Stricture of Urethra: Patterns and Outcomes of Management from a Single Centre in Pakistan Over 7 Years

Manzoor Hussain, Muhammad Shamim Khan, Murli Lal, Altaf Hashmi, Syed Ali Anwer Naqvi and Syed Adibul Hasan Rizvi

Department of Urology, Sindh Institute of Urology and Transplantation, Karachi, Pakistan

Abstract

Objective: To determine the outcomes of urethroplasty and its complications from a large cohort of patients managed in a single centre.

Study Design: Descriptive study.

Place and Duration of Study: Department of Urology, Sindh Institute of Urology and Transplantation (SIUT), Karachi, from January 2010 to December 2016.

Methodology: A total of 546 patients with stricture urethra at different locations underwent urethroplasty from January 2010 to December 2016 were included. All patients had an ascending urethrogram followed by retrograde ± antegrade urethroscopy to assess the location and length of the stricture. Technique of urethroplasty was chosen according to the site, length and etiology. Following appropriate procedure, patients were followed up in the dedicated urethral stricture clinic. Procedure was considered successful if either no further therapeutic intervention was required and the maximum flow rate (Qmax) was >20 ml/sec with a voided volume of at least 200 mls. The procedure was regarded as unsuccessful, if further treatment was required or Qmax was <10ml/sec.

Results: A total of 546 patients with mean age of 32.3 ±13.1 years (range: 12-74) involving anterior (n=323, 59.2%) or posterior (n=223, 40.8%) urethra were treated. Mean follow-up was 43.6 months (range: 3-84). The success rates of bulbar urethral strictures after excision and primary anastomosis (EPA) was 93. 3%, non-transecting urethroplasty 84.6% and oral mucosal graft (OMG), 81.8%. In penile urethral strictures, OMG, Orandi procedure and Johanson's techniques yielded success rates of 88.4%, 66.6% and 57.1%, respectively. In posterior urethral strictures, after excision and bulbo-prostatic anastomosis, good results were seen in 88.3%. In pan-urethral strictures, abdominal skin graft repair, combined tissue transfer and OMG urethroplasty yielded success rates of 74%, 78.5% and 75%, respectively. The complications/ adverse events were encountered in 251 / 546 (45.9%) patients in this series.

Conclusion: Anastomotic urethroplasty yielded best outcomes followed by OMG urethroplasty. In the long-term follow-up, erectile dysfunction (ED), infertility and recurrence of stricture are the main complications which need individualised management.

Key Words: *Urethroplasty, Outcomes, Complications.*

How to cite this article: Hussain M, Khan MS, Lal M, Hashmi A, Naqvi SAA, Rizvi SAH. Stricture of urethra: Patterns and outcomes of management from a single centre in Pakistan over 7 years. *J Coll Physicians Surg Pak* 2020; **30(1)**:79-84.

INTRODUCTION

Urethral stricture management is a challenging discipline of reconstructive surgery due to variations in etiology, location, extent of fibrosis and prior multiple surgical interventions.[1] The treatment options range from dilatation, direct visual internal urethrotomy (DVIU), laser incision, stents and urethroplasty.[2-4] Urethroplasty is considered the gold standard as it yields best outcomes; restoration of normal voiding with lowest risk of recurrence compared to less invasive procedures.[5]

Correspondence to: Prof. Manzoor Hussain, Department of Urology, Sindh Institute of Urology and Transplantation, Civil Hospital, Karachi-74200, Pakistan
E-mail: hmanzoor2015@gmail.com

Received: March 04, 2019; Revised: June 27, 2019; Accepted: June 27, 2019

There are three principal aims in urethroplasty; restoring normal voiding while preserving the erectile function and fertility.[6] However, these objectives are generally not achievable in pan-urethral strictures irrespective of etiology and technique. Sexual dysfunction after urethroplasty has significant impact on patients' quality of life (QOL) and overall satisfaction. To reduce the risk of these complications, technique of non-transecting urethroplasty (NTU) has been proposed as an alternative in highly selected cases.[7]

Stricture management can be grouped into four anatomical domains; penile, bulbar, pan-urethral and posterior. The reconstructive procedures include excision and primary anastomosis (EPA), graft procedures and perinealurethrostomy.[8]

This study aimed to report on the outcomes of the urethral stricture surgery and its complications in a single institution from Pakistan.

METHODOLOGY

A descriptive study was performed from January 2010 to December 2016 at Sindh Institute of Urology and Transplantation (SIUT). During this period, 546 patients underwent urethroplasty. All patients gave informed consent to participate in the study. All patients with strictures in penile, bulbar, posterior urethra and pan-urethral involvement were included. Preoperative evaluation included history, physical examination, urinalysis, urine culture, renal function test, ascending urethrogram and voiding cysto-urethrogram. Data collected included, demographics, etiology, flow rate, urinalysis, culture results, renal profile, imaging and endoscopic assessment and technique of repair and complications.

Catheter was removed two weeks after an anterior and 3 weeks following posterior urethroplasty. Supra-pubic catheter (SPC) was clamped and uroflowmetry performed in all cases.

Different techniques were used according to the location of strictures as per standard guidelines.[7,9,10]

Success rate and complications were recorded at 3, 6 and 12 months and at the end of the study period. The criteria used to assess the outcome was based on results of uroflow, measurement of post-void residual and flexible urethroscopy in cases with suboptimal flow rate results. If Qmax was >20 ml/sec, urethroplasty was successful. A flow rate in range of 10-15 ml/sec after the procedure was a fair result but if it was either <10 ml/sec or patient required any additional intervention, procedure was a failure. Following successful trial of voiding, SPC was removed after a week. In patients undergoing two-stage procedures, the second stage being performed after three months. Patients with poor outcomes underwent either redo urethroplasty, laser urethrotomy or DVIU.

Follow-up in the urethral clinic ranged from 3 to 84 months. On each follow-up visit, patients were questioned about voiding, erectile function, infertility and overall satisfaction after urethroplasty in a questionnaire developed by consensus of local urologists.

SPSS version 20 was used to analyse the data. Descriptive statistics were used to summarise the continuous and categorical variables. Continuous variables like age and follow-up period were presented as mean ±standard deviation (SD). Categorical variables such as location of stricture were expressed as frequencies with percentages. Chi-square test was applied to assess the differences in etiology and outcomes according to different locations and techniques of urethroplasty. A p-value of <0.05 was considered as significant.

RESULTS

A total of 3,357 procedures were performed for urethral stricture during the study period. Of these, 1,447 (43.1%) underwent urethroscopy and dilatation, 1,133 (33.7%) DVIU and 35 (1.0%) laser urethrotomy. A total of 546 (16.2%) male patients had urethroplasty. The mean age was 32.3 $\pm$13.0 years (range=12-74 years). Of these, 212 (38.8%) had bulbar, 222 (40.7%) pelvic fracture urethral injury (PFUI), 55 (10.1%) penile and 57 (10.4%) had pan-urethral location of stricture. The mean follow-up was 43.5 months (range: 3-84 months). The aetiology of different urethral strictures in 546 patients is shown in Table I. There were significant differences in the etiology of stricture depending on the location of the stricture in vast majority of cases, as shown by p-values in Table I. The outcomes are shown in Table II. There were no significant difference in success rates of outcome depending on various techniques in penile (p=0.20), and bulbar (p=0.06) urethral strictures. On the other hand, there were significant differences in the rates of success in pan-urethral strictures depending on the techniques of repair (p=0.02), as shown in Table II.

The early adverse events and surgical complications in 546 patients are listed in Table III. Most of the complications were minor (grade-1) according to Clavian-Dindo classification. There were no statistically significant differences in complications in relation to the

Table I: Etiology of 546 urethral strictures according to location of stricture.

	Penile (n=55) n (%)	Bulbur (n=212) n (%)	Pan urethra (n=57) n (%)	Posterior (n=222) n (%)	Total n	p-value
Idiopathic	11 (20.3)	50 (23.5)	11 (19.2)	3 (1.3)	75	<0.001
Straddle injury	3 (5.5)	47 (22.1)	4 (7)	5 (2.2)	59	<0.001
Post urethral catheter	6 (11.1)	10 (4.7)	4 (7)	3 (1.3)	23	<0.008
Post TURP	1 (1.8)	7 (3.3)	-	3 (1.3)	11	0.32
Post hypospadias	7 (12.9)	1 (0.47)	2 (2.3)	-	10	<0.001
Road traffic accidents	2 (3.7)	9 (4.2)	3 (5.2)	30 (13.4)	44	0.002
STI/urethitis	4 (7.4)	3 (1.4)	8 (14)	-	15	<0.001
BXO/lichen sclerosis	8 (14.8)	-	4 (7)	-	12	<0.001
Post instrument	6 (11.1)	-	7 (12.2)	-	13	<0.001
Penile trauma	6 (11.1)	-	5 (8.7)	-	11	<0.001
Pelvic fracture urethral injury	-	3 (1.4)	-	208 (93.2)	211	<0.001
Gun shot	2 (3.7)	8 (3.7)	-	10 (4.4)	20	0.45
Water cane perineum	-	3 (1.4)	-	2 (0.8)	5	0.65

Table II: Outcomes of urethroplasty according to location and technique.

	No	Good	Fair	Poor	p-value
Penile (n=55)					
OMG urethroplasty	26	23 (88.4%)	1 (3.8%)	2 (7.6%)	0.20
Orandi procedure	21	14 (66.6%)	2 (9.5%)	5 (23.8%)	
Johanson's 2 Stage	7	4 (57.1%)	-	3 (42.8%)	
Bulbar (n=212)					
E.P.A	166	155 (93.3%)	3 (1.8%)	8 (4.8%)	0.06
Non-transecting	13	11 (84.6%)	-	2 (15.3%)	
OMG urethroplasty	33	27 (81.8%)	-	6 (18.1%)	
Pan urethral stricture (n=57)					
Abdominal wall skin grafting	31	23 (74.1%)	3 (9.6%)	5 (16.1%)	0.02
Combined tissue transfer	14	11 (78.5%)	-	3 (21.5%)	
OMG urethroplasty	12	9 (75%)	1 (8.3%)	2 (16.6%)	
PFUI/PFUDD (n=222)	223	197 (88.3%)	16 (7.1%)	10 (4.4%)	NA

NA = Not applied.

Table III: Early surgical complications.

	Penile (n=55)	Bulbar (n=212)	Pan-urethral (n=57)	Posterior (n=222)	p-value	ClavianDindo Classification
Fever	4 (8.5%)	13 (7.3%)	3 (6.7%)	15 (7.7%)	0.98	Grade I
Penile/ scrotal swelling	1 (1.8%)	7 (3.3%)	5 (8.8%)	3 (4%)	0.02	Grade I
Wound infections	3 (6%)	4 (9%)	2 (3.5%)	4 (1.8%)	0.36	Grade I
UTI	2 (3.7%)	5 (2.3%)	2 (3.5%)	3 (6.7%)	0.62	Grade I
Bleeding	0	3 (1.4%)	2 (3.5%)	4 (1.8%)	0.52	Grade II
Painful ejaculation	1 (2.5%)	4 (4.3%)	0	3 (2.0%)	0.60	Grade I
Post-void dribbling	0	3 (3.2%)	2 (8.7%)	2 (1.4%)	0.10	Grade I
Stress incontinence	0	6 (2.8%)	0	15 (6.8%)	0.01	Grade II
Recurrence of stricture	11 (20%)	17 (8%)	14 (24.6%)	24 (10.8%)	0.002	Grade III B
Chordae	3 (5.5%)	1 (0.5%)	1 (1.8%)	4 (1.7%)	0.08	Grade III B

UTI = Urinary tract infection

location of stricture in the vast majority of cases, as shown in Table III. There were no deaths in this series.

Preoperatively, erectile function assessment showed poor or no erections in 155 (28.3%) patients while post-urethroplasty, erectile dysfunction (ED) was reported by 214 (39.1%) patients at 3-6 months follow-up. This figure improved spontaneously at one year follow-up in 29 patients leaving 185 (34%) with ED. So, the difference of weak/no erections in pre- and post-urethroplasty was 29 (5.3%) patients. In these, ED persisted after urethroplasty and needed treatment.

The assessment of fertility showed that 91 (16.7%) patients were married and fertile before urethroplasty, while post-urethroplasty, 74 (13.5%) patients retained this function. The fertility status was assessed in only married patients and who had at least 1 year of follow-up.

DISCUSSION

Urethral stricture management has evolved over the last few decades. In the developed world, most of the strictures are managed in the dedicated centres by experts with special interest in reconstruction with good outcomes. The referral pathways are strictly regulated allowing management in the specialist units.

On the contrary, emerging world has generally not been able to embrace the sub-specialisation. Most patients with this condition receive a variety of interventions from novices ranging from aggressive attempts at dilatation to reconstruction. These interventions generally aggravate the consequences of injury and impact on the final outcomes when patient ultimately reaches the specialised units.[11]

This series is from a centre which has embraced the practice of sub-specialisation by establishing a dedicated urethral clinic. The authors reported outcomes of management of 546 patients, all males with mean age of 32 years. Peak age distribution in the previously reported cohort of 1,600 patients with urethral stricture was 41-50 years with a mean of 45 years.[1] These figures suggest that increasingly younger people are involved in developing countries.

A large majority of patients in this cohort were rural dwellers, injured in farming accidents (tractors), road accidents or falls from trees or ceilings. The urethroplasty was performed in 16% of patients who attended the unit during the above period. This statistics may suggest that urethroplasty was offered to a limited number of cases and a vast majority had endoscopic management.[12] However, the majority of the strictures seen in the clinic are grade I and II involving limited

mucosal scarring which can be treated by endoscopic methods.

The etiology of the strictures varied in different segments of the urethra and in different parts of the world. A study from Mexico revealed that iatrogenic trauma due to catheterisation and urethral instrumentation was the commonest cause accounting for 73% of urethral strictures.[12] In another study on etiology of strictures included, hypospadias repair in penile, idiopathic in bulbous, post-instrumentation in pan-urethral and PFUI in posterior strictures.[13]

In this cohort, a significant number of penile urethral strictures (38.8%) were treated using penile skin flaps because of unsuitability of OMG due to changes caused by beetle nut chewing. Although our institutional preference has been a dorsal inlay OMG urethroplasty for penile strictures, in 7 patients we opted for the lateral or ventral onlay grafts as complete obliteration of the urethral lumen made inlay grafts impractical. We elected to perform two-stage Johanson's urethroplasty in post-infective strictures and patients with cavities and false passages and those with lichen sclerosis.

In this series, Orandi procedure gives success rate of 66%, which is inferior compared to OMG urethroplasty. In a study from Netherland, De La Rosette *et al.* reported 32% recurrence rate and 20% fistula formation.[14] Patients with significant comorbidities and infective cavities in urethra were managed with perineal urethrostomy as the first stage of Johanson's urethroplasty in seven patients.[20] Out of these, five requested for 2nd stage Johanson's, done six months after the first stage but two of them with age >70 years opted for perineal urethrostomy, which needed intermittent dilatation with Nelton catheter.

Length of strictures in the bulbar urethra ranged from 1-7 cm with mean of 2.43 $\pm$1.26 cm. At the study centre, 1-2 cm bulbur strictures were treated with EPA urethroplasty if DVIU was not successful, is non-traumatic strictures;[15] but in traumatic bulbur strictures, EPA was the primary option in 166 (78.3%) patients. In younger patients, even strictures as long as 3-4 cm can be managed with this technique with excellent outcomes.[16] In this series, good results were achieved in 93% of cases after EPA urethroplasty, a success rate which matches results from other reported series.[17]

Non-transecting urethroplasty (NTU) was undertaken in 13 (6.1%) of bulbar strictures. Most suitable patients for this procedure are those with strictures 1 - 1.5 cm in length and minimal spongio-fibrosis. There are theoretical advantages of lower risk of ED because of preservation of blood supply. The results in this series were inferior to EPA urethroplasty. This may be attributable to poor selection of cases including those with traumatic strictures in whom the diseased part of urethra was not excised fully. Another series on NTU of 75 patients, with short bulbar and posterior strictures, reported 8% recurrence and 21.9% de-novo-ED which improved at 12 months follow up in all patients except one.[18]

OMG was used in 33 patients with bulbar strictures >4cms. Grafts were harvested from the inner cheek and lower lip in all except 3, which were harvested from the dorso-lateral aspect of tongue. Of 33 patients, 8 had augmented anastomosis with dorsal onlay patch. In the remainder, stricturotomy and OMG patch was used either as a dorsal or lateral onlay in 12 and 13 patients, respectively. Good outcomes were obtained in 81.87%. In one meta-analysis, OMG substitution urethroplasty reported success rate of 88.1% and no difference between dorsal and ventral onlay techniques.[18,19]

Successful management of pan-urethral strictures required two-stage urethroplasty in early phase of our learning curve.[20] However, with increasing experience, we treated patients with a single-stage reconstruction. These strictures were treated either by penile skin flaps or OMG or combination of the techniques *i.e.* penile skin flaps for penile and OMG for bulbar as reported in another study.[21]

In pan-urethral strictures, in 31 (54%) patients, abdominal wall full-thickness skin graft was used for urethral reconstruction. It was more relevant in our set-up. Use of abdominal wall skin for repair of urethral strictures as an alternative to OMG has been reported in another study.[22]

In 12 patients (21%) with pan-urethral strictures, OMG urethroplasty was performed if the length of the stricture was upto 6 cm. A subgroup of 14/57 (24.5%) patients underwent combined tissue transfer technique as the authors believed that repairing strictures >6 cm with OMG alone increases the morbidity. Berglund *et al.* however, reported a series of 18 patients with a mean length of 15.1 cm using combined OMG and genital skin with good success.[21]

PFUI strictures were managed by excision and bulbo-prostatic anastomosis urethroplasty. Additional maneuvers used were mobilisation of urethra, separation of the crura and partial pubectomy, wherever necessary. Re-routing of urethra, however, was not required in any of the patients. Good outcomes were achieved in 88.3%. In PFUI group, 10 patients (4.4%) had poor results just after operation while other 13 (6%) developed recurrence of stricture making a total of 23 (10.3%) recurrence rate, they were managed by either redo urethroplasty DVIU or by Mitrofenoff continent diversion in 2 cases. Incontinence rates in this cohort of PFUI are comparable to other reported series.[22,23] The overall success reported in other series of PFUI repairs ranges from 90-98%.[22,23] We believe that relatively inferior outcomes in our series may partly be attributed to differences in the definition of

success and unsuccessful multiple interventions in the past at other centres.[23] Morey *et al.* reported success rate of 93%, although 11% patients amongst successful cohort required DVIU and 3% were considered failed.[23] In this study, any postoperative surgical intervention was considered as failure; whereas, in Morey *et al.* study, a single DVIU after urethroplasty was not considered as failure.

The adverse events were encountered in 251/546 (45.9%) patients in this series. In another series reporting on the complications, showed early minor complications in 44% while late major complications in 22%.[23] Al-Qudah *et al*. reported 39% early and 40% late complications.[24] Majority of these were minor (97%) and resolved without intervention or late consequences. Only 3% of the early complications were major.

In the present study, erectile functions and fertility status were evaluated before and after urethroplasty. There was spontaneous improvement in erectile function at 12 months in the majority of patients but 30 (10.8%) had persistence of ED after urethroplasty. This reported 10.8% ED in this series is little higher than the reported incidence of 2-5% by Blaschko *et al*.[12] This impact of urethroplasty on ED needs further research.

In this study, 91 patients were fertile before urethroplasty, rest were not married or did not complete follow-up of >1 year. Seventy-four remained fertile after the procedure. Effect of urethroplasty on fertility is poorly researched. Whether trauma or urethroplasty procedure causes obstruction to the ejaculatory ducts is not known and hence, needs further study.

CONCLUSION

This is the largest series reported on urethroplasty outcomes from Pakistan. The best results of reconstruction were achieved with EPA urethroplasty followed by OMG urethroplasty. Limited resources are the biggest challenge in functional rehabilitation in the developing countries.

PATIENTS' CONSENT:
Patients' consents were obtained during the procedures as part of the patient care protocol and to use the data for research purpose.

CONFLICT OF INTEREST:
Authors declared no conflict of interest.

AUTHORS' CONTRIBUTION:
MH, MSK: Conception and designing, collection and analysis of data, primary drafting of the paper and final approval.
ML, AH: Acquisition of data, critical review of the paper.
SAAN, SAHR: Critical review and final approval of the manuscript.

REFERENCES

1. Hussain M, Askari H, Lal M, Naqvi SAA, Rizvi SAH. Experience at a stricture clinic in a developing country. *J Pak Med Assoc* 2013; **63**:234-8.
2. Latini JM, Arinch MC, Brandes SB, Change JY, Rosantein D, Chapter I. Epidemiology, etiology, anatomy and nomenclature of urethral stenosis, strictures and pelvic fracture urethral disruption Injuries. *Urology* 2013; **09**:009.
3. Palminteri E. Stents and urethral strictures: A lesson learned? *Eur Urol* 2008; **54**:498-500.
4. Hussain M. Urethral stricture disease: An old disease with newer treatments. *J Pak Med Assoc* 2008; **58**:227-8.
5. Carson CC. Urethroplasty: A model for international progress in urology. *Contemp Urol* 2006; **18**:11.
6. Erickson BA, Ghareeb GM. Definition of successful treatment and optional follow-up after urethral reconstruction for urethral stricture disease. *Urol Clinic N Am* 2017; **44**:1-9.
7. Andrich DE, Mundy AR. Non-transecting anastomotic bulbar urethroplasty: A preliminary report. *BJU Int* 2012; **109**:1090-4.
8. Hillary CJ, Osman NI, Chapple CR. Current trends in urethral stricture management. *Asian J Urol* 2014; **1**:46-54.
9. Al-Ali M, Al-Hajaj R. Johanson's staged urethroplasty revisited in the salvage treatment of 68 complex urethral stricture patients: presentation of total urethroplasty. *Eur Urol* 2001; **39**: 268-71.
10. Wessells H, Morey AF, McAninch JW. Single stage reconstruction of complex anterior urethral strictures: combined tissue transfer techniques. *J Urol* 1997; **157**:1271-4.
11. Webster GD, Peterson AC. Simple perineal and elaborated perineal posterior urethroplasty. *Arab J Urol* 2015; **13**:17-23.
12. Blaschko SD, Sanford MT, Schlomer BJ, Alwaal A, Yang G, Villata JD, *et al.* The incidence of erectile dysfunction after pelvic fracture urethral injury: A Systematic review and meta analysis. *Arab J Urol* 2015; **13**:68-74.
13. Cisneros-Chavez R, Aragon-Castro MA, Morales-Ordaz O. Urethral stricture: Etiology and treatment. Experience at the Centro Medico ISSEMYM. *Rev MexUrol* 2013; **73**:229-36.
14. de la Rosette JJ, DeVries JDM, Lock MTWT, Debruyne FMJ. Urethroplasty using the pedicledisland flap technique in complicated urethral strictures. J Urol 1991; 146:40-2.
15. Wright JL, Wessells H, Nathens AB, Hollingworth W. What is the most cost-effective treatment for 1 to 2-cm bulbar urethral strictures: societal approach using decision analysis. *Urology* 2006; **67**:889-93.
16. Terlecki RP, Steel MC, Valadez C, Moray AF. Grafts are unnecessary for proximal bulbar reconstruction. *J Urol* 2010; **184**: 2395-9.
17. Altahawy EA, Virasoro R, Schlossberg SM, McCammon KA, Jordan GH. Long term follow-up for excision and primary anastomosis for anterior urethral strictures. *J Urol* 2007; **117**: 1803-6 .
18. Lumen N, Poelaert F, Oosterlinck W. Nontransecting anastomotic repair in urethral reconstruction: Surgical and functional outcome. *J Urol* 2016; **196**:1679-84.
19. Wang K, Miaox X, Wang L, Li H. Dorsal onlay *vs*. ventral onlay

urethroplasty for anterior urethral strictures: A meta-analysis. *Urol Int* 2009; **83**:342-8.

20. Mori RL, Angermeier KW. Staged urethroplasty in the management of complex anterior urethral stricture disease. *Transl Androl Urol* 2015; **4**:29-34.
21. Berglund RK, Angermeier KW. Combined buccal mucosa graft and genital skin flap for reconstruction of extensive anterior urethral strictures. *Urology* 2006; **68**:707-10.
22. Meeks JJ, Erickson BA, Fetchev P, Crawford SE, Fine NA, Gonzalez CM. Urethroplasty with abdominal skin grafts for long segment urethral stricture. *J Urol* 2010; **183**:1880-4.
23. Morey AF, McAninch JW. Reconstruction of posterior urethral disruption injuries: Outcomes analysis in 82 patients. *J Urol* 1997; **157**:506-10.
24. Al-Qudah HS,Santuccai RA. Extended complications of urethroplasty. *Int Braz J Urol* 2005; **31**:315-23.