA, Santucci RA. Advances in urethral stricture management. *F1000 Res*.2016;5: 2913.
9. Guirassy S, Simakan NF, Bakle A, Sow KB, Balde S, Bah I, et al. Post traumatic urethral strictures at Ignace Deen University Teaching Hospital. Retrospective Study of 74 cases. *Annales D' Urologie*.2001;35:162-6. DOI:10.4236/oju.2020.104012.
10. Heyns CF, Van Der Merwe J, Basson J, Van Der Merwe A. Etiology of male urethral stricture. Evaluation of temporal change at a single center, and review of literature. *African Journal of Urology*. 2012; 18:4-9. DOI:10.1016/j.afju. 2012.04.009.

11. Laumen N, Hoebeke P, Willesmen P, De Troyer B, Pieters R, Oosterlinck W. Etiology of urethral stricture disease in the 21<sup>st</sup> century. *J Urol.* 2009; 182(3): 9837. DoI: 10.1016/j.juro. 2009.05.023.
12. Bagchi PK, Pratihari SK, Rajeev TP, Barua SK, Sarma D, Phukan M. An audit of management of male urethral stricture and its outcome: a single centre retrospective review. *Int Surg J.*2020;7(3):774-80. DOI:10.18203/2349-2902 isj20200821.
13. Barbagli G, Selli C, Di Cello V, Mottola A. A one-stage dorsal free-graft urethroplasty for bulbar urethral strictures. *Bri J Urol.*1996;929-32. DOI:10.1046/J.1464-410X.1996.23121.X.
14. Kulkarni S, Barbagli G, Sansalone S, Lazzeri M. One- sided anterior urethroplasty: a new dorsal onlay graft technique. *BJU Int.* 2009;104:1150-5. DOI:10.1111/J.1464-410X. 2009.08590.x.