SAS Journal of Surgery **ISSN 2454-5104**
SAS J. Surg., Volume-3; Issue-9 (Sep, 2017); p-244-250

(An International Publisher for Academic and Scientific Resources)

Clinicopathological Evaluation of Anterior Urethral Stricture and Its Management: A Prospective Observational Study

Dr. Tapas Kumar Majhi, Dr. Saptarshi Mukherjee*, Dr. Debashish Maity
Department of Urology, Nil Ratan Sircar Medical College & Hospital, Kolkata, India.

***Corresponding author**
Dr. Saptarshi Mukherjee

Article History
Received: 10.09.2017
Accepted: 16.09.2017
Published: 30.09.2017

DOI:
10.21276/sasjs.2017.3.9.3

Abstract: Anterior urethral stricture mainly occurs in men and is a challenging urological condition representing a significant workload for urologists. Here, we report clinicopathological observations of patients with anterior urethral stricture and their management at a tertiary care centre in India. This was a single-centre, prospective, observational study conducted between March 2014 and September 2015. Male patients with definitive diagnosis of anterior urethral stricture were eligible to participate. Demographic details, details of stricture and treatment were collected. Overall, 110 patients with anterior urethral stricture were enrolled in the study. The highest incidence of anterior urethral stricture was seen in the age group of 20-50 years. Trauma was the most common (35%) cause, and bulbar urethra (52%) was the most common site of anterior urethral stricture. Patient with meatal stenosis were treated with meatal dilatation along with topical therapy (n=11), patients with fossa navicularis stricture caused due to balanitis xerotica obliterans (BXO) were treated with topical therapy (n=7) and graft placement (dorsal onlay) (n=3), and patients who came with recurrent stricture (n=16) after optical internal urethrotomy (OIU) were treated with dorsal onlay buccal mucosa graft (BMG) urethroplasty. Patients with long segment penile urethral stricture were treated with two stage Johanson procedure with BMG (n=5), and dorsal onlay BMG only (n=5). Overall, the treatment success rate ranged from 50% to 100%.
Keywords: Buccal mucosa, Urethral stricture, urethroplasty

INTRODUCTION

The term urethral stricture primarily refers to anterior urethral stricture. This is generally caused by a fibrous scarring due to collagen and fibroblast proliferation, and is associated with scar around corpus spongiosum, known as spongiofibrosis [1,2]. This scarring process generally extends to the adjacent structures. Contraction of this scar narrows the urethral lumen. The incidence of male anterior urethral stricture varies from place to place, but the true incidence remains unknown [3]. In the United States, it accounts for about 5,000 inpatient visits and 1.5 million office visits per year [4].

An anterior urethral stricture mainly occurs in men and is a challenging urological condition representing a significant workload for urologists [3]. Urethral stricture can have a significant impact on quality of life, and may have several complications including thick-walled trabeculated bladder, acute retention, prostatitis, epididymo-orchitis, hydro nephrosis, periurethal abscess, and bladder or urethral calculi [5].

Clinical management of urethral stricture primarily depends on the etiology of stricture. As per Lumen *et al*., the majority of urethral strictures were idiopathic, traumatic, inflammatory or iatrogenic, and the most common site of stricture was bulbar followed by penile [6]. The treatment strategy not only includes quick resolution of urinary outflow, but also to treat the underlying pathology. Open surgical urethroplasty has a long-term success rate of around 85 to 95% and is considered as a gold standard for the treatment of urethral strictures [5]. Other treatment options include topical therapy, dilatation, optical internal urethretomy (OIU), ureterostomy and open reconstruction.

In this paper, we report clinicopathological observations of patients with anterior urethral stricture and their management at a tertiary care centre in India.

METHODS

Study design

This was a single centre prospective observational study of all the cases of anterior urethral stricture managed at urology department of Nil Ratan Sircar Medical College and Hospital, Kolkata, conducted between March 2014 and September 2015. The study aimed to describe patient characteristics and the current treatment strategies in male patients with urethral stricture. Study also evaluated the incidence of

stricture according to etiological background, age, risk factors. Additionally, study evaluated the utilization of uroflometry, retrograde urethrogram, voiding cyst urethrogram, and sonourethrogram and treatment modalities with topical therapy, urethral dilatation, optical urethrotomy, primary resection and end to end urethral anastomosis, and graft urethroplasty.

Study participants

Male patients hospitalized between March 2014 and September 2015 with definitive diagnosis of anterior urethral stricture was eligible to participate.

The study was conducted in accordance with the International Conference on Harmonization Good Clinical Practices (ICH GCP) and applicable local regulatory requirements and principles outlined in the Declaration of Helsinki. The institutional ethics committee at the study centre reviewed and approved the study protocol. All participants provided written informed consent to participate in the study. Written informed assents were obtained (where possible) from participants less than 18 years of age, along with consent from their parents.

Outcome assessment

Following data was collected: demographic characteristics (age), history of present and past illness, details of laboratory and radiological examination, details of stricture, and treatment.

Statistical analysis

There was no formal sample size calculation employed for this study. All male patients with anterior urethral stricture visiting during the study period and provided consent were enrolled. Categorical variables were presented using numbers and percentages, whereas continuous variables were summarized using mean and range. Statistical analysis was performed using SPSS statistical software (version 18)

RESULTS

A total of 127 cases of anterior urethral stricture were admitted during the study period, of which 110 gave the informed consent and were included in the study. Seventeen patients refused for participation.

Incidence

Among 110 patients, highest incidence of anterior stricture disease was seen in the age group of 20 – 50 years (n=63, 57.3%) (Table 1). Among aetiology, trauma was the most common (n=39, 35.5%) cause of anterior urethral stricture followed by balanitis xerotica obliterans (BXO) (n=25, 22.7%). The most common site of anterior urethral stricture was bulbar urethra (n=57, 51.8%) followed by meatus (n=21, 19.1%). Majority of urethral stricture length was between 1 to 3 cm (n=78, 70.9%).

Treatment

Table 2 and 3 summarizes the treatment modalities among the studies population. Patient with meatal stenosis were treated with meatal dilatation along with topical therapy (n=11) followed by clobetasol propionate (n=10). Four patients, who did not respond to topical therapy, were treated with dorsal onlay buccal mucosa graft (BMG) meatoplasty. The success rate for treatment with topical therapy for meatal stenosis (mostly due to BXO) ranged from 60% to 82%. The success rate in patient treated with graft meatoplasty was excellent (near 100%). Among patients with fossa navicularis stricture (Table 2) caused due to BXO were treated with topical therapy (n=7) and graft placement (dorsal onlay) (n=3). Stricture after TUR and idiopathic stricture were only treated with intermittent dilatation. Success rate among patients treated with tropical therapy ranges from 60% to 70%, however, the success rate was 100% among patients who were treated with BMG (dorsal onlay) placement.

Among bulbar urethral stricture, patients having short segment stricture (<1.5 cm) irrespective of aetiology, initially were treated with OIU. Patients who came with recurrent stricture (n=16) after OIU were treated with dorsal onlay BMG urethroplasty. Patients with long segment stricture were treated with primary end-to-end anastomotic urethroplasty for stricture length >2 cm and with longer stricture those also involving proximal penile urethra were treated with graft urethroplasty placed either dorsally (n=8) or ventrally (n=5). The success rate for short segment bulbar stricture that were treated with OIU was 56% and for long segment stricture treated with anastomotic urethroplasty and graft urethroplasty was 86% and 91%, respectively. Patient with short segment (1-2 cm) bulbar urethral stricture had excellent response (93%), however, the response for long segment stricture was slightly lower (91% and 78%, respectively for stricture length 2-3 cm and 3-4 cm).

Patients with long segment penile urethral stricture were treated with two stage Johanson procedure with BMG (n=5), and dorsal onlay BMG only (n=5). Patient group treated with dorsal onlay BMG and two stages Johanson without BMG had similar success rate (80% each) and who were treated with one stage Johanson with BMG the success rate was 67% (Table 2).

Among patients who developed panurethral strictures after BXO were treated with topical therapy (n=1) and one stage Johanson with BMG (n=2), but one patient who developed stricture after inflammation was treated with perineal urethrostomy and another patient with idiopathic stricture was treated with serial urethral dilatation (Table 2). After follow-up for up 7 to 19 months, overall patients with pendular strictures had highest success rate of 80% (Table 4).

Table−1: Incidence of urethral stricture

Parameter	N=110
Stricture according to age	
<20 years	2 (1.8)
≥20 to <50 years	63 (57.3)
≥50 to <75 years	41 (37.3)
≥75 years	4 (3.6)
Stricture according to aetiology	
Trauma	39 (35.5)
BXO	25 (22.7)
Inflammatory	21 (19.1)
Post-hypospadius	2 (1.8)
TUR	3 (2.7)
Catheterization	7 (6.4)
Instrumentation	2 (1.8)
Idiopathic	11 (10.0)
Stricture according to site	
Meatus	21 (19.1)
Panurethral	6 (5.5)
Fossa navicularis	11 (10.0)
Bulbar urethra	57 (51.8)
Penile urethra	15 (13.6)
Stricture according to length	
<1 cm	9 (8.2)
≥1 to 2 cm	37 (33.6)
≥2 to 3 cm	41 (37.3)
≥3 to 4 cm	0
≥4 to 5 cm	13 (11.8)
≥5 to 6 cm	3 (2.7)
≥6 cm	7 (6.4)
Data presented as n (%). BXO, balanitis xerotica obliterans; TUR, trans-urethral resection.	

Table−2: Treatment according to involved site and outcome

Treatment	No. of patients treated	Treatment	Outcome	
			Success (%)	Failure (%)
Meatal stenosis due to BXO				
Clobetasol propionate (0.05%)	10	Clobetasol propionate (0.05%)	60	40
Clobetasol + Tacrolimus	7	Clobetasol + Tacrolimus	75	25
Meatal Dilatation + Topical Therapy	11	Meatal Dilatation + Topical Therapy	82	18
BMG (Dorsal Onlay) Meatoplasty	4	BMG (Dorsal Onlay) Meatoplasty	100	0
Fossa navicularis stricture				
Stricture after TUR				
Intermitent Dilatation	2	Clobetasol propionate (0.05%)	60	40
Stricture due to BXO				
Clobetasol propionate (0.05%)	5	Topical Therapy + Dilatation	70	30
Topical Therapy + Dilatation	2	BMG (Dorsal Onlay) Placement	100	0
BMG (Dorsal Onlay) Placement	3			
Idiopathic				
Dilatation	4			
Pendular urethral stricture				
Penile stricture after trauma		OIU	50	50
Two Stage Johanson with BMG	5	Dorsal Onlay BMG	80	20
One Stage Johanson	3	One Stage Johanson	67	33
	2	Two Stage Johanson with BMG	80	20

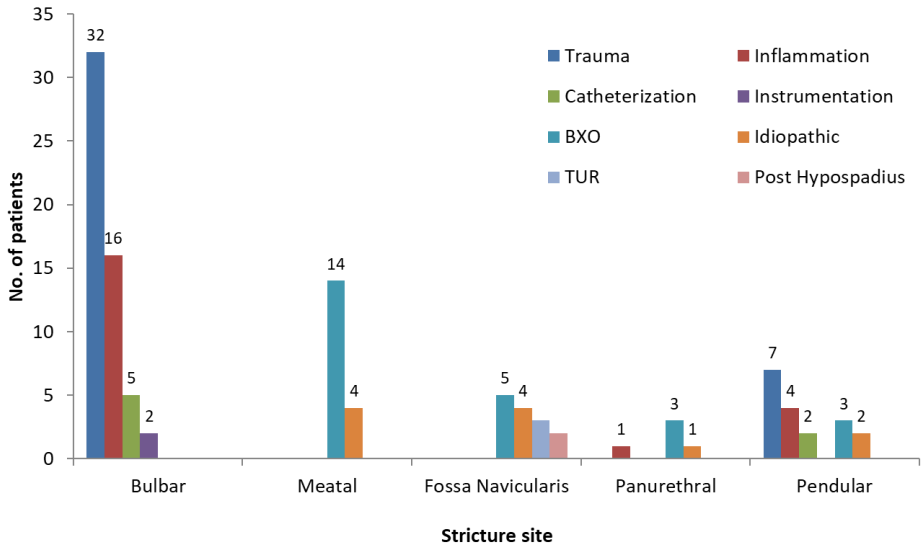
Dorsal Onlay BMG Penile stricture after inflammation Short segment (<1cm), (OIU) Long Segment, (Dorsal onlay BMG)	 2 3			
Panurethral strictures Stricture after BXO Topical therapy + serial urethral dilatation One stage Johanson with BMG Stricture after inflammation Perineal urethrostomy Idiopathic stricture Serial urethral dilatation	 1 2 1 1	-	-	-
BMG, buccal mucosa graft; BXO, balanitis xerotica obliterans; OIU, optical internal urethrotomy; TUR, trans-urethral resection.				

Table–3: Treatment for bulbar urethral stricture and outcome

Treatment	No. of patients treated
Traumatic strictures Short segment (<1.5 cm) OIU/VIU Dorsal Onlay BMG in patient with failed OIU Long segment (>2 cm) Primary resection and end-to-end anastomosis urethroplasty Dorsal Onlay BMG Ventral Onlay BMG	 19 10 5 5 3
Inflammatory strictures Short segment (<1.5 cm) OIU/VIU Dorsal onlay BMG in patient with failed OIU Long segment (>2 cm) Primary resection and end-to-end anastomosis urethroplasty Dorsal onlay BMG Ventral onlay BMG	 11 6 2 3 2
Stricture after catheterization Short Segment (1 – 1.5cm) OIU	 2
Stricture after instrumentation Short Segment (<2cm) OIU	 2
Stricture due to idiopathic cause OIU	 3
BMG, buccal mucosa graft; OIU, optical internal urethrotomy; VIU, visual internal urethrotomy.	

Table–4: Follow-up and outcomes

Stricture site (no. of patients)	Age (years)	Stricture length (cm)	Follow-up period (months)	Pre-operative Qmax (ml/s)	Post-operative Qmax in successful patients (ml/s)	Success rate Ratio (%)
Meatal and submeatal (4)	11 – 38	2 – 3	11 – 18	2.9 – 8.7	12.1 – 22.3	3/4 (75%)
Fossa navicularis/ distal penile (3)	22 – 46	3 – 5.5	13 – 19	4.1 – 7.5	13.1 – 21.3	2/3 (67%)
Pendular (5)	28 – 59	4.2 – 8.7	9 – 18	3.6 – 9.2	14.7 – 21.5	4/5 (80%)
Panurethral/penile + bulbar (10)	35 - 82	8.5 – 14	7 - 19	2.7 – 6.3	11.6 – 18.3	7/10 (70%)
Data presented as range, except for success rate.						



Fig−1: Incidence of site of anterior urethral stricture according to aetiology Footnote: BXO, balanitis xerotica obliterans; TUR, trans-urethral resection.

DISCUSSION

Urethral strictures are divided into two main types, anterior and posterior. These strictures not only differ in their location, but also differ with their underlying pathogenesis. The posterior stricture occurs when the scar tissue forms at the posterior urethra at the bladder neck, prostatic urethra, and membranous urethra, and has no involvement of corpus spongiosum [7]. The treatment of urethral strictures has advanced dramatically with our increasing understanding of both the aetiology of these strictures and the surgical principles required achieving successful reconstruction.

Distal anterior urethral strictures are especially challenging to repair, as both urethral functionality and glanular cosmesis are important to the overall success of the procedure. Careful discussion of the patient's expectations, appropriate selection of graft tissues and consideration of the reconstructive procedures chosen are critical to the long-term success of distal urethral reconstruction. Several techniques and options have emerged in the last 3 decades for the repair of anterior urethral stricture. Aetiology has also shifted from infective to traumatic, inflammatory and iatrogenic causes [8].

Imaging of the urethra based on retrograde urethrography and voiding cystourethrography is an integral component of the evaluation of patients with urethral disease [1]. The incorporation of other techniques like sonourethrography, yields additional information which is helpful in diagnosis and decision making [1]. Direct visual internal urethrotomy (DVIU) is the treatment of first choice for bulbar urethral stricture less than 1.5cm with minimal spongiofibrosis [9]. Repeat urethrotomy is associated with poor cure rates. Intermittent dilatation for more than a year may delay the onset of stricture recurrence [9].

Dorsal onlay graft urethroplasties are important in the treatment of single-stage repair of long segment anterior urethral strictures [10]. A dorsolateral patch with one-sided urethral mobilization could be an alternative for dorsal onlay graft urethroplasty. This approach could avoid the mobilization of the urethra or avoid unnecessarily incision of the scarred urethra [10]. A buccal mucosa graft placed dorsally or ventrally is an excellent graft material in the bulbar and pendulous urethra. When lichen sclerosus (BXO) is present, initial treatment with topical steroid for short segment stricture is associated with good results, who failed to respond meticulous dissection and careful complete excision of diseased urethra followed by BMG graft placement give excellent outcome with less recurrence.

Grafts are useful for single-stage reconstruction of fossa navicularis and pendulous urethral strictures. The buccal and lingual mucosa serves as a preferred resource material. Overall, the treatment strategy using of urethroplasty has been shifted from a double-stage to single-stage procedure. Though, buccal mucosa only has its own importance in bulbar urethroplasty, however it has shown positive results in pendulous urethra [8]. Treatment of panurethral strictures is not only challenging but also is associated with poor outcomes. There is no single technique that can be considered better than other. Even after careful planning, reconstructive procedures are also associated with poor results and finally patients to be kept on permanent urethrostomy. In previous studies [11, 12, 9, 13] use of dorsal onlay bulbar urethroplasty with BMG graft showed success rate of 85% to 98%. In these studies, the follow-up ranged from 19 months to 60 months and the follow-up method included uroflowmetry, urethrography, and urethroscopy. In the

present study, dorsal onlay BMG showed success rate of 93%.

Overall success rate of penile urethroplasty in the previous studies was around 73% to 100% [11,9, 12,14] ; success rate panurethral urethroplasty was around 83% to 92% [9, 14]. These results were higher than the present study (penile urethroplasty, 73%; and panurethral urethroplasty, 50%). The success rate of OIU for anterior urethral stricture ranges from 8% to 77%; however, the success rate in the present study was 53% [4,13].

Authors would like to acknowledge following limitation of the study. The study was conducted at only one tertiary care centre of India; hence the generatability of the results is limited. Further research would be needed to support our results.

CONCLUSION

Distal anterior urethral strictures are especially challenging to repair, as both urethral functionality and glanularcosmesis are important to the overall success of the procedure. Careful discussion of the patient's expectations, appropriate selection of graft tissues and consideration of the reconstructive procedures chosen are critical to the long-term success of distal urethral reconstruction.

Several techniques and options have emerged in the last 3 decades for the repair of anterior urethral stricture. Etiology has also shifted from infective to traumatic, inflammatory and iatrogenic causes. Imaging of the urethra based on retrograde urethrography and voiding cystourethrography and sonourethrography is an integral component of the evaluation of patients with urethral disease.

DVIU is the treatment of first choice for bulbar urethral stricture less than 1.5cm with minimal spongiofibrosis. Repeat urethrotomy is associated with poor cure rates.Intermittent dilatation for more than a year may delay the onset of stricture recurrence.

For single-stage repair of long segment anterior urethral strictures, dorsal onlay grafturethroplasties are the mainstay of treatment. A dorsolateral patch by one-sided urethral mobilization may be a good alternative for dorsal onlay grafturethroplasty. A buccal mucosa graft placed dorsally or ventrally is an excellent graft material in the bulbar and pendulous urethra.

When lichen sclerosus (BXO) is present, initial treatment with topical steroid for short segment stricture is associated with good results, who failed to respond meticulous dissection and careful complete excision of diseased urethra followed by BMG graft placement give excellent outcome with fewer recurrence.

Grafts are useful for single-stage reconstruction of fossa navicularis and pendulous urethral strictures. The buccal and lingual mucosa serves as a preferred resource material.

The management has shifted from a 2-stage procedure to a single-stage urethroplasty wherever feasible. Although buccal mucosa onlay has fixed its place in bulbar urethroplasty, its use in pendulous urethra has shown encouraging results.

Pan urethral strictures are difficult to treat and are associated with relatively poorer outcomes. There is no one technique that is superior to other. Even after meticulous planning, reconstructive procedures are also associated with poor results and finally patient is to be kept on permanent ureterostomy.

REFERENCES

1. Kawashima A, Sandler CM, Wasserman NF, LeRoy AJ, King BF Jr, Goldman SM. Imaging of Urethral Disease: A Pictorial Review. Radiographics 2004;24 Suppl 1:S195-216.
2. El-Bab TKF, Galal EM, Abdelhamid AM, Amin MF. Magnetic resonance urethrography versus conventional retrograde urethrography in the evaluation of urethral stricture: Comparison with surgical findings. Egypt J Radiol Nuclear Med 2015;46:199-204.
3. Lazzeri M, Sansalone S, Guazzoni G, and Barbali G. Incidence, causes and complications of urethral stricture disease. Eur Urol Suppl 2016;15:2-6.
4. Santucci RA, Joyce GF, Wise M. Male urethral stricture disease. J Urol 2007; 177:1667-1674.
5. Hampson LA, McAninch JW, Breyer BN. Male urethral strictures and their management. Nat Rev Urol 2014;11:43–50.
6. Lumen N, Hoebeke P, Willemsen P, De Troyer B, Pieters R, Oosterlinck W. Etiology of urethral stricture disease in the 21st century. J Urol 2009;182:983-987.
7. Gallegos MA, Santucci RA. Advances in urethral stricture management. F1000Res 2016;5:2913.
8. Singh SK, Agrawal SK, Mavuduru RS. Management of the stricture of fossa navicularis and pendulous urethral strictures. Indian J Urol 2011;27:371-377.
9. Dubey D. The current role of direct vision internal urethrotomy and self-catheterization for anterior urethral strictures. Indian J Urol 2011; 27:392-396.
10. Singh BP, Pathak HR, Andankar MG. Dorsolateral onlay urethroplasty for anterior urethral strictures by a unilateral urethral mobilization approach. Indian J Urol 2009;25:211-214.
11. Barbagli G, De Angelis M, Romano G, Lazzeri M: Long-term followup of bulbar end-to-end anastomosis: a retrospective analysis of 153 patients in a single center experience. J Urol 2007;178:2470–2473.

12. Andrich DE, Mundy AR: Substitution urethroplasty with buccal mucosal-free grafts. J Urol 2001;165:1131–1134.
13. Pansadoro V, Emiliozzi P, Gaffi M, Scarpone P, DePaula F, Pizzo M: Buccal mucosa urethroplasty in the treatment of bulbar urethral strictures. Urology 2003;61:1008–1010.
14. Kulkarni S, Barbagli, Sansalone S, Lazzeri M: One-sided anterior urethroplasty: a new dorsal onlay graft technique. BJU Int 2009;104:1150–1155.