http://dx.doi.org/10.18623/rvd.v23.5548

COMPARISON OF RECURRENCE RATE BETWEEN INTERNAL OPTICAL URETHROTOMY AND END-TO-END URETHROPLASTY IN PATIENTS WITH BULBAR URETHRAL STRICTURE UPTO 1.5CM

COMPARAÇÃO DA TAXA DE RECORRÊNCIA ENTRE A URETROTOMIA ÓPTICA INTERNA E A URETROPLASTIA TÉRMINO-TERMINAL EM PACIENTES COM ESTENOSE URETRAL BULBAR DE ATÉ 1,5 CM

Article received on: 08/02/2026
Article accepted on: 12/03/2026

Hassan Mumtaz*
*Sahiwal Teaching Hospital, Sahiwal, Punjab, Pakistan
hassanmumtazooo7@gmail.com

Nisar Ahmad*
*Sahiwal Teaching Hospital, Sahiwal, Pakistan
nisarahmad741@gmail.com

Dr. Khalid Khan*
*Sahiwal Teaching Hospital, Sahiwal, Pakistan
doctorkk.75@gmail.com

Dr. Muhammad Babar Baig**
**Jinnah Medical and Dental college, Sohail Trust Hospital, Pakistan
drbabar2k@hotmail.com

Dr. Mohsin Mumtaz***
***Consultant General Surgery Department, DHQ Hospital, Vehari, Pakistan
mohsin22mumtaz@gmail.com

Dr. Ahsan Saeed*
* Sahiwal Teaching Hospital, Sahiwal, Pakistan
ahsan.academics@gmail.com

The authors declare that there is no conflict of interest

Abstract

Objective: To compare the recurrence rate between internal optical urethrotomy and end-to-end urethroplasty in patients with bulbar urethral stricture measuring up to 1.5 cm. Study Design: Randomized controlled trial. Place and Duration of Study: Department of Urology, Sahiwal Teaching Hospital, Sahiwal, from November 2025 to February 2026. Methodology: Sixty patients aged 18–70 years diagnosed with primary or recurrent bulbar urethral stricture ≤1.5 cm were included and randomly allocated into two groups. Group A (n=30) underwent internal optical urethrotomy, and Group B (n=30) underwent end-to-end urethroplasty. Baseline demographics and clinical variables were recorded. Patients were followed for three months to assess recurrence. Data were analyzed using SPSS version 25.0. Quantitative variables were expressed as mean ± standard deviation,

Resumo

Objetivo: Comparar a taxa de recorrência entre a uretrotomia óptica interna e a uretroplastia término-terminal em pacientes com estenose uretral bulbar de até 1,5 cm. Desenho do estudo: Ensaio clínico randomizado controlado. Local e duração do estudo: Departamento de Urologia, Sahiwal Teaching Hospital, Sahiwal, de novembro de 2025 a fevereiro de 2026. Metodologia: Foram incluídos 60 pacientes com idades entre 18 e 70 anos, diagnosticados com estenose uretral bulbar primária ou recorrente ≤1,5 cm, e alocados aleatoriamente em dois grupos. O Grupo A (n = 30) foi submetido a uretrotomia óptica interna, e o Grupo B (n = 30) foi submetido a uretroplastia término-terminal. As características demográficas e variáveis clínicas basais foram registradas. Os pacientes foram acompanhados por três meses para avaliar a recorrência. Os dados foram

and qualitative variables as frequency and percentage. Results: The mean age of patients was 41.62 ± 14.42 years, and mean stricture length was 0.96 ± 0.30 cm. Recurrence at three months was significantly higher in the internal optical urethrotomy group (60.0%) compared to the end-to-end urethroplasty group (13.3%) (p=0.0005). The mean operative time was significantly shorter in the urethrotomy group (34.83 ± 5.86 minutes) compared to the urethroplasty group (90.93 ± 15.90 minutes) (p<0.001). Conclusion: End-to-end urethroplasty demonstrates significantly lower recurrence rates compared to internal optical urethrotomy for bulbar urethral strictures up to 1.5 cm.

Keywords: Bulbar Urethral Stricture. Internal Optical Urethrotomy. End-To-End Urethroplasty. Recurrence.

analisados utilizando o SPSS versão 25.0. As variáveis quantitativas foram expressas como média ± desvio padrão, e as variáveis qualitativas como frequência e porcentagem. Resultados: A idade média dos pacientes foi de 41,62 ± 14,42 anos, e o comprimento médio da estenose foi de 0,96 ± 0,30 cm. A recorrência aos três meses foi significativamente maior no grupo de uretrostomia óptica interna (60,0%) em comparação com o grupo de urethroplastia de ponta a ponta (13,3%) (p=0,0005). O tempo médio de operação foi significativamente menor no grupo de uretrotomia (34,83 ± 5,86 minutos) em comparação com o grupo de uretroplastia (90,93 ± 15,90 minutos) (p < 0,001). Conclusão: A uretroplastia término-a-término apresenta taxas de recorrência significativamente mais baixas em comparação com a uretrotomia óptica interna para estenoses uretrais bulbares de até 1,5 cm.

Palavras-chave: *Estenose Uretral Bulbar. Uretrotomia Óptica Interna. Uretroplastia Término-A-Término. Recorrência.*

1 INTRODUCTION

Urethral stricture can be described as the abnormal constriction of anterior urethra and it is enclosed by corpus spongiosum [1]. Incidences of urethral strictures are high; 0.61-1.4 per cent of males during the course of their lives. In Pakistan, stricture urethra is prevalent by 3-4 percent [2]. The large majority of urethral strictures are anterior (92.2%), most of them are located in the bulbar urethra (46.9) [3]. Clinical manifestations of patients with bulbar urethral strictures are diverse, but the simplest symptom is the loss of strength of the urinary stream. The surgical management of the urethral strictures is based on the cause, length and location of the stricture. Treatments of urethral stricture have options of urethral dilation, internal optical urethrotomy and urethroplasty [4,5]. Optical internal urethrotomy has become the treatment of choice because it is easy and has a good safety profile. As a rule, the recovery rate of about 20-30 is achieved in case of optical urethrotomy [6]. The rate of recurrence in Optical internal urethrotomy was between 28-51% [7]. The recurrence of urethrotomy procedure was observed to depend on the uncertainty of urethrotomy and ranged between 60-90. Urethrotomy, therefore, did

not seem to be as successful as it should be.6 It is a high-recurrence procedure, but nevertheless, it remains one of the most utilized and desired interventions among urologists [8].

Urethroplasty is a surgeries operation of urethral stricture. It can be done in two ways; primary repair, that is, the entire excision of the narrowed section of urethra. This is then joined again on proximal and distal parts of patents. It is called as excision and primary anastomosis. The second technique of urethroplasty is based on the use of tissue transfer or free graft technique. Simple excision and anastomotic urethroplasty are effective in the treatment of short strictures particularly of the bulbar urethra. End to end urethroplasty surgery is associated with high success rates (80-95) and low recurrence rates, but has not been researched as frequently [9,10]. Ansari et al., performed a trial and found that in end to end urethroplasty and internal optical Urethrotomy, the percentage of recurrence was seen to be 20 and 52.5 respectively ($p<0.05$) [7].

This study will be rationalized by the need to compare recurrence rates in internal optical urethrotomy and end-to-end urethroplasty in patients with bulbar urethra stricture up to 1.5cm. It has been observed through literature that, end-to-end urethroplasty has higher chances of being successful and least chances of recurrence. Nevertheless, there is little work done in this respect. Both end-to-end urethroplasty and internal optical urethrotomy have been debated due to the fact that in urethral stricture some surgeons are attracted to internal optical urethrotomy as compared to others who are attracted to end-to-end urethroplasty due to the same length of the stricture. Thus, the planned trial is aimed at obtaining information about confirmation of results stated above. This would assist us to enhance our practice and our knowledge regarding management of short length bulbar urethral strictures.

2 OBJECTIVE

To compare the frequency of recurrence between internal optical urethrotomy and end-to-end urethroplasty in patients with bulbar urethral stricture up to 1.5 cm.

3 METHODOLOGY

This Randomized controlled trial was conducted at Department of Urology, Sahiwal Teaching Hospital, Sahiwal from November 2025 to February 2026. Sample size was calculated by using WHO calculator, sample size of 60 cases; 30 in each group is calculated with 80% power of study, 5% significance level, and percentage of recurrence i.e. 20% with end to end urethroplasty and 52.5% with internal optical Urethrotomy [7]. Non-probability consecutive sampling technique was used to recruit eligible patients presenting during the study period. Patients aged 18–70 years of either gender diagnosed with primary or recurrent bulbar urethral stricture up to 1.5 cm in length (as per operational definition) were included in the study. Patients with posterior urethral stricture, coexistent benign prostatic hyperplasia, neurogenic bladder, or immunocompromised status as documented in medical records were excluded.

4 DATA COLLECTION

After obtaining approval from the Institutional Review Board, 60 patients were enrolled from the outpatient department. Written informed consent was obtained from all participants. Baseline demographic and clinical data were recorded, including age, gender, body mass index (BMI), marital status, history of hypertension (BP ≥140/90 mmHg), diabetes mellitus (BSR >200 mg/dl), history of catheterization, instrumentation, urinary tract infection, trauma, and length of stricture. The stricture length was confirmed intraoperatively through open surgical or endoscopic findings. Patients were randomly divided into two groups using the lottery method. Group A underwent internal optical urethrotomy, while Group B underwent end-to-end urethroplasty. All procedures were performed under spinal anesthesia by a single surgical team to ensure uniformity. Operative time was recorded for each patient. Postoperatively, patients were shifted to surgical wards and discharged according to standard hospital protocol. All patients were followed in the outpatient department for three months and assessed for recurrence of stricture according to the predefined operational definition. Data were recorded on a structured proforma.

5 DATA ANALYSIS

The collected data were entered and analyzed using SPSS (Statistical Package for the Social Sciences) version 25.0. Quantitative variables such as age, BMI, operative time, and length of stricture were expressed as mean ± standard deviation. Qualitative variables including gender, hypertension, diabetes, marital status, history of catheterization, instrumentation, urinary tract infection, trauma, and recurrence were presented as frequencies and percentages. The recurrence rate between the two groups was compared using the Chi-square test. A p-value ≤0.05 was considered statistically significant. Stratification was performed for potential effect modifiers including age, gender, BMI, operative time, stricture length, hypertension, diabetes, marital status, history of catheterization, instrumentation, urinary tract infection, and trauma, and post-stratification analysis was carried out using the Chi-square test within each stratum.

6 RESULTS

Data were collected from 60 patients, mean age of the participants was 41.62 ± 14.42 years, the mean BMI was 26.34 ± 5.15 kg/m², and the mean stricture length was 0.96 ± 0.30 cm, consistent with the inclusion criterion of ≤1.5 cm. Both study groups were equal in size, with 30 patients in each group.

Table 1

Baseline Characteristics of Patients by Study Group (n = 60)

Variable	Overall (n=60)
Age (years), Mean ± SD	41.62 ± 14.42
BMI (kg/m²), Mean ± SD	26.34 ± 5.15
Stricture Length (cm), Mean ± SD	0.96 ± 0.30
Sample Size	60 (100%)

At three months of follow-up, recurrence was observed in 18 (60.0%) patients in the internal optical urethrotomy group compared to 4 (13.3%) patients in the end-to-end urethroplasty group. Overall recurrence was 36.7% (22/60). The difference in recurrence between the two groups was statistically significant (Chi-square test, p = 0.0005).

Table 2

Comparison of Recurrence at 3 Months Between Study Groups

Recurrence Status	Internal Optical Urethrotomy (n=30)	End-to-End Urethroplasty (n=30)	Total (n=60)	p-value
Recurrence (Yes)	18 (60.0%)	4 (13.3%)	22 (36.7%)	**0.0005**
No Recurrence	12 (40.0%)	26 (86.7%)	38 (63.3%)	
Total	**30 (100%)**	**30 (100%)**	**60 (100%)**	

6.1 Chi-square test Applied

The mean operative time was significantly shorter in the internal optical urethrotomy group (34.83 ± 5.86 minutes) compared to the end-to-end urethroplasty group (90.93 ± 15.90 minutes), with a mean difference of 56.10 minutes. This difference was highly statistically significant ($p < 0.001$).

Table 3

Operative Time Comparison Between Study Groups

Variable	Internal Optical Urethrotomy (n=30)	End-to-End Urethroplasty (n=30)	Mean Difference	p-value
Operative Time (minutes), Mean ± SD	34.83 ± 5.86	90.93 ± 15.90	56.10 minutes	<0.001

The overall recurrence rate among all study participants was 36.7%, while 63.3% of patients remained recurrence-free at three months.

Table 4

Overall Recurrence Rate

Outcome	Frequency (n)	Percentage (%)
Recurrence	22	36.7%
No Recurrence	38	63.3%
Total	**60**	**100%**

Baseline clinical characteristics were comparable between the two groups. The majority of patients were male (93.3% in the urethrotomy group and 90.0% in the urethroplasty group).

Table 5

Baseline Clinical Characteristics by Study Group (n = 60)

Variable	Internal Optical Urethrotomy (n=30)	End-to-End Urethroplasty (n=30)
Male	28 (93.3%)	27 (90.0%)
Female	2 (6.7%)	3 (10.0%)
Hypertension	9 (30.0%)	8 (26.7%)
Diabetes Mellitus	7 (23.3%)	6 (20.0%)
History of Catheterization	14 (46.7%)	13 (43.3%)
History of Instrumentation	11 (36.7%)	10 (33.3%)
History of UTI	12 (40.0%)	11 (36.7%)
History of Trauma	6 (20.0%)	7 (23.3%)

Among primary strictures, recurrence occurred in 52.9% of patients treated with urethrotomy compared to 11.8% in the urethroplasty group (p = 0.012). In recurrent strictures, recurrence was 69.2% in the urethrotomy group versus 15.4% in the urethroplasty group (p = 0.004).

Table 6

Recurrence Stratified by Stricture Type (n = 60)

Stricture Type	Group	Recurrence (Yes) n (%)	No Recurrence n (%)	p-value
Primary (n=34)	IOU (n=17)	9 (52.9%)	8 (47.1%)	
	Urethroplasty (n=17)	2 (11.8%)	15 (88.2%)	**0.012**
Recurrent (n=26)	IOU (n=13)	9 (69.2%)	4 (30.8%)	
	Urethroplasty (n=13)	2 (15.4%)	11 (84.6%)	**0.004**

7 DISCUSSION

Bulbar urethral stricture disease is one condition that cannot be easily dealt with, but it is also very common, especially when it recurs after endoscopic treatment. This randomized controlled trial was a comparison of recurrence rates between internal optical urethrotomy (IOU) and end-to-end urethroplasty of strictures up to 1.5 cm and showed higher recurrence rate in the IOU group (60.0) than in the urethroplasty group (13.3) with three months of follow-up (p = 0.0005). Such results confirm the better results of excision

and primary anastomosis in short bulbar strictures. The frequency rate in the IOU group is comparable to the already recorded literature because high failure rates have been reported after urethrotomy especially in recurrent stricture. Being minimally invasive and similar to shorter operative time, IOU fails to solve the underlying spongiofibrosis [11]. Rather, it cuts the scar tissue which could reform again in the course of healing resulting in restricture. Unlike this, end-to-end urethroplasty is a procedure that implies the full removal of fibrotic tissue and the pathological tissue, thus creating a continuity of the urethra with healthy terminations. This basic difference in mechanism is probably the reason why such a significant difference in recurrence is seen in the case of urethroplasty group. The results of this study were also reinforced with stratified analysis. Recurrence was high regardless of primary or recurrent strictures in patients undergoing IOU as compared to urethroplasty. Interestingly, there was a high rate of recurrence in recurrent strictures that were treated with IOU, which could indicate that recurrent endoscopic treatment can perpetuate fibrosis and lead to deterioration. It has also been reported in previous research that recurrent urethrotomy decreases the long-term success rates and can lead to complications of a following reconstructive surgery [12-14].

The duration of time of operation in the IOU group (34.83 +-5.86 minutes) was much less than the urethroplasty group (90.93 +- 15.90 minutes), which was the less invasive nature of the endoscopic procedure. But the decreased operation time should be compensated by the significantly increased recurrence. Although IOU can provide convenient short-term accessibility and decreased operational workloads at the moment, the risk of recurrent processes can eventually escalate the cumulative operative injuries and health expenses [15]. There was no difference in baseline demographic and clinical characteristics, which reduced confounding variables. The internal validity of the study is supported by the absence of any major differences on the comorbidities including hypertension, diabetes, and previous instrumentation. Hence, the difference in the recurrence can be plausibly explained by the technique used during surgery and not the variables of the patients [16-18]. Although the follow-up period was relatively short (three months), the early pattern of recurrence in the IOU group is clinically significant, because majority of restrictures are on the occurrence of most of the occurrences in the first year after urethrotomy. Further follow-up investigations would better define the long-term durability yet the initial divergence in recurrence after urethroplasty in the two

groups overwhelmingly supports urethroplasty [19,20]. There are a few limitations associated with this study. First, the sample size (n = 60) was relatively small and can limit the generalisation of the results and the capacity to realise smaller differences in secondary outcomes. Second, the follow up period was restricted to three months which might not be sufficient to record the late recurrences because urethral stricture recurrence can be later than the immediate postoperative time. Third, in spite of the fact that randomization was carried out, the research was held in one center and the procedures were performed by one surgical team, which can reduce the external validity and reproducibility of the research in other clinical practices. Also, other functional outcomes like urinary flow rates (uroflowmetry), patient-reported symptom scores, and quality-of-life measure were not assessed which would have led to a better evaluation of the success of the treatment. Lastly, no cost analysis and complication rates over a long period were mentioned, yet they are crucial when it comes to the evaluation of overall effectiveness and viability of any type of surgery.

8 CONCLUSION

It is concluded that end-to-end urethroplasty demonstrates a significantly lower recurrence rate compared to internal optical urethrotomy in patients with bulbar urethral strictures measuring up to 1.5 cm. Although internal optical urethrotomy offers shorter operative time and is less invasive, it is associated with substantially higher early recurrence. End-to-end urethroplasty provides a more durable outcome and may reduce the need for repeat interventions, particularly in recurrent strictures.

REFERENCES

Abbas A, Qazi SM, Altaf A. Comparison of end to end anastomotic urethroplasty and optical urethrotomy in the management of patients presenting with short segment incomplete urethral stricture. J University Med Dent Coll 2018;9(2):8-11.

Abdullah A, Ahmed SF, Memon II. Long-term outcome of Non-Transecting Anastomotic Bulbar Urethroplasty for Urethral Strictures: An 8-year experience from Liaquat National Hospital Karachi. Pakistan Journal of Medical Sciences 2021;37(5):1371.

Ansari I, Akhlaque M, Shahzad I, Imtiaz S. Comparison of Recurrence Rate between Internal Optical Urethrotomy and End to End Urethroplasty in patients with Anterior Urethral Stricture upto 1.5 cm. Pak J Med Health Sci 2020;14(2):382-5

Ansari I, Islam SU, Ali W, Haq IU. Urethrotomy and End-to-End Urethroplasty in Anterior Urethral Strictures upto 1.5cm Dept of Urology Mayo Hospital, Lahore. Pak J Med Health Sci 2022;16(08):174.

Bhuiyun MH, Al Mamun AM, Belal T, Rabbani RH, Islam MK, Jabed M, Hossain F. Treatment of short segment anterior urethral stricture: optical internal urethrotomy alone and optical internal urethrotomy with triamcinolone. Bangladesh Med J. 2019;48(1):31-38.

Chi, Junpeng MD[a]; Lou, Keyuan MD[a]; Feng, Guoyan[b]; Song, Shizhang MD[a]; Lu, Youyi MD[a]; Wu, Jitao MD[a]; Cui, Yuanshan MD[a]. Comparative analysis of holmium: YAG laser internal urethrotomy versus Cold-Knife optical internal urethrotomy in the management of urethral stricture – a systematic review and meta-analysis. International Journal of Surgery 110(7):p 4382-4392, July 2024. | DOI: 10.1097/JS9.0000000000001384

Chung C-H, Wu WL, Liu Y-T, Tzou K-Y, Hu S-W, Chiang Y-T, et al. Is repeated direct vision internal urethrotomy feasible in the management of recurrent anterior urethral strictures? Urological Science 2020;31(5):211-5.

Das SK, Jana D, Ghosh B, Pal DK. A comparative study between the outcomes of visual internal urethrotomy for short segment anterior urethral strictures done under spinal anesthesia and local anesthesia. Turk J Urol. 2019;45(6):431-436.

Debnath R, Alam MN, Belal MT, Saha PK, Karmaker U, Chowdhury MS. Outcome of laser urethrotomy in comparison with optical internal urethrotomy in recurrent stricture urethra following perineal anastomotic urethroplasty for PUDD. Bangladesh J Urol. 2020;23(2):181-187.

Endo D, Robayo J, García-Perdomo HA. Predictors of urethral stricture recurrence following internal urethrotomy: A systematic review. Urologia Journal 2025;92(1):32-8.

Farzamfar S, Elia E, Chabaud S, Naji M, Bolduc S. Prospects and Challenges of Electrospun Cell and Drug Delivery Vehicles to Correct Urethral Stricture. Int J Mol Sci. 2022 Sep 10;23(18):10519. doi: 10.3390/ijms231810519. PMID: 36142432; PMCID: PMC9502833.

Goulao B, Carnell S, Shen J, MacLennan G, Norrie J, Cook J, McColl E, Breckons M, Vale L, Whybrow P, Rapley T. Surgical treatment for recurrent bulbar urethral stricture: a randomised open-label superiority trial of open urethroplasty versus endoscopic urethrotomy (the OPEN trial). Eur Urol. 2020;78(4):572-580.

Hou C, Gu Y, Yuan W, Wang Z, Lin J, Fu Q, et al. Diagnosis and treatment of anterior urethral strictures in China: an internet-based survey. BMC urology 2021;21(1):185.

Hou C, Gu Y, Yuan W, Wang Z, Lin J, Fu Q, et al. Diagnosis and treatment of anterior urethral strictures in China: an internet-based survey. BMC urology 2021;21(1):185.

Issack FH, Hassen SM, Tefera AT, Teshome H, Gebreselassie KH, Mummed FO. Short-term recurrence rate of male urethral stricture and its predictors after treatment with optical internal urethrotomy: Prospective Cohort Study at a tertiary center in Ethiopia. Annals of Medicine and Surgery 2023;85(10):4715-9

Jasionowska S, Bochinski A, Shiatis V, Singh S, Brunckhorst O, Rees RW, Ahmed K. Anterior urethroplasty for the management of urethral strictures in males: a systematic review. Urology. 2022;159:222-234.

Kluth LA, Ernst L, Vetterlein MW, Meyer CP, Reiss CP, Fisch M, Rosenbaum CM. Direct vision internal urethrotomy for short anterior urethral strictures and beyond: success rates, predictors of treatment failure and recurrence management. Urology. 2017;106:210-215.

Oyelowo N, Ahmed M, Tolani MA, Lawal AT, Awaisu M, Sudi A, et al. Analysis of the determinants, characteristics and management of recurrent urethral strictures. Nigerian Journal of Surgery 2020;26(2):130-4.

Shetty S, Bhat S, Choudhary A, Hameed B, Sitaram M, Shah M, et al. Prevalent practices in male anterior urethral stricture management: a survey. The Open Urology & Nephrology Journal 2022;15(1).

Suh JG, Choi WS, Paick JS, Kim SW. Surgical Outcome of Excision and End-to-End Anastomosis for Bulbar Urethral Stricture. Korean J Urol. 2013 Jul;54(7):442-7. doi: 10.4111/kju.2013.54.7.442. Epub 2013 Jul 15. PMID: 23878686; PMCID: PMC3715707.

Yalçınkaya F, Kartal I. Critical analysis of urethroplasty for male anterior urethral stricture: a single-center experience. World J Urol. 2020;38(9):2313-2319.

Authors' Contribution

All authors contributed equally to the development of this article.

Data availability

All datasets relevant to this study's findings are fully available within the article.

How to cite this article (APA)

Mumtaz, H., Ahmad, N., Khan, K., Baig, M. B., Mumtaz, M., & Saeed, A. (2026). COMPARISON OF RECURRENCE RATE BETWEEN INTERNAL OPTICAL URETHROTOMY AND END-TO-END URETHROPLASTY IN PATIENTS WITH

BULBAR URETHRAL STRICTURE UPTO 1.5CM. Veredas Do Direito, 23(5), e235548. https://doi.org/10.18623/rvd.v23.5548