ORIGINAL ARTICLE

NON-TRANSECTING ANASTOMOTIC BULBAR URETHROPLASTY FOR URETHRAL STRICTURE DISEASE-EXPERIENCE FROM A HIGH-VOLUME SPECIALIST CENTRE

Imran Memon, Kashifuddin Qayoom Soomro, Zakir Hussain Rajpar, Aziz Abdullah*

Department of Urology, Liaquat University of Medical & Health Sciences, Jamshoro, *Liaquat National Medical College & Hospital, Karachi-Pakistan

Background: Urethral stricture disease has significant economic impact throughout world. The bulbar urethra is the commonest site for urethral strictures (Approx 50%) followed by penile urethra in most of the published literature. In developing countries trauma (road traffic accident and iatrogenic) is the leading cause of urethral stricture disease. Younger patients have usually idiopathic type as compare to old age group, which present more frequently with iatrogenic and trauma related urethral strictures. **Methods**: This Qausi Experimental study was conducted from May2012-June2016 of duration at Liaquat National Hospital Karachi. All the patients diagnosed with short urethral strictures related to bulbar urethra were included in this study. All the patients underwent non transecting bulbar urethroplasty. All patients were assessed preoperatively, peri-operatively and postoperatively and on follow-up visits as; on 2nd, 8th and 24th week. All the data regarding outcome was recorded on the Performa and analyzed on SPSS V20. **Results:** Total of 179patients were included, mean age was 38±SD15.3years (range 20–65years). Anatomically bulbar urethra was affected in 52% of the cases followed by bulbopenile, bulbomembranous region. Etiologically idiopathic type was found in 40% cases, while trauma 21%, iatrogenic injury 26% and UTI 13% were also reasons. Stricture length was mean1.1±SD 1.4 cm (range 0.5–2.5cm). Preoperative Uroflowmetry revealed mean Qmax of 10.5±SD 5.3 ml/sec. Mean operative time was 35±SD 4.6 minutes, 7 patients had conversion to other procedures (3.91%), Postoperative complications were minimal. Mean follow up was 12±SD 21 months (range 6 months to 3 years). On initial follow up at 8th week and 24th week, Qmax was significantly improved. Only 3 patients required DVIU after the 24th week. Initial success rate after 24th week was 98.3% and eventually 100% at the long-term follow-up. **Conclusion**: non-transecting anastomotic bulbar urethroplasty (NTABU) is a new standard of care for the short bulbar urethral stricture up to 2.5cm. Idiopathic aetiology, iatrogenic and posttraumatic urethral strictures in selective patients can safely be operated with this technique.

Keyword: Non-transecting; Bulbar Urethroplasty; Urethral strictures

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INTRODUCTION

Throughout the world urethral stricture disease have significant economic impact and cost around 1.5 million office visits and $191 million over a period of 10 years in the USA alone.[1] The bulbar urethra is the commonest site for urethral strictures (Approx 50%) followed by penile urethra in most of the published literature.[2] In developed countries, most urethral strictures are iatrogenic.[3] and data from developing countries indicates trauma (road traffic accident and iatrogenic) as leading cause of urethral stricture disease.[4] Age and aetiology is also well correlated by many authors and indicate that younger patients have usually idiopathic type as compare to old age group, which present more frequently with iatrogenic and trauma related urethral strictures 2.[5] Anatomically young patients have usually anterior urethral strictures as compare to old age which present with posterior urethral strictures.[6] Urethral stricture is a common and challenging disease in urology. Currently, there are numerous surgical procedures to treat this disease. Based on current evidence the Direct Visual Internal Urethrotomy (DVIU) is recommended for urethral strictures of less than 2cm in length.[7] Pal DK have reported poor long term results of DVIU (13.33% success rate after 3 years).[8] American Urology Association guidelines do suggest Urethroplasty as first option in management of bulbar urethral strictures less than 2cm in size. The current gold standard for urethral stricture is Excision of Stricture and Primary End-to-End Anastomosis (EPA).[9,10] Urethroplasty has shown success rate of more than 90% in initial and re-do procedures. Long and multiple strictures, specially involving Penile urethra are best managed with Augmentation procedures.[11,12] Daniela introduced the concept of non-transecting Anastomotic urethroplasty with the background that it minimizes the neurovascular compromise as compared to the standard technique of complete transaction and end-to-end anastomosis.[13] Mundy

et al published a series of 67 patients with urethral strictures treated with non-transaction Anastomotic Urethroplasty, he reported 97.7% radiological success rate at a mean follow up of 13 months.[14] Non-transecting Anastomotic Urethroplasty showed 2.6% Erectile dysfunction in long term follow up, which is comparatively lower than the traditional technique Excision and Primary end-to-end Anastomosis. Here we present our prospective data of Urethroplasty using technique of Non-transecting Anastomotic Bulbar Urethroplasty (NTABU).

MATERIAL AND METHODS

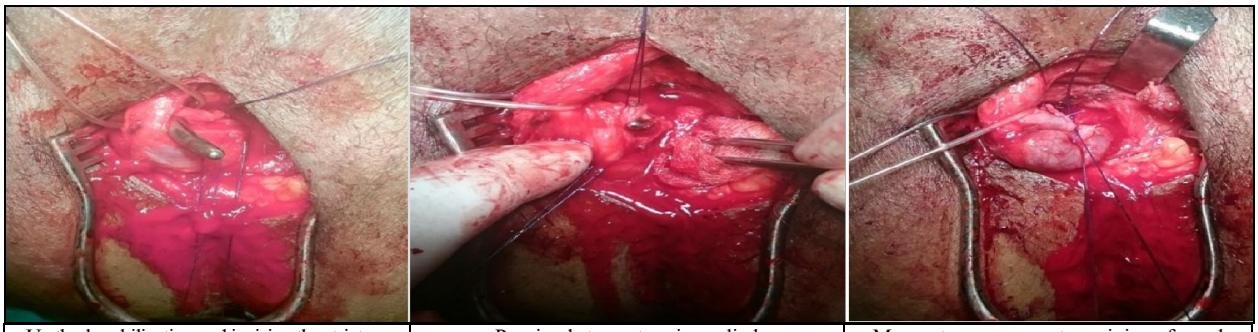
This experimental study was conducted at Liaquat National Hospital & Medical College, Karachi, Pakistan. This four-year Study was conducted from May 2012 to June 2016. All the patients diagnosed with short strictures of the urethra at bulbo-penile junction, bulbar urethra and bulbo-membranous urethra were included in the study. Complete medical history and clinical examination were carried out in all the cases. All the patients with severe co-morbidities (Ischemic heart disease, Diabetes Mellitus, Liver diseases, Hypertension, Dyslipidaemia) were excluded from the study. Before surgery all the patients were evaluated for renal Function tests, urinalysis and culture, complete blood count, Ultrasound KUB and post void residual, Uroflowmetry, Ascending & Descending Urethrogram. Written informed consent was taken from all the cases. Patients diagnosed with UTI were treated before the surgery. All the patients underwent non-Transecting Anastomotic Bulbar Urethroplasty technique as described and illustrated by Mundy *et al*.[14,15] The objective of this technique is to minimise the trauma and preserve the blood supply. Steps of the procedure are shown in figure-1. Postoperatively antibiotics and analgesia were given for 3 days.

On 1st day postoperatively patients were mobilized out of bed, drain output was marked and noted and dressing was changed. On 2nd postoperative day, redivac drain (if empty or negligible output) were removed, dressings were also removed and patients were discharged with catheter. All the patients were assessed on follow-up visits as; on 2nd, 8th and 24th week. All patients were asked verbally about penile function pre-operatively and during follow-up. Catheter removed after 2 weeks. In case, where the patient had obstructive genitourinary symptoms, an urethrogram was done before removing the catheter), UFM at 8th week and 24th week were carried for objective assessment of urinary flow, while Urethrogram was done if UFM shows obstructive pattern. All the data including the patient demographics, postoperative outcome variables were recorded on a preformed *pro forma* which was analyzed using SPSS 20, IBM, Armonk, NY, United States of America. Continuous variables were represented as percentage and frequencies while the categorical data were presented in the form of tables and graphs (Table: 1–3).

RESULTS

A total of 179 patients were included in the study, with a mean age±SD of 38±15.3 years ranging between 20–65 years. Anatomically, bulbar urethra was affected in 93 (52%) of the cases followed by bulbo-penile urethra in 52 (29%) and bulbo-membranous urethra in 34 (19%). According to aetiology, idiopathic type was found in 72 (40%) of cases, while trauma, iatrogenic injury and UTI were found in 38 (21%), 47 (26%), and 22 (13%) cases respectively. Mean length ±SD of stricture was 1.1±1.4 cm with range of 0.5–2.5 cm. Preoperative Uroflowmetry revealed mean Qmax ±SD of 10.5±5.3 ml/sec. (Table-1)

Mean operative time ±SD was 35±4.6 minutes. The mean blood loss was measured by quantifying the weight of gauze sponges pre and postoperatively which estimated to be <100 ml. 7 (3.91%) patients had conversion to other procedures. Post-operative complications were Scrotal swelling in 4 (2.2%) patients, wound dehiscence in 3 (1.67%) patients and wound infection in only 1 (0.5%) patient (Table-2). Mean follow up ±SD was 12±21 months ranging 6 months to 3 years. On initial follow up at 8th week and 24th week, urinary flow (Qmax) was 34±SD6.3ml/sec and 31±SD 8 ml/Sec respectively. Only 3 (1.7%) patients required Urethrogram and subsequent DVIU after the 24th week follow-up. Twelve (6.7%) patients reported erectile dysfunction at the initial follow up of 8th week and out of them 8 (4.5%) patients recovered at the 24th week and remaining recovered erectile function subsequently. Initial success rate after 24th week was 98.3% and eventually 100% at the long term follow up (Table-3). Strictures with variable aetiology in selective patients.



Urethral mobilization and incising the stricture	Proximal stay suture is applied	Mucosa to mucosa anastomosis is performed

Figure-1: Surgical Steps for Non-Transecting Anastomotic Bulbar Urethroplasty

Table-1: Demographic data (n = 179)

Age	**Mean±SD = 38±15.3 Years Range = 20–65years.**
Anatomical Site of Stricture	
Bulbar urethra	93 (52%)
Bulbar Penile urethra	52 (29%)
Bulbo membranous urethra	34 (19%)
Aetiology of Stricture	
Idiopathic	72 (40%)
Trauma	38 (21%)
Iatrogenic injury	47 (26%)
UTI	22 (13%)
Length of Urethral Stricture	
Mean±SD	1.1±1.4 cm.
Range	0.5–2.5 cm.
Initial Qmax ml/sec (mean±SD)	10.2±5.3 ml/sec

Table-2: Operative findings

Duration of Surgery	**(Mean±SD) = 35±4.6minutes.**
Estimated Blood Loss	100ml
Conversion to other procedures	7 (3.9%) 5 = EPA 2 = BMG Augmentation Urethroplasty.
Intra-operative Complications	Nil
Post-operative Complications (3.9%)	
Scrotal Swelling.	4 (2.2%).
Wound Dehiscence.	3 (1.67%).
Wound Infection.	1 (0.5%).

Table-3: Follow-up and success rate. (n=179)

	8th week Follow-up (n=179)	**24th week Follow-up (n=179)**	**Long-term Follow-up Mean 12±SD21 months (n=158)**
UFM – Qmax (mean±SD)	34±6.3ml/sec	31±8ml/Sec	29.2±4.5ml/Sec
Urethrogram	***	3	3
Auxiliary Procedure	***	3	
Urethral dilatation	***	***	***
Optical Urethrotomy	***	3	Successful
Redo Urethroplasty	***	***	***
Erectile Dysfunction			
Transient	12	4	Nill
Permanent	***	Nill	Nill
Overall Success			100%

DISCUSSION

This study was conducted at the specialized urethral reconstructive centre. Liaquat National Hospital is the 800 bedded and one of the largest private sector hospitals, it was established in 1953 and encompasses 37 medical and surgical sub-specialities. We encounter around 180–190 cases of urethral stricture disease. Data from registry indicate predominant young population (mean 40 years) and anatomically, bulbar urethra being the common site of involvement. Predominantly urethral strictures are treated with DVIU, and if Urethroplasty is indicative than non-transecting transecting Anastomotic Urethroplasty is performed at bulbar level. End-to-end Urethroplasty with or without substitution was commonly performed before 2012, but after the introduction of NTABU technique by Mundy *et al* frequency is decreased significantly.

By definition urethral stricture is an abnormal narrowing of the urethra resulting from spongio-fibrosis6, narrowness in urethra leads to bothersome voiding symptoms and objectively it is portrayed as low Qmax on uroflowmetry and narrow lumen in Urethrogram. Our data shows that younger age population is mostly affected (mean age 38Years) which is consistent with presenting age in European studies (mean age 34 years).[14] In our study all selected patients had bulbar-urethra related stricture, as conceptualized by Mundy *et al* that the bulbar urethra is muscle deficit at ventral aspect and relatively avascular

and longitudinal stricturotomy with tension free closure in horizontal plane can be performed. Here we report mean stricture length of 1.1±SD 2.1 cm with range of 0.5–2.5 cm, on comparison Andrich DE *et al* reported preliminary experience with stricture length of negligible length to 2 cm in length.[14] But with experience Mundy *et al* further reported mean stricture length of 1.6 cm with range of 0.2–3 cm[15] for NTABU and in other study with non-transecting bulbar urethroplasty using BMG he reported mean stricture length of 5.3 cm (ranging 3–8 cm) with mean excision of obliterative spongio-fibrosis component of 1.2 cm ranging 0.5–2 cm.

The data from this evolving technique is defiantly improving in terms of "only idiopathic" aetiology to iatrogenic, trauma and also in terms of range of stricture length which in last 5 years have increased from 1.5 cm to 3 cm with or without substitution of BMG.[15] Idiopathic aetiology was common in our cases 40.0% whereas Hussain *et al* reported trauma as leading cause of urethral stricture disease (49.5%) in the same geographic region4 which was 21% in our group of patients. This difference can be attributed to the study duration of the two studies. Ours is a four-year prospective study, while Hussain *et al* reported a 30-years retrospective data. Another factor could be that historically, RTA was associated with significant morbidity and mortality in developed as well as developing countries. In our study, mean operative time ±SD was 35±4.6 minutes, most of the previously reported studies regarding NTABU have not reported the operative time but it is definitely lesser than the EPA and substitution urethroplasty.[16]

The 10 years urethroplasty Data from the USA regarding immediate peri-operative complications reported 6.6% and wound related complications were about 1.1%, whereas we observed no immediate peri-operative complications and 3.6% wound related complications.[17] Granieri MA *et al* evaluated the post-operative complications and patient-reported complications of 10 years duration, which include 38% complications. Based on Clavien-Dindo Classification of surgical complications, majority of them were Grade I (60%) followed by Grade II (32%), Grade III (6%) and Grade IV (2%) complications.

Along with symptoms uroflowmetry is commonly being used as a non-invasive tool for the assessment of urethral stricture disease[18] many studies have shown the decrease in Qmax/sec (Quantity of maximum volume voided per second) is a strong indicator of recurrence of urethral strictures[19]. In our patient population, follow-up mean Qmax were 34 ml/sec, 31 ml/sec and 29 ml/sec at 8th week, 24th week and in long term follow up respectively. Mundy *et al* also reported mean Qmax of 35 ml/sec at 12 months follow-up in NTABU group[15] and Qmax 26.6ml/sec in non-transecting bulbar urethroplasty using buccal mucosal graft, which depicts similarity in results[16].

We observed transient erectile dysfunction in 6.7% of patients but no permanent erectile dysfunction in terms of long-term follow-up. This is in concordance with other studies that reported erectile dysfunction anywhere between 1–40%.[20] The recovery of sexual function can be attributed to the alleviation of inflammation and postoperative oedema. And the increased in over series of NTABU, Initial success was 98.3% and 3 patients had DVIU. Overall success rate was 100% which is consistent with experience of Barbagli *et al* (Success rate ranging from 81.8 to 100%). S. Bugeja *et al* also reported success rate of 97.9% in NTABU and 100% in Augmented NTABU.[16]

CONCLUSION

With almost negligible peri-operative complications and long-term complications. Although idiopathic urethral strictures are common worldwide, traumatic and iatrogenic factors are also significant contributors. Data from our high-volume centre shows that NTABU can also be performed with excellent safety profile and preserved erectile function in long-term. Further long-term follow-up is needed to incorporate this new technique in guidelines as standard of care in small urethral

AUTHORS' CONTRIBUTION

IM: Conceptualization of study design, data collection and analysis. KQS: Data analysis, write-up. ZHR: Data interpretation and literature search. AA: Conceptualization of study design, proof reading.

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Address for Correspondence:

Prof. Aziz Abdullah, Head of Urology Department, Liaquat National Medical College & Hospital, Karachi-Pakistan.
Cell: +92 333 274 5326
Email: dr.memon.imran@gmail.com