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Original Article

Patient-Reported Outcome Measures Using Modified Urethral Stricture Surgery: Patient-Reported Outcome Measure for Direct Visual Internal Urethrotomy and Nontransecting Urethroplasty for Short Nontraumatic Bulbar Urethral Stricture – A Prospective Comparative Observational Study from a University Teaching Hospital

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Abstract

Purpose: To evaluate the patient-reported outcomes of primary direct visual internal urethrotomy (DVIU) and nontransecting bulbar urethroplasty techniques (NTBU) for the short segment (<2 cm) nontraumatic bulbar urethral stricture using the modified urethral stricture surgery patient-reported outcome measures (USS PROMs). **Materials and Methods:** The USS PROM questionnaire used to evaluate lower urinary tract symptom (LUTS) was modified by adding a six-item International Index of Erectile Function and a four-item version of MSHQ-EjD to evaluate erectile and ejaculatory domains. All cases of short nontraumatic bulbar urethral stricture who underwent primary DVIU and NTBU who consented were asked to fill the modified PROM at initial evaluation, at 6 months, and at 1 year. **Results:** The LUTS score for NTBU at 12 months is significantly better (1.93 ± 2.13 vs. 8.76 ± 5.92, $P = 0.000$). The Peeling score of the NTBU is significantly better at 12 months (1.41 ± 0.68 vs. 2.67 ± 0.73, $P = 0.000$). The erectile function score at 12 months for NTBU is better than DVIU (24.37 ± 3.2 vs. 21.143 ± 2.86, $P = 0.001$). The Ejaculatory function score at 6 months and 12 months is significantly better for the NTBU. Receiver operating characteristic (ROC) AND Odd's Ratio analysis for analyzing patient satisfaction showed erectile function (area under ROC [AUROC] - 0.889, $P < 0.001$), ejaculatory function (AUROC - 0.957, $P < 0.001$) at 1 year and maximum flow rate of urine on uroflometry (Qmax) (AUROC - 0.928, $P < 0.001$) at 6 months and (AUROC - 1.000, $P < 0.001$) at 1 year. The overall satisfaction rates in patients undergoing NTBU is 96.5%. **Conclusion:**

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NTBU shows superior outcomes in almost all domains of USS-PROM with better overall satisfaction rates. Improvement of sexual function domain, followed by the LUTS domain was the best predictor of overall patient satisfaction and improvement in the quality of life at 1 year.

Keywords: Direct visual internal urethrotomy, sexual function, stricture urethra, urethral stricture surgery patient-reported outcome measure, urethroplasty

Introduction

Urethral stricture is characterized by fibrosis of the urethral mucosa and underlying spongiosum and is caused by traumatic or nontraumatic etiology. It is a cause of voiding difficulty in young- and middle-aged men.[1] Stricture can affect any part of the male urethra but most often occurs in the bulbar segment.[2] The optimal management of bulbar strictures is still debated.[3] For many years, direct visual internal urethrotomy (DVIU) was conventionally used as a first-line surgical management for these patients. However, the failure rate of DVIU is at least 50%.[4] Complete transection of the urethra with excision and primary anastomosis (EPA) is the treatment of choice for patients who failed to respond to the first-line management by DVIU.[5] Recently, there have been increasing concerns that complete urethral transection may adversely affect urethral and spongiosum blood supply resulting in sexual side effects.[6]

Nontransecting urethroplasty avoids complete transection of the urethra and healthy corpus spongiosum and thereby has the potential to prevent the risks associated with sexual dysfunctions.[7] Moreover, nontransecting bulbar urethroplasty (NTBU) is promising in terms of success and sexual satisfactory rates.[5,8] Therefore, this study aimed to evaluate the patient-reported outcomes of DVIU and NTBU for the short segment (<2 cm) bulbar urethral strictures using modified urethral stricture surgery patient-reported outcome measures (USS PROM).[9]

Materials and Methods

Institutional Ethics Board and CTRI (CTRI/2020/02/023578) approved this prospective observational comparative study. Patients with urethral stricture were assessed clinically and investigated using a retrograde urethrogram and a micturating cystourethrogram to measure the length of the stricture. We excluded the patients with traumatic etiology, age <18 years, not sexually active, those not willing to participate in filling questionnaires, and those lost to follow-up. The primary stricture was defined as no prior intervention, including dilatation, DVIU, or urethroplasty.

This study included cases with nontraumatic bulbar urethral strictures of size <2 cm undergoing nontransecting urethroplasty (n = 29) and primary DVIU (n = 24) between September 2018 and September 2019. Patients were asked to fill the modified USS PROM form before surgery at 6 months and 12 months postoperatively during follow-up [Figure 1 and Table 1].

DVIU was performed using a single incision with a cold knife at the 12 o'clock position. Based on the stricture length as per preoperative and intraoperative assessment, we used the most suitable nontransecting urethroplasty techniques, such as the Heineke-Mikulicz (H-M) technique, non transecting anastomotic bulbar urethroplasty (NTABU), augmented nontransecting anastomotic bulbar urethroplasty (ANTABU) technique and dorsal onlay buccal graft urethroplasty. Recurrence of stricture was defined as any intervention, including self-dilatation, dilatation, DVIU, and urethroplasty.

Procedures for nontransecting urethroplasty–surgical techniques:

Heinke– mikulicz urethroplasty

When the stricture was effectively only one or two millimeters long, we performed a stricturoplasty rather than excise it. Once the stricturotomy was made, only an extremely narrow strip of denuded spongiosum remained. The mucosal margins on either side of this were sutured, and the longitudinal stricturotomy was closed transversely [Supplementary Figures 1-9].[10]

Nontransecting excision of the stricture and mucosal anastomosis

If the stricture is more than just a membrane (up to two centimeters and sometimes longer), the scarred epithelium with the surrounding spongiofibrosis was excised, leaving the healthy underlying spongiosum intact. The mucosal edges on either side of the excised segment were sutured to each other. The ability to bring these two edges together tension-free after adequate mobilization of the bulbar urethra and corporal separation. If necessary, the length of stricture was dictated. The longitudinal dorsal stricturotomy was then closed transversely.[10]

Augmented nontransecting excision of the stricture and mucosal anastomosis

A focal area of more pronounced urethral stenosis is a common finding of the long bulbar stricture. In such cases, this short area of spongiofibrosis might be excised in a nontransecting fashion and the urethral plate reconstituted ventrally by a mucosa-to-mucosa anastomosis. The dorsal stricturotomy is then augmented with a buccal mucosal graft in what is known as the augmented non-transecting anastomotic urethroplasty technique.[11,12]

Modified patient-reported outcome measure: Scoring system

Lower urinary tract symptom domain

- The lower urinary tract symptom (LUTS) domain comprised six summative questions from previous international reports.[10] In addition, in consultation on the incontinence questionnaire male LUTS module,[10] the symptoms, including hesitancy, stream, strain,

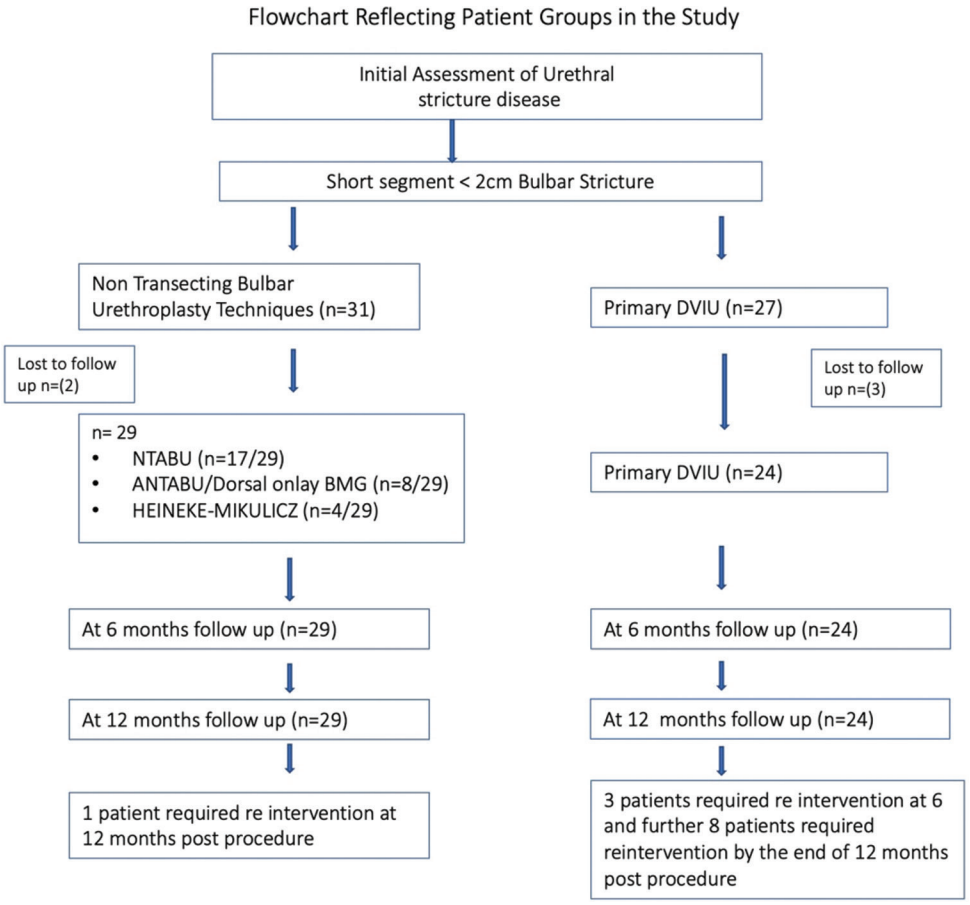

Figure 1: Flowchart of the study design and patient groups

intermittency, incomplete emptying, and postmicturition, were assessed to generate a total score between 0 (least symptomatic) and 24 (most symptomatic)

- Peeling's voiding picture:[11] an illustration of a man voiding wherein the respondent circles an integer between 1 (best) and 4 (worst) corresponding to their uroflow pattern then
- A Likert-scaled LUTS-specific quality of life[12] question was asked as "Overall, how much do your urinary symptoms interfere with your life?"

The EuroQol (EQ) Visual Analog Scale and EQ-5D descriptive system of the original USS PROM were excluded during the evaluation in this study questionnaire.

Sexual function domain

Erectile function was assessed by the modified six-item International Index of Erectile Function 16 questionnaire addressing the various aspects of erection.

The ejaculatory function was addressed by the four-item version of the Male Sexual Health Questionnaire-Ejaculatory dysfunction to assess ejaculatory function [MSHQ-EjD],[13] wherein the last question evaluated the bother or satisfaction of the patient.

Uroflowmetry was performed at baseline(excluding those on a suprapubic catheter), at 6 months and 1 year postoperatively for objective assessment during their follow-up.

Statistical analysis of the LUTS domain and bother/satisfactory score of the MSHQ-EjD was done using the–Whitney test. Erectile function score, MSHQ-EjD, and Qmax are analyzed using the ANOVA test and AUC-receiver operating characteristic (ROC) curves for satisfaction analysis.

Results

The LUTS score of the nontransecting urethroplasty procedures at 6 months was significantly improved by the end of the study (1.93 ± 2.13 vs. 8.76 ± 5.92, $P < 0.001$), the peeling score was significant at 6 months (1.59 ± 0.56 vs. 2.26 ± 0.96, $P < 0.001$) and 12 months (1.41 ± 0.68 vs. 2.67 ± 0.73, $P < 0.001$). Moreover, the erectile function score was significant at 12 months (24.37 ± 3.2 vs. 21.143 ± 2.86, $P = 0.001$), ejaculatory function score and bother/satisfaction score was significant at 12 months (14.00 ± 1.0 vs. 11.76 ± 1.78, $P < 0.001$), (0.55 ± 0.68 vs. 1.57 ± 0.87, $P < 0.001$). In addition, improvement of uroflowmetry (Qmax) was significant in the urethroplasty group at 6 months (25.81 ± 2.83 vs. 18.55 ± 4.15, $P < 0.001$) and 12 months (26.7 ± 4.08 vs. 15.35 ± 5.16, $P < 0.001$) [Table 2] [Figure 2].

Of 29 patients in the nontransecting urethroplasty group, eight had prior DVIU or dilatations, five underwent ANTABU or dorsal onlay BMG, and three underwent NTABU. One patient with prior multiple DVIU, who had undergone ANTABU, required re-intervention at 12 months. Moreover, two patients who underwent ANTABU had postmicturition dribble without bothersome. In contrast, 28 patients were satisfied or very satisfied with the procedure, and one was unsatisfied. Of 24 patients who underwent primary DVIU, 11 required re-intervention by the end of the study and were unsatisfied or very unsatisfied.

The area under the ROC curve (AUROC) [Supplementary Figure 10] was analyzed for LUTS 1-year predicting satisfaction. The diagnostic performance was fair because satisfied versus unsatisfied was 0.768 (95% confidence interval [CI]: 0.531–1.000). Similarly, predicting peeling satisfaction 1 year after operation showed fair diagnostic performance because the satisfied versus unsatisfied was 0.7 (95% CI: 0.458–0.942) ($P = 0.005$). Moreover, predicting satisfaction for erectile function at 1 year showed statistically significant ($P = 0.029$), and satisfied versus unsatisfied was 0.889 (95% CI: 0.789–0.989), suggesting good diagnostic performance ($P < 0.001$).

Meanwhile, the AUROC for predicting satisfaction of the ejaculatory function at 1 year showed excellent diagnostic performance (satisfied *vs*. unsatisfied, 0.957 [95% CI: 0.902–1.000, $P < 0.001$]). Moreover, predicting satisfaction on ejaculatory bother score at 1 year showed fair diagnostic performance (satisfied versus unsatisfied, 0.745 [95% CI: 0.553–0.937] [$P = 0.007$]).

Discussion

As the DVIU is relatively easy to perform outpatient, it is the procedure of choice among urologists for treating short-segment structures, despite poor long-term success rates.[14] If patients fail to respond to the first-line management by DVIU, transection of the urethra with EPA is the surgical treatment of choice for these patients because of its long-term success rates of 90%–98.6%.[15]

This study revealed that nontransecting urethroplasty offers statistically better surgical outcomes in nontraumatic short bulbar urethral strictures. Transection of the urethra and corpus spongiosum for short-segment bulbar strictures was first challenged at the American Urological Association meeting in 2009.[16] The debate in favor or against transection with EPA

Table 1: Baseline characteristics of the study population

	Nontransecting urethroplasty ($n=29$)	DVIU ($n=24$)
Age (mean±SD)	46.79±0.79	51±0.20
Stricture location		
Proximal bulbar	8	6
Proximal and mid bulbar	9	4
Mid bulbar	7	8
Mid and distal bulbar	3	3
Distal bulbar	2	3
Stricture etiology		
Idiopathic	14	10
Iatrogenic	9	11
Inflammatory	6	3
Stricture length (mean±SD)	1.31±0.50	1.16±0.44
Previous intervention		
None	21	24
DVIU	6	-
Dilatation	1	-
Multiple DVIU/dilatations	1	-
Urethroplasty	-	-

SD: Standard deviation, VIU: Visual internal urethrotomy, DVIU: Direct VIU

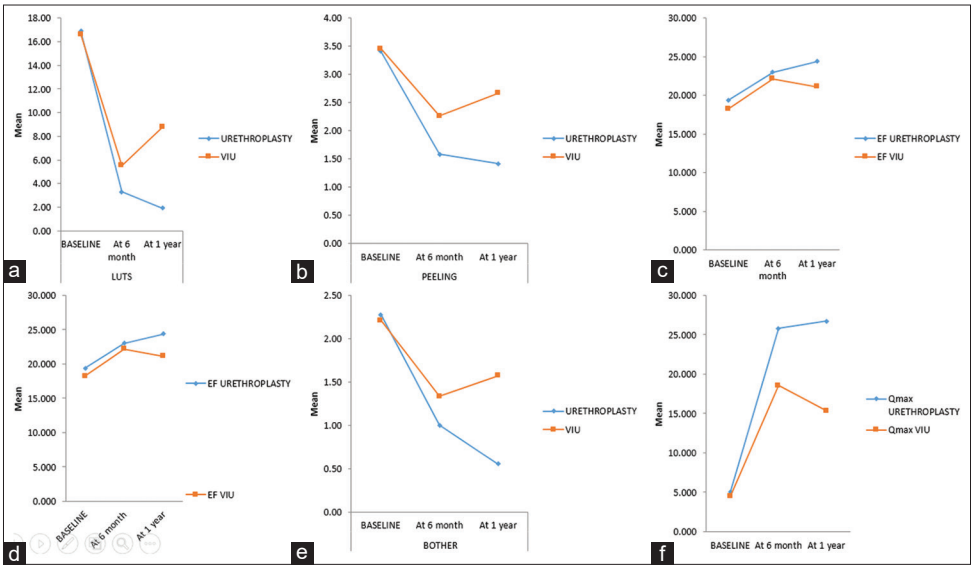

Figure 2: (a) LUTS Score, (b) peeling voiding picture score, (c) erectile function score, (d) ejaculatory function score, (e) ejaculatory function-bother score, (f) uroflowmetry (Qmax). LUTS: Lower urinary tract symptom

Table 2: Statistical analysis of variables

	Mean±SD		*P*
	Urethroplasty (*n*=29)	VIU (*n*=24)	
LUTS score			
Baseline	16.90±5.1	16.63±4.4	0.879
6 months	3.31±2.14	5.54±5.88	0.605
1 year	1.93±2.13	8.76±5.92	0.000
Peeling voiding picture score			
Baseline	3.41±0.56	3.46±0.50	0.838
6 months	1.59±0.56	2.26±0.96	0.007
1 year	1.41±0.68	2.67±0.73	0.000
Erectile function score			
Baseline	19.37±3.45	18.25±2.38	0.181
6 months	23±3.63	22.16±3.43	0.398
1 year	24.37±3.2	21.143±2.86	0.001
Ejaculatory function score			
Baseline	11.31±2.2	10.58±1.12	0.165
6 months	13.41±1.18	12.33±1.49	0.005
1 year	14.00±1.0	11.76±1.78	0.000
Ejaculatory function - bother/ satisfaction score			
Baseline	2.28±1.36	2.21±0.83	1.000
6 months	1.00±0.75	1.33±0.86	0.165
1 year	0.55±0.68	1.57±0.87	0.000
Qmax			
Baseline	5.03±1.20	4.48±1.70	0.192
6 months	25.81±2.83	18.55±4.15	0.000
1 year	26.7±4.08	15.35±5.16	0.000

SD: Standard deviation, LUTS: Lower urinary tract symptom, VIU: Visual internal urethrotomy

and nontransecting techniques is based on the success rates and adverse sexual dysfunctions associated with complete transection. EPA is best suited for traumatic strictures with full-thickness spongiofibrosis and no remaining vascularized spongiosum tissue. In nontraumatic strictures, the corpus spongiosum is usually well preserved with minimal scarring of around 10% involving the urethral wall unless there have been prior interventions.[2] Hence, EPA for nontraumatic strictures inevitably transects healthy corpus spongiosum and is associated with an 18%–22.5% incidence of sexual dysfunction.[17,18]

Jordan and colleagues[19] were the first to promote the idea of vessel sparing bulbar urethroplasty which laid foundation for Non-transecting bulbar urethroplasty techniques[3] with the aim to avoid the potential morbidity associated with transection of corpus spongiosum.

The most pronounced obstructive symptoms in urethral stricture disease are a weak stream, dribbling, and incomplete emptying.[20] Therefore, the primary goal in stricture management is the restoration of the unimpeded flow of urine with minimal sexual dysfunctions.[21]

Our study observed significant improvements in LUTS score, peeling voiding picture score, and uroflowmetry (Qmax) in the nontransecting urethroplasty group compared to the primary DVIU group. The difference in LUTS score was not statistically significant at 6 months, but a worsening in LUTS score and Qmax was noted in the DVIU group by the end of 12 months. More durable and sustained long-term outcomes can be achieved with nontransecting urethroplasty rather than DVIU for short-segment bulbar strictures. Numerous studies reported sexual dysfunction following surgery for urethral strictures, but outcomes in most studies are heterogeneous.[22] Our study's results were homogeneous because of the selection of patients with only nontraumatic, short-segment (<2 cm) bulbar urethral strictures.

We reported statistically significant improvement in erectile function scores of the nontransecting urethroplasty group at 12 months. The explanation for the improvement of erectile function could be the recovery of neuropraxia, decrease in tissue inflammation following surgical manipulation and psychosomatic recovery, and the elimination of a suprapubic catheter after surgery, improvement of body image as well as psychological factors contributing to possible explanations for the improvement in erectile function.[23,24] Moreover, the preservation of healthy spongiosum maintained sexual function.

Ejaculatory function scores of the nontransecting urethroplasty group were statistically higher at the end of 12 months. The significant improvement of ejaculatory score in the urethroplasty group can be asserted to the resection of scarred and noncontractile part of the urethra/spongiosum, which improves the rhythmic ejaculatory mechanism by restoring the continuity of the musculature.[25] The improvement of ejaculatory function in the DVIU group can be ascertained as the resolution of urethral obstruction.[24] The studies on ejaculatory function are sparse for both nontransecting urethroplasty and DVIU. In addition to erectile and ejaculatory function, decreased penile sensitivity and cold glans syndrome after surgery can lead to decreased sexual satisfaction.[26] No patient in the study had *de novo* erectile dysfunction or complained of altered glans sensitivity/turgidity. Similar observations have been reported by retrospective studies performed nontransecting for short-segment bulbar stricture.[3,5]

The satisfaction rate in the NTBU group was 96.5% which was consistent with previous findings.[3,5] One patient in the group with prior multiple endoscopic interventions and who underwent ANTABU required endoscopic dilatation and was not satisfied with the surgical outcome [Supplementary Table 1].

Two patients (8%) who underwent ANTABU in the urethroplasty group had postmicturition dribble, which was not bothersome. Postmicturition dribble could be because of impaired function of perineal nerve branches from the surgical dissection.[21,23] Similar rates of postmicturition dribble (13.8%) were also noted by Ivaz *et al*.[5]

Eleven patients (46%) of the primary DVIU group required re-intervention and were unsatisfied with the outcome. Therefore, the patients who were very satisfied and satisfied

Table 3: Lower urinary tract symptom and sexual function domain subgroup analysis – Nontransecting urethroplasty group

	H-M ($n=4$), mean	NTABU ($n=17$), mean	ANTABU/dorsal onlay BMG ($n=8$), mean
LUTS score			
Baseline	18.25	17.29	15.37
6 months	2	3.7	3.12
1 year	0.75	1.94	2.5
Peeling voiding picture score			
Baseline	3.25	3.41	3.5
6 months	1.5	1.588	1.62
1 year	1	1.47	1.5
Erectile function score			
Baseline	21.5	20.35	16.25
6 months	26.5	22.94	21.35
1 year	28	24.11	23.125
Ejaculatory function score			
Baseline	12.25	11.23	11
6 months	14.25	13.29	13.25
1 year	14.5	13.94	13.87
Ejaculatory function- bother score			
Baseline	1.75	2.29	2.5
6 months	0.75	0.941	1.25
1 year	0.5	0.52	0.625
Qmax			
Baseline	5.1	4.83	5.44
6 months	27.9	26.24	23.85
1 year	28.8	27.5	24.02

H-M: Heineke-Mickulicz, NTABU: Nontransecting anastomotic bulbar urethroplasty, ANTABU: Augmented NTABU, BMG: Buccal mucosal graft

after surgery had reasonable maximum flow rates, low LUTS scores, and improved sexual function. Conversely, the patients unsatisfied with the surgery had low flow rates, high LUTS scores, and modest sexual function. Hence assessing the subjective outcomes of PROM can help achieve a holistic approach to the follow-up and preoperative decision-making of the patient.

The success rate of the nontransecting urethroplasty was 96.5% in our study. Similar success rates were noted in other studies.[3,5] As most strictures recur in the 1st year posturethroplasty,[27] a subjective and objective stricture-free rate of 96.5% at 12 months might be a satisfactory outcome in the long term. However, most studies published on the outcomes of DVIU are conglomerates of variable lengths and etiologies; hence, they cannot provide a complete picture of the DVIU outcome. The success rate of DVIU in prior studies was 60% for the primary DVIU, 20% for the second DVIU, and almost 0% after the third DVIU. The success rate of primary DVIU in our study was 54% in a homogeneous group of primary DVIU for short-segment bulbar stricture.

Our findings suggested that the improvement of the sexual function domain was the best-discriminating factor between the satisfied and unsatisfied group, followed by the LUTS domain. However, the physician's view (objective improvement in uroflowmetry) might differ from what the patient perceives (patient's reported outcomes). Therefore, it is important to the patient's perception of successful outcomes, and minimal sexual dysfunctions are expected, along with a good urinary stream.

Among the nontransecting urethroplasty techniques, H-M and NTABU showed superior outcomes in all the domains and better satisfactory rates [Table 3]. However, it is hard to comment on the superiority of one technique over the other because of the small sample size, short follow-up, and nonrandomization in this study. Nevertheless, H-M and NTABU techniques had satisfactory outcomes when we chose the right case.

Moreover, prior DVIU/dilatations increase the complexity of the inevitable urethroplasty.[28] The patients in the nontransecting urethroplasty group with previous interventions with DVIU/dilatations had to undergo relatively more complex reconstructions. They had inferior LUTS and sexual outcomes compared to those with no prior interventions [Supplementary Table 2].

Limitations

This study was conducted at a single tertiary care facility with a limited number of cases. Therefore, a multi-institutional study with a larger sample size in which different surgeons operate should be conducted in the future for a better understanding of this issue.

Conclusion

In our study, the outcomes in terms of voiding, erectile, and ejaculatory function as assessed by modified USS PROM seen in patients who underwent NTBU compared to DVIU for nontraumatic short-segment bulbar urethral stricture at 6 months follow-up were comparable. Still, NTBU was statistically superior to DVIU in almost all domains of USS PROM at 1-year follow-up. We also noted that the improvement of the sexual function domain, followed by the LUTS domain, was the best predictor of overall patient satisfaction at the end of 1 year [Supplementary Table 3]. In conclusion, NTBU techniques have more durable outcomes in voiding, erectile, and ejaculatory function at 1-year follow-up.

Data Availability Statement

The datasets generated during and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Nil.

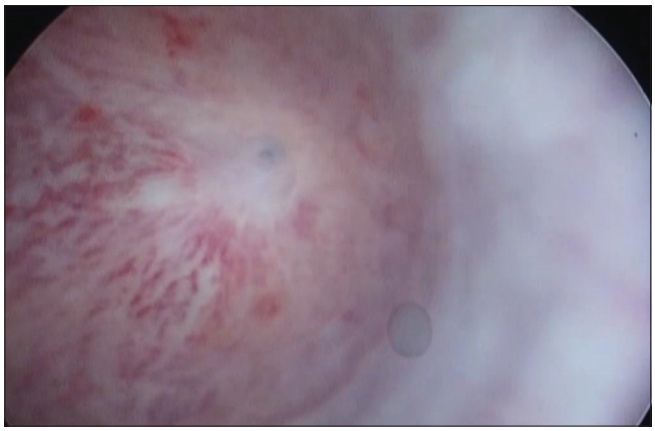
Conflicts of interest

There are no conflicts of interest.

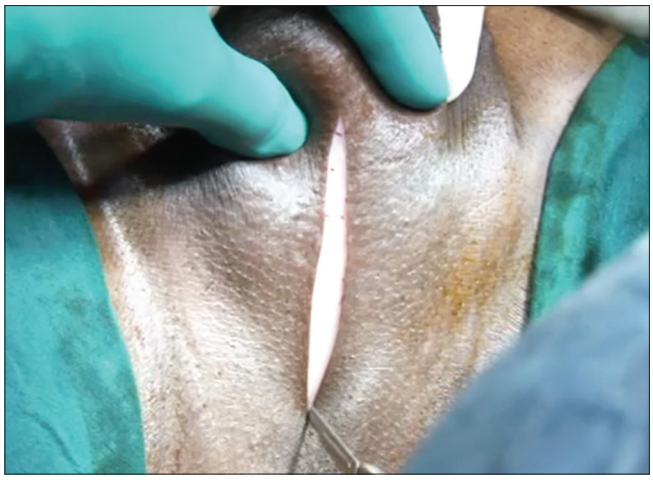
References

1. Santucci RA, Joyce GF, Wise M. Male urethral stricture disease. J Urol 2007;177:1667-74.
2. Meeks JJ, Erickson BA, Granieri MA, Gonzalez CM. Stricture recurrence after urethroplasty: A systematic review. J Urol 2009;182:1266-70.
3. Bugeja S, Andrich DE, Mundy AR. Non-transecting bulbar urethroplasty. Transl Androl Urol 2015;4:41-50.
4. Santucci R, Eisenberg L. Urethrotomy has a much lower success rate than previously reported. J Urol 2010;183:1859-62.
5. Ivaz S, Bugeja S, Frost A, Andrich D, Mundy AR. The nontransecting approach to bulbar urethroplasty. Urol Clin North Am 2017;44:57-66.
6. Anderson KM, Blakely SA, O'Donnell CI, Nikolavsky D, Flynn BJ. Primary non-transecting bulbar urethroplasty long-term success rates are similar to transecting urethroplasty. Int Urol Nephrol 2017;49:83-8.
7. Andrich DE, Mundy AR. Non-transecting anastomotic bulbar urethroplasty: A preliminary report. BJU Int 2012;109:1090-4.
8. Virasoro R, DeLong JM. Non-transecting bulbar urethroplasty is favored over transecting techniques. World J Urol 2020;38:3013-8.
9. Elliott SP. Re: Comprehensive qualitative assessment of urethral stricture disease: Toward the development of a patient centered outcome measure. Eur Urol 2017;72:1022.
10. Donovan JL, Abrams P, Peters TJ, Kay HE, Reynard J, Chapple C, *et al*. The ICS-'BPH' study: The psychometric validity and reliability of the ICSmale questionnaire. Br J Urol 1996;77:554-62.
11. Nuss GR, Granieri MA, Zhao LC, Thum DJ, Gonzalez CM. Presenting symptoms of anterior urethral stricture disease: A disease specific, patient reported questionnaire to measure outcomes. J Urol 2012;187:559-62.
12. Bertrand LA, Voelzke BB, Elliott SP, Myers JB, Breyer BN, Vanni AJ, *et al*. Measuring and predicting patient dissatisfaction after anterior urethroplasty using patient reported outcomes measures. J Urol 2016;196:453-61.
13. Benson CR, Hoang L, Clavell-Hernández J, Wang R. Sexual dysfunction in urethral reconstruction: A review of the literature. Sex Med Rev 2018;6:492-503.
14. Dogra PN, Saini AK, Seth A. Erectile dysfunction after anterior urethroplasty: A prospective analysis of incidence and probability of recovery – Single-Center experience. Urology 2011;78:78-81.
15. Choi JW, Song PH, Kim HT, Moon KH. Impact of visual internal urethrotomy on sexual function in patients with urethral stricture. J Endourol 2013;27:214-9.
16. D'hulst P, Muilwijk T, Vander Eeckt K, Van der Aa F, Joniau S. Patient-reported outcomes after buccal mucosal graft urethroplasty for bulbar urethral strictures: Results of a prospective single-Centre cohort study. BJU Int 2020;126:684-93.
17. Viers BR, Pagliara TJ, Shakir NA, Rew CA, Folgosa-Cooley L, Scott JM, *et al*. Delayed reconstruction of bulbar urethral strictures is associated with multiple interventions, longer strictures and more complex repairs. J Urol 2018;199:515-21.
18. Morey A. Urethral stricture is now an open surgical disease. J Urol 2009;181:953-4.
19. Peeling WB. Diagnostic assessment of benign prostatic hyperplasia. Prostate Suppl 1989;2:51-68.
20. Jackson MJ, Sciberras J, Mangera A, Brett A, Watkin N, N'dow JM, *et al*. Defining a patient-reported outcome measure for urethral stricture surgery. Eur Urol 2011;60:60-8.
21. Rosen RC, Catania JA, Althof SE, Pollack LM, O'Leary M, Seftel AD, *et al*. Development and validation of four-item version of male sexual health questionnaire to assess ejaculatory dysfunction. Urology 2007;69:805-9.
22. Al Taweel W, Seyam R. Visual internal urethrotomy for adult male urethral stricture has poor long-term results. Adv Urol 2015;2015:656459.
23. Andrich DE, Dunglison N, Greenwell TJ, Mundy AR. The long-term results of urethroplasty. J Urol 2003;170:90-2.
24. Palminteri E, Franco G, Berdondini E, Fusco F, De Cillis A, Gentile V. Anterior urethroplasty and effects on sexual life: Which is the best technique? Minerva Urol Nefrol 2010;62:371-6.
25. Barbagli G, Lazzeri M. Reconstructive urethral surgery to be addressed at 2009 GURS meeting. AUA News 2009;14:14.
26. Mundy AR, Andrich DE. Non-transecting bulbar urethroplasty. In: Brandes SB, Morey AF, editors. Advanced Male Urethral and Genital Reconstructive Surgery. New York: Humana Press; 2014. p. 531-40.
27. 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;178:2470-3.
28. Al-Qudah HS, Santucci RA. Buccal mucosal onlay urethroplasty versus anastomotic urethroplasty (AU) for short urethral strictures: Which is better? J Urol 2006;175:03.

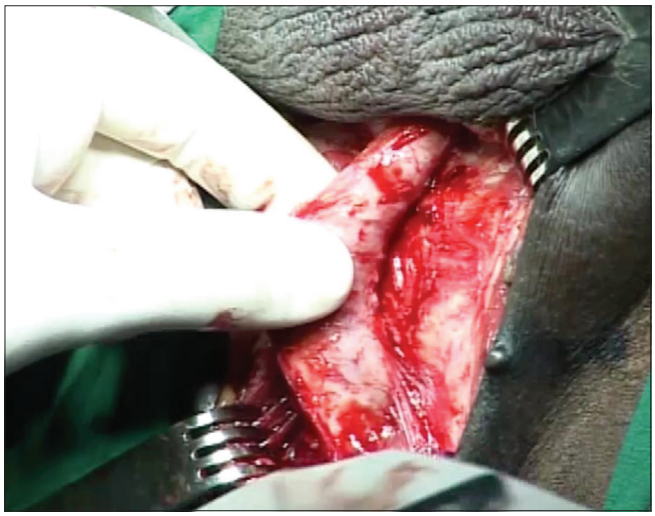
Supplementary Materials



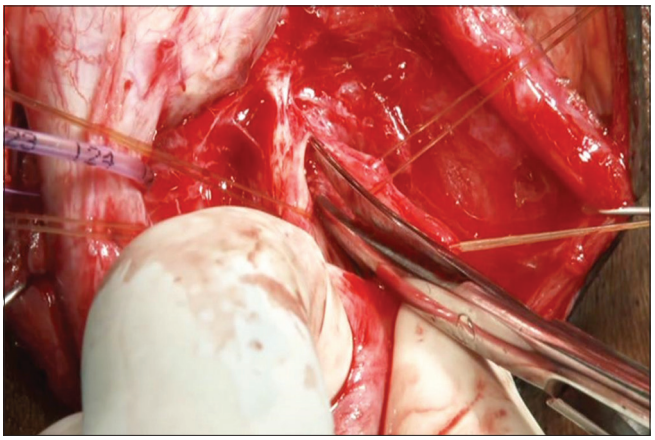
Supplementary Figure 1: Endoscopic view of near obliterative proximal bulbar urethral stricture



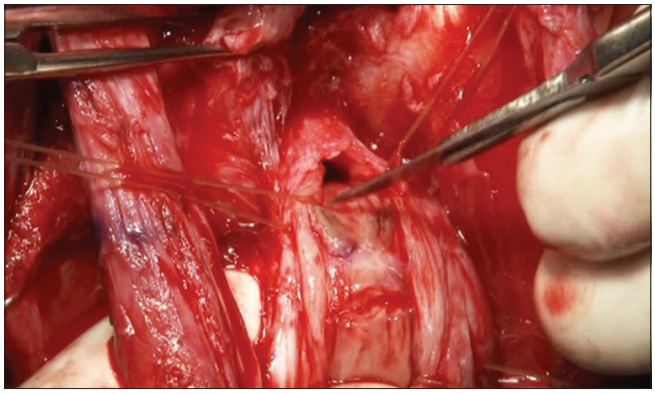
Supplementary Figure 2: Vertical midline perineal incision



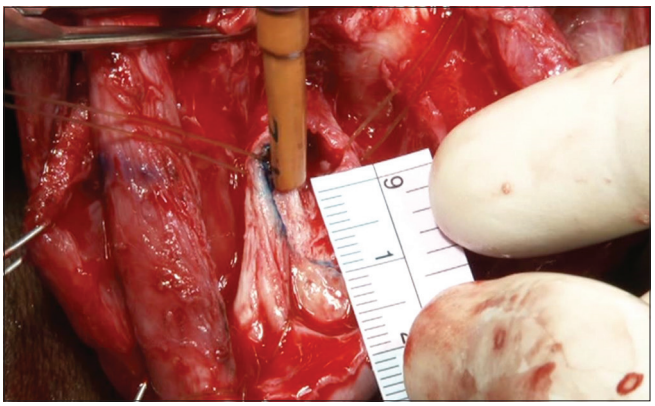
Supplementary Figure 3: Mobilisation of bulbar urethra



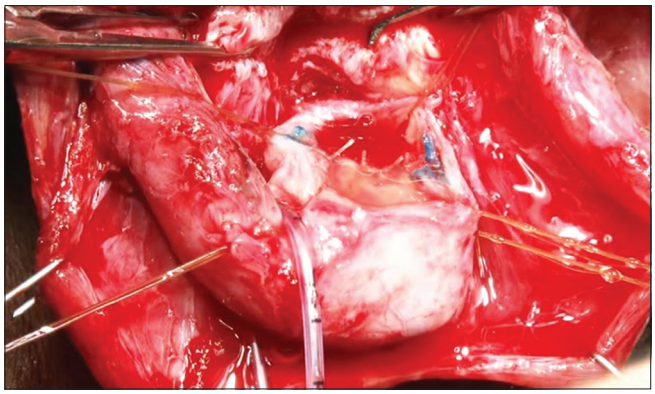
Supplementary Figure 4: Vertical dorsal urethrotomy



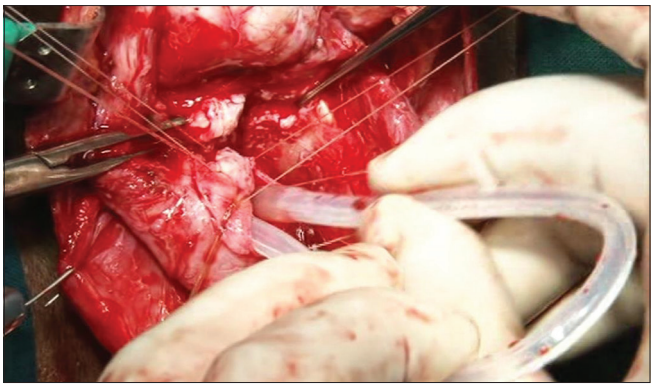
Supplementary Figure 5: Excision of short segment proximal bulbar urethral stricture - Scar tissue



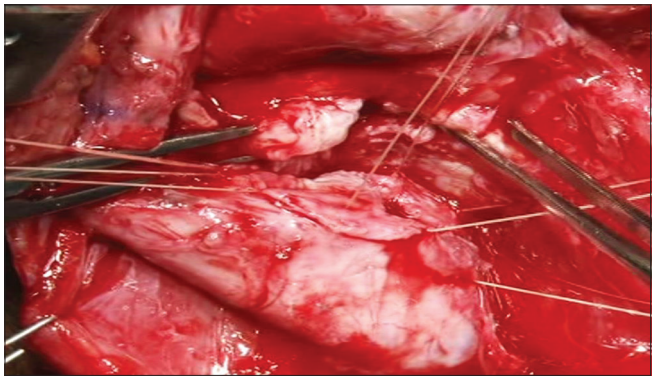
Supplementary Figure 6: Measuring the length of stricture



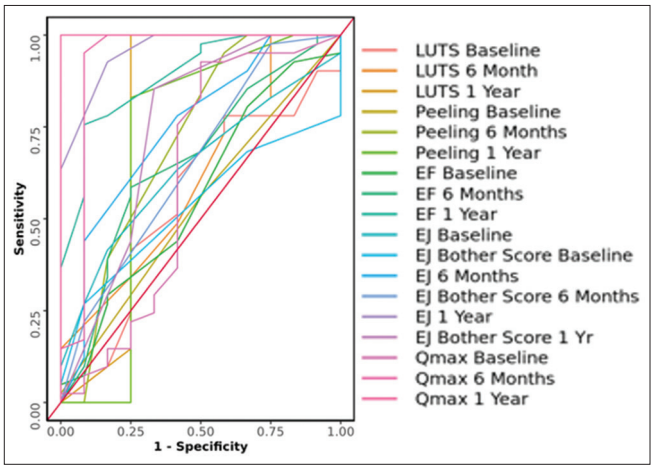
Supplementary Figure 7: Reconstruction of mucosal edge



Supplementary Figure 8: Placement of 14 Fr Catheter



Supplementary Figure 9: Transverse closure of dorsal urethrotomy



Supplementary Figure 10: Receiver operating characteristic curve of various variables

Supplementary Table 1: Surgical satisfactory rates - cross tabulation

Treatment satisfaction	Treatment satisfaction in nontransecting urethroplasty group and DVIU cross-tabulation				
	Nontransecting urethroplasty group Count			Total	DVIU
	H-M	NTABU	ANTABU/dorsal onlay BMG		
Satisfied	1	8	6	15	5
Unsatisfied	-	-	-	-	7
Very satisfied	3	9	1	13	8
Very unsatisfied	-	-	1	1	4

H-M: Heineke-Mickulicz, NTABU: Nontransecting anastomotic bulbar urethroplasty, ANTABU: Augmented NTABU, BMG: Buccal mucosal graft, VIU: Visual internal urethrotomy, DVIU: Direct VIU

Supplementary Table 2: Lower urinary tract symptom and sexual function domain subgroup analysis – nontransecting urethroplasty group with and without prior interventions

	Urethroplasty group with no previous interventions	Urethroplasty group with previous interventions
LUTS score		
Baseline	17.09	16.37
6 months	3.23	3.5
1 year	1.38	3.37
Peeling voiding picture score		
Baseline	3.42	3.37
6 months	1.47	1.87
1 year	1.23	1.8
EF score		
Baseline	20.14	17.37
6 months	23.85	20.75
1 year	25.14	22.375
Ejaculatory function score		
Baseline	11.33	11.25
6 months	13.38	13.5
1 year	14.09	13.75
Ejaculatory function - bother score		
Baseline	2.33	2.12
6 months	0.95	1.12
1 year	0.38	1
Qmax		
Baseline	5.04	5.01
6 months	26.54	23.9
1 year	28.11	23.07

EF: Erectile function, LUTS: Lower urinary tract symptom

Supplementary Table 3: Comparison of the diagnostic performance of the variables in predicting satisfaction

Predictor	AUROC	95% CI	*P*
LUTS baseline	0.553	0.356-0.75	0.586
LUTS 6 month	0.612	0.423-0.8	0.240
LUTS 1 year	0.768	0.531-1	0.005
Peeling baseline	0.537	0.372-0.701	0.670
Peeling 6 months	0.710	0.52-0.901	0.016
Peeling 1 year	0.700	0.458-0.942	0.029
EF baseline	0.567	0.377-0.757	0.478
EF 6 months	0.661	0.477-0.844	0.091
EF 1 year	0.889	0.789-0.989	<0.001
EJ baseline	0.641	0.48-0.802	0.136
EJ bother score baseline	0.535	0.387-0.682	0.711
EJ 6 months	0.748	0.581-0.915	0.008
EJ bother score 6 months	0.652	0.479-0.826	0.081
EJ 1 year	0.957	0.902-1	<0.001
EJ bother score 1 year	0.745	0.553-0.937	0.007
Qmax baseline	0.611	0.376-0.846	0.251
Qmax 6 months	0.928	0.79-1	<0.001
Qmax 1 year	1.000	1-1	<0.001

EF: Erectile function, LUTS: Lower urinary tract symptom, AUROC: Area under the receiver operating characteristic, CI: Confidence interval, Sn: Sensitivity, Sp: Specificity, PPV: Positive predictive value, NPV: Negative predictive value, DA: Diagnostic accuracy, EJ: Ejaculatory function