



## Management of post TURP strictures

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### Abstract

**Introduction** Urethral stricture is a well-known complication after transurethral surgeries. The incidence of urethral stricture after transurethral resection of prostate (TURP) varies between 2.2 and 9.8%. Most of the cases present within 6 months of transurethral surgery. Presentation is likely with poor flow, urinary tract infection or acute retention.

**Materials and methods** A prospective study was undertaken from January 2010–June 2017 for the management of post TURP stricture. A total of 170 patients with stricture urethra due to TURP were studied.

**Results** The age of patients was 54–87 years (mean age 67.34). The mean preop Qmax was 6.1 ml (range 0–15). The length of stricture varied from very short in the proximal bulbar to pan urethral stricture. Out of 170, 94 were treated with dorsal approach, 71 with ventral approach and 5 with simultaneous distal dorsal, proximal ventral approach. Five patients underwent endoscopic procedure. Mean BMG length was 6.25 cm (4–8) and width was 1.5 cm (1.3–1.8). Overall success rate was 82.43%.

**Conclusion** Urethral stricture is a well-known complication after transurethral surgeries. Post TURP can cause stricture at any part urethra. BMG mucosa Urethroplasty is the safe, feasible and offer long-term success in these patient and should be strongly considered over CIC and VIU. Ventral approach is best suited for proximal bulbar strictures close to membranous urethra. This is a continence preserving surgery.

**Keywords** Urethral stricture · TURP · Proximal bulbar stricture

### Introduction

Urethral stricture is a well known complication after transurethral surgeries. According to the Hofmann, the incidence of urethral stricture after transurethral resection of prostate (TURP) varies between 2.2 and 9.8%. Most of the patients present within 6 months of transurethral surgery [1, 2]. Presentation is likely with poor flow, urinary tract infection or rarely acute retention. Quite often these patients present with concomitant bladder neck contracture. Although the management of bladder contractures those affecting the anterior urethra has rarely been detailed. Management of these patients is challenging due to the proximity of these stricture to the external sphincter, risk of incontinence, near Obliterative presentation and associated poor outcomes endoscopically or using augmentation techniques surgically.

In past, various means of prophylaxis for preventing these strictures from occurring have been described including pre operative urethral dilatation, internal urethrotomy (Otis type) and application of Carboxymethyl cellulose postoperatively [1–4]. These measures do not work and are not recommended.

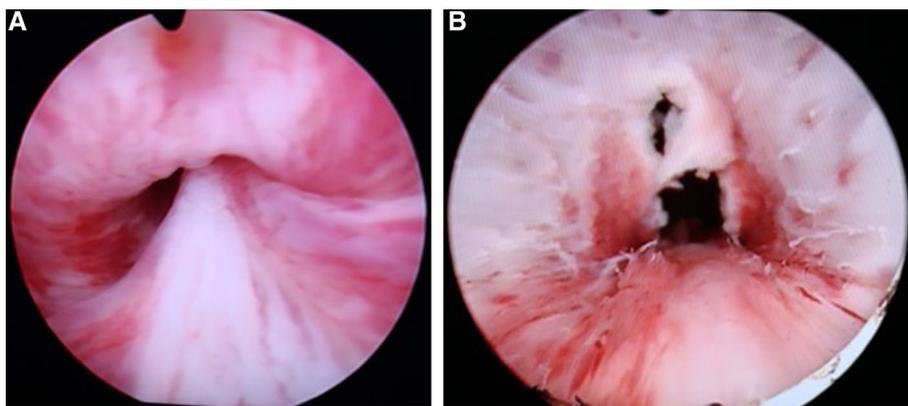
The normal male urethral meatus is 25 Fr in size, penile urethra 26 Fr and bulbar urethra widest at 30 Fr [5]. The use of 26 Fr/28 Fr resectoscope for the resection of prostate may traumatize the urethra and primarily responsible for these patients (Fig. 1a, b). Various associated factors for the pathogenesis like resection time, catheter type, duration of catheterization, size of catheter, final histopathology and urinary tract infection have been described but is probably a combination of all these leading to final pathology [4].

Furthermore, there have been various studies trying to analyse the set point when these stricture manifest or the flow rates when retrograde dye studies will identify a significant narrowing of the urethra [1, 2]. Unfortunately, the heterogeneity of the disease prevents any such conclusion to be made. Therefore, even for a peak flow of 10 ml/sec many

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**Fig. 1** Endoscopic view of proximal bulbar urethra before TURP (a) and after TURP (b)



patients were found to harbour significant narrowing of the urethra and hence the decrease in the peak flow might be a more informative outcome rather than the absolute value at a certain point of time.

The common site of these strictures has been meatus, fossa navicularis, peno bulbar (due to instrumentation through the anatomical bend in the urinary passage) (Fig. 2a, b) and pendulous urethral strictures [4, 5] and bulbar strictures. Most challenging is to manage are the proximal bulbar strictures. These strictures are very close to the membranous urethra. There is a risk of incontinence while treating these strictures. These are bulbar strictures and in the past were erroneously described as membranous/sphincter strictures [5]. Post TURP strictures can also be panurethral [4, 5]. Management has varied from endoscopic treatment for a short segment urethral stricture disease to augmentation techniques for a long segment urethral stricture of anterior urethra.

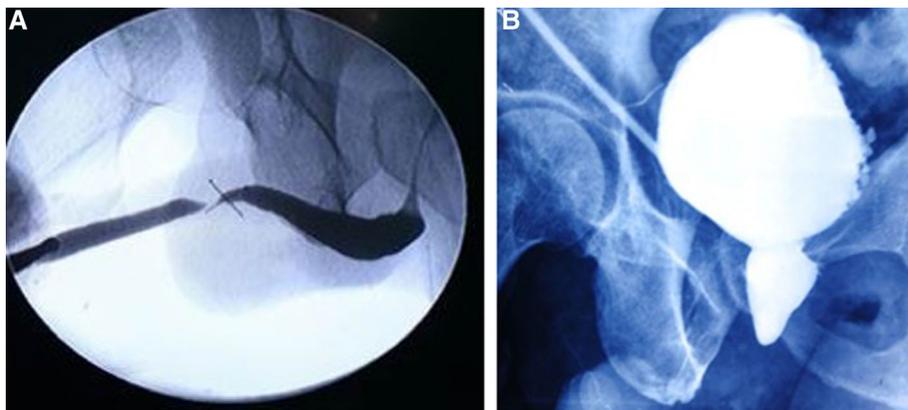
Our study pertains to the presentation of anterior urethral strictures following TURP, distribution of anatomical site and their management by endoscopic means, anastomotic techniques and buccal mucosa graft augmentation urethroplasty in varied application and analysis of the results. We try to bring forth the erroneously recognised ‘sphincter strictures’ which are actually the proximal bulbar strictures

and Achilles heel of any reconstructive centre dealing with strictures.

## Methods

This is a prospective data analysed from Jan 2010–June 2017 with a minimum follow-up of 12 months. Ours is a tertiary referral centre for reconstructive urethral surgery. These patients were referred from outside usually with a diagnosed stricture disease following TURP with poor flow and obstructive symptoms. We maintain a prospective database of all patients with diagnosis of urethral stricture disease. Patients were assessed, detailed history taken, examined along with the details of pre operative symptoms. Lower urinary tract symptom severity and International Prostate Symptom Severity score was charted. The operative notes of previous surgeons were analysed. The post operative course following the surgery was noted for duration of catheterization, any complications following surgery. The histopathology of the disease was noted for malignancy. If there was evidence of stricture preoperatively or during endoscopy while transurethral surgery then these patients were excluded from our study. Also patients with associated bladder neck contracture diagnosed either previously or on our evaluation

**Fig. 2** a Stricture at penoscrotal junction. b Obliterative stricture after TURP at bulbar urethra



were excluded. Time duration since the stricture occurrence was noted. Patients were subjected to retrograde and micraturating cystourethrogram. The length of stricture and site was assessed.

No intervention was done before 3 months of previous transurethral surgery. Choice was made between judicious endoscopic intervention or dilatation or a formal definitive reconstructive augmentation procedure. The patient was counselled with both the options and their respective success rates. The consenting patients were subjected to reconstructive urethroplasty. The type of procedure performed was dependent on site and length of stricture. Commonly performed procedures included dorsal onlay Buccal mucosa graft (BMG) urethroplasty and Ventral onlay BMG urethroplasty. All surgeries are performed under spinal plus general anaesthesia. We routinely perform small calibre endoscopy with 6 Fr Ureteroscope preoperatively. Methylene blue is injected in urethra, which helps in delineating the stricture. BMG was harvested from cheek and rarely from the lingual area if cheek is not healthy due to tobacco chewing. We do not harvest lip mucosa for cosmetic purpose. Dorsal onlay BMG for bulbar stricture was done using Barbagli [6] or Kulkarni technique [7] described previously. Panurethral stricture was managed using Kulkarni technique. Ventral onlay procedure was done using the technique described by Jack McAninch and Allen Morey [8] Catheter was removed on day 28 followed by Uroflowmetry and regular follow-up every 3 months and annually later. Evaluation included history and assessment of LUTS, physical examination and Uroflowmetry. Any decreased flow mandated retrograde study evaluation and if required endoscopic or urodynamic assessment.

## Results

The series comprised men aged 54–87 years (mean age 66.94) who presented with urethral strictures following TURP. We have treated 202 patients of post TURP strictures since 2000. The database is prospectively studied since 2010. Therefore, we have included patients from 2010 to 2017 with a minimum follow-up of 12 months. A total of 170 patients were included in the study of which 165 underwent urethroplasty and five were managed with endoscopic approach 34.1% of patient had diabetes, 29% had hypertension and 12.4% had prior history of Ischemic heart disease which was treated medically or surgically. The comorbidities could be due to the age factor of the patients who undergo TURP.

The mean Preop Qmax was 6.18 (range 0–15). The mean length of stricture for bulbar, penile and penobulbar were 1.95, 4.65 and 4.75, respectively. Panurethral stricture length was 16.75 cm. 106 patients had bulbar stricture, 19

**Table 1** Patient characteristic

<i>N</i>	170
Mean age	67.34 years (54–87)
Mean pre-operative Qmax	6.18 ml/s (0–15)
Mean length of bulbar stricture	1.95 cm (1–4)
Mean length of penile	4.65 cm (3–6)
Mean length of penile + bulbar	4.75 cm (3–8)

**Table 2** Distribution of the disease

<i>N</i>	170
Bulbar	143
Penile	5
Penile with bulbar	22

had panurethral strictures and 15 had penile and penoscrotal junction strictures. We do not get referrals for metal strictures as these are managed by local urologist with meatotomy and meatoplasty (Tables 1, 2).

Out of 170, 94 patients were treated with dorsal approach and 71 were treated with ventral approach. Five patients have concurrent distal and proximal stricture and treated with distal dorsal and proximal ventral approach. Mean BMG length was 6.25 cm (4–8) and width was 1.5 cm (1.3–1.8). Overall success rate was 82.43%. The post op hospital stay was around 48 h. None of the patients were lost to follow-up.

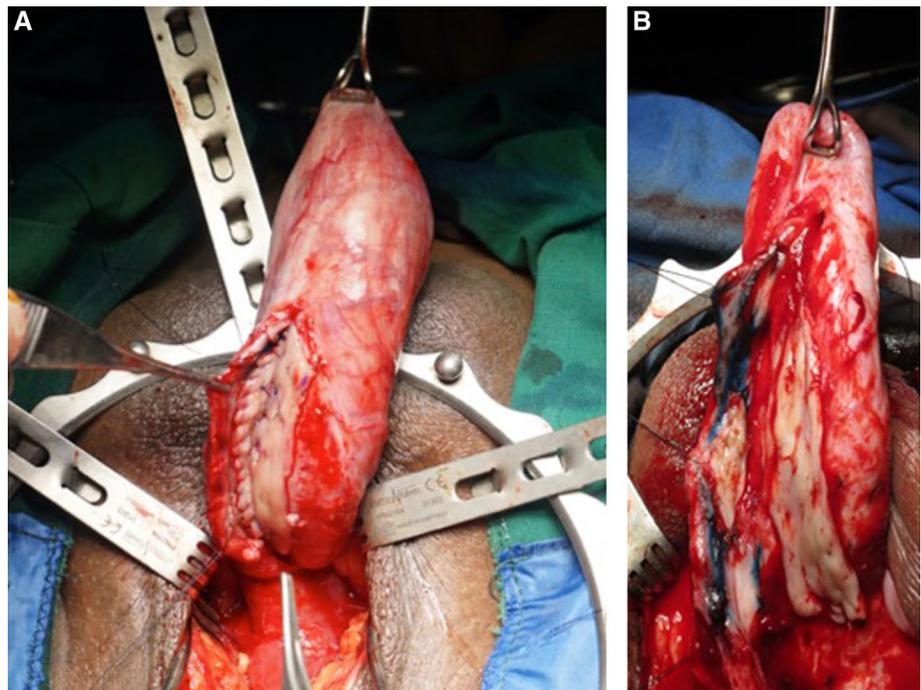
## Endoscopic approach

There were five patients referred with complex issues. There was complete obliteration at the proximal bulbar region close to the membranous urethra (Fig. 2b). Such patients are difficult to treat with urethroplasty. After TURP, continence depends on the membranous urethra. Any surgery in that region could jeopardise continence. In such patients, we prefer endoscopic approach. First, using Mini Nephroscope, bladder neck is assessed. Then Hey Groves curved bougie was passed through SPC tract and per-urethrally VIU knife was advanced through the centre of obliteration without cutting tissues towards the direction of the bougie. Then a give-way is noticed once we pass the obliterative short segment. A guide wire is inserted and tract dilated with Teflon dilators. All these patients are now performing self-intermittent catheterisation. Most importantly they are continent.

## Success rates

Success was defined as asymptomatic uroflow with no need of any instrumentation, dilatation or CIC and no urinary tract infections. The mean follow-up is 14 (range 6–192 months). Dorsal onlay urethroplasty (Fig. 3a) was

**Fig. 3** **a** Dorsal onlay buccal mucosa graft augmentation urethroplasty for penoscrotal junction stricture. **b** Double face buccal mucosa graft augmentation urethroplasty for near Obliterative stricture



successful in 84.61%, ventral onlay 81.81%. Double face urethroplasty (Fig. 3b) was successful in 83.33 patients. Failures were seen in patients who had near obliterative dense strictures and who presented very early within 3 months of TURP and retention of urine. Patients who underwent endoscopic management were excluded for defining success of urethroplasty.

## Discussion

The site of Post TURP strictures is well known, the meatal being the commonest followed by the bulbar because of the abrupt change in anatomy of urethra at that point. But most studies describe membranous stricture or sphincter stricture frequently which to our experience has been the proximal bulbar strictures at large [5].

The management of such strictures has varied widely. This has been dilation endoscopically, anastomotic urethroplasties and augmented approaches to urethral reconstruction [1, 5]. But none of the studies in past convincingly audit the patients who present with strictures after transurethral surgery especially TURP. In our study, the most common site was bulbar urethra followed by panurethral. The proximal bulbar region was affected more than mid to distal bulbar urethra.

The mean pre operative maximum flow rate at presentation was 6.1 ml/sec (0–15) which is comparable with the literature [1, 5]. While we managed most of our patients with reconstructive approach, the frequently used technique

has been that of dilatation and other endoscopic means [1]. The overall success rate was 70.70%. Best success rate was with dorsal onlay technique for bulbar strictures 84.61% followed by double face 83.33%. Panurethral stricture repair (Kulkarni technique [5]) of 84%. All these results mimic those of any other pathology including inflammatory or associated BXO. The ventral onlay BMG grafts results are almost same as dorsal onlay with success rates of 81.81%.

The very fact that all pendulous, panurethral and dorsal onlay technique for bulbar strictures yielded reasonable results underlines the fact that these strictures are candidate for augmentation techniques routinely used for other causes. Also, philosophically these are ischaemic strictures likely to fare poorly with anastomotic techniques and with the risk of incontinence, anastomotic urethroplasty is not the best option for such stricture.

## Issue of the so-called sphincter stricture and the continence preservation

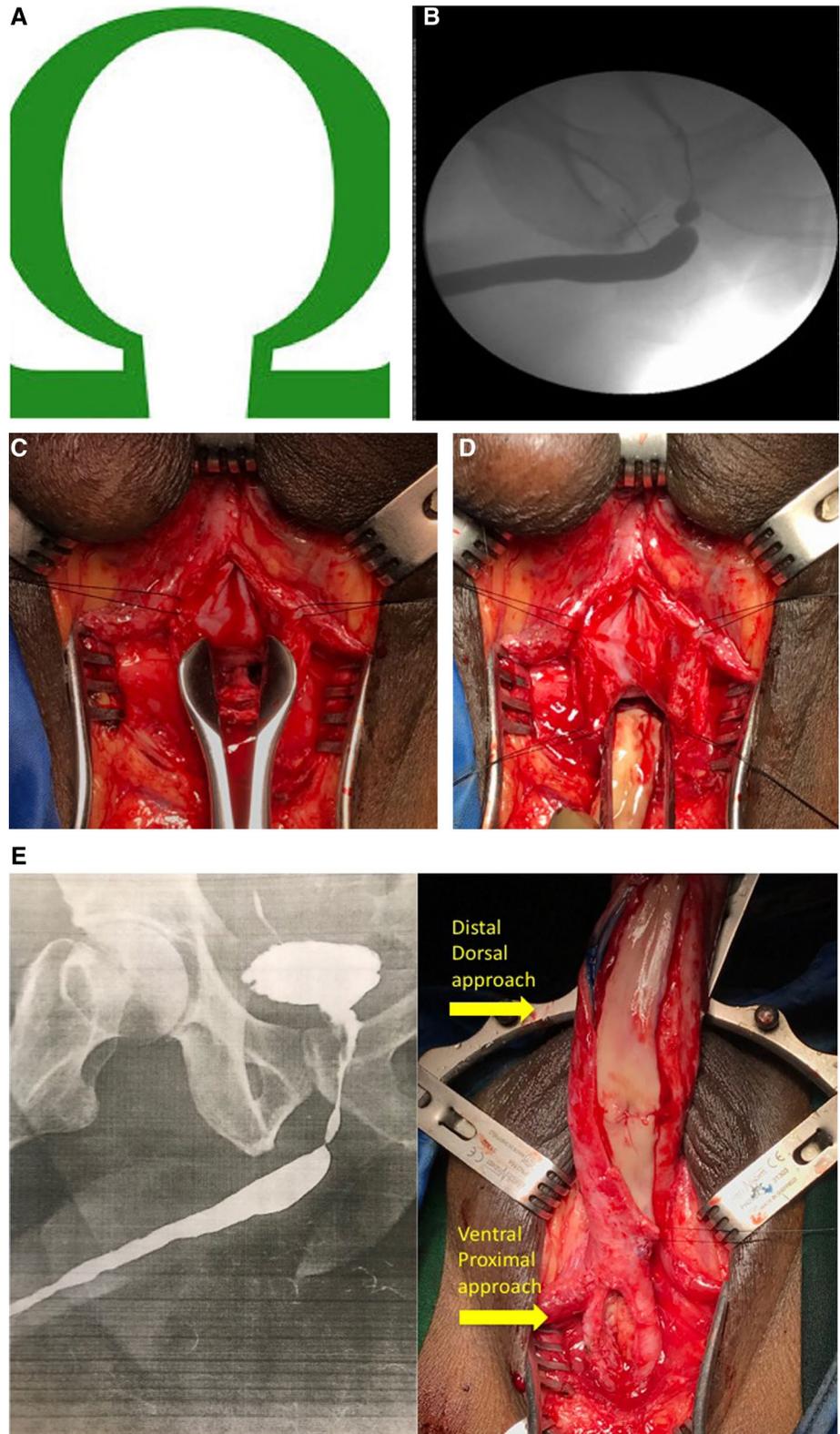
Turner Warwick wrote about post prostatectomy sphincter stricture [9]. As the bladder neck is non functional due to surgery the continence depended on the external sphincter. After open surgery for enlarged benign prostate the finger dissection at the apex of the prostate may lead to prostatico-membranous stricture. A gentle dilation was advised for the fear of continence.

We have continued to call post TURP proximal bulbar stricture erroneously as bulbo-membranous or sphincter urethral strictures. These are short proximal bulbar urethral

stricture close to the membranous urethra (Fig 4a). The membranous urethra/external sphincter Omega shaped, deficient posteriorly. If dorsal approach is performed, we

may have to incise the full thickness of urethra. This can cause injury to external sphincter and lead to incontinence. In the ventral approach, we incise only the mucosa over the

**Fig. 4** **a** Anatomy of external urethral sphincter which is a omega-shaped stricture deficient posteriorly. **b** Proximal bulbar stricture after TURP close to membranous urethra. **c** Ventral onlay urethroplasty showing urethra incised ventrally, veru is seen in the picture. **d** Ventral onlay buccal mucosa graft augmentation urethroplasty. **e** Distal dorsal and proximal ventral onlay buccal graft mucosa urethroplasty



**Table 3** Approach used for urethroplasty

<i>N</i>	170
Dorsal approach	82
Ventral onlay BMG urethroplasty	71
Distal dorsal and proximal ventral	5
Double face	12

**Table 4** Therapeutic procedures and their success rate

Overall success rate	82.43%
Dorsal onlay BMG urethroplasty	84.61%
Ventral onlay BMG urethroplasty	81.81%
Double face	83.33%

**Table 5** Distribution of the modality of energy used for prostate surgery

Monopolar/bipolar	98
Holmium	37
Thulium	5 (recent)

Mean of interval of presentation following TURP 6.4 months (3–24)

Mean follow up 14 (18–210 months)

Mean size of prostate gland on ultrasonography: 37.8 g (29–68)

stricture and insert BMG proximally. The surgery is intra urethral and there is no risk of damaging external sphincter (Fig. 4b). Therefore, Ventral onlay approach is best suited for very proximal post TURP strictures close to membranous urethra (Fig 4c, d). We have modified our approach since 2013 and none of our patients of these very proximal bulbar stricture are incontinent after urethroplasty.

### New approach for concurrent penile and proximal bulbar strictures

In the last 2 years, we have seen five patients with distal urethral stricture and concurrent proximal bulbar strictures. Distal strictures are treated with dorsal approach (Table 3). Extending the dorsal approach to proximal bulbar urethra may lead to incontinence. We have above explained the merits of ventral approach for proximal post TURP strictures, which is continence preserving. We now perform distal dorsal onlay and proximal ventral onlay BMG urethroplasty for patients with distal and proximal concurrent strictures (Fig 4e).

By and large the stricture occurrence following the inception of transurethral surgeries has remained uniform despite the steps taken to prevent it. However, our reconstructive techniques have increased in armamentarium over time and Urethroplasty can give good results for majority of post TURP strictures (Table 4). As per our data, the energy source has not affected the referrals of post TURP strictures (Table 5). We have seen strictures after Monopolar/Bipolar TURP, Holmium and Thulium laser prostatectomy.

## Conclusion

Urethral stricture is a well-known complication after transurethral surgeries. Post TURP can cause stricture at any part urethra. BMG mucosa Urethroplasty can cure this patient and should be strongly considered over CIC and VIU. Proximal bulbar strictures, close to membranous urethra are best treated with continence preserving, intraluminal ventral onlay BMG urethroplasty. Urethroplasty can provide a long-term solution for post TURP strictures.

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