http://dx.doi.org/10.18623/rvd.v23.5980

COMPARATIVE STUDY BETWEEN LASER (HOLMIUM YAG) AND COLD KNIFE OPTICAL URETHROTOMY FOR THE TREATMENT OF BULBAR URETHRAL STRICTURE

ESTUDO COMPARATIVO ENTRE A URETROTOMIA ÓPTICA A LASER (HOLMIUM YAG) E A URETROTOMIA ÓPTICA COM BANDA FRIO PARA O TRATAMENTO DA ESTRITURA URETRAL BULBAR

Article received on: 1/20/2026
Article accepted on: 3/5/2026

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The authors declare that there is no conflict of interest

Abstract
Introduction: For short segment bulbar urethral stricture, two of the most popular endoscopic procedures are holmium YAG laser urethrotomy and cold knife optical urethrotomy. The Holmium YAG laser makes a precise cut in tissue with little harm to the surrounding area, whereas cold knife optical urethrotomy makes a direct cut through the stricture using a cold blade that can be seen directly through an endoscope. Both methods are thought to work well and be safe, but there is still a lot of discussion regarding whether one works better to improve symptoms and keep them from coming back. Materials & Methods: This quasi-experimental study was done in Department of Urology Allied-II Hospital, Faisalabad from August 2025 to January 2026. Males aged 18-70 years with a

Resumo
Introdução: Para a estenose uretral bulbar de segmento curto, dois dos procedimentos endoscópicos mais comuns são a uretrotomia a laser de holmium YAG e a uretrotomia óptica com bisturi frio. O laser de holmium YAG realiza um corte preciso no tecido com pouco dano à área circundante, enquanto a uretrotomia óptica com bisturi frio realiza um corte direto através da estenose utilizando uma lâmina fria que pode ser visualizada diretamente através de um endoscópio. Considera-se que ambos os métodos funcionam bem e são seguros, mas ainda há muita discussão sobre qual deles funciona melhor para melhorar os sintomas e evitar sua recorrência. Materiais e Métodos: Este estudo quase-experimental foi realizado no Departamento de Urologia do Hospital Allied-

diagnosis of bulbar urethral stricture measuring ≤ 2cm were included. Patients with alternative etiologies of bladder outlet obstruction resulting in lower urinary tract symptoms (LUTS), numerous or recurring urethral strictures, bulbar urethral strictures exceeding 2cm, and pelvic fracture urethral damage were excluded. The treating surgeon's decision and the patient's preference determined which of two groups the patients were put in: Group A: Patients receiving Holmium:YAG laser urethrotomy; Group B: Patients receiving cold knife optical internal urethrotomy. A standardized Lower Urinary Tract Symptoms (LUTS) score by IPSS was used to record the intensity of baseline symptoms. Patients in both groups were monitored on day 7, at 6 weeks, and at 3 months post-procedure. Results: The mean values of Qmax, PVR, and IPSS before surgery were 9.31 ± 2.01 mL/s, 92.32 ± 23.91 mL, and 19.49 ± 3.91 in group A, and 8.92 ± 2.72 mL/s, 95.69 ± 31.26 mL, and 21.32 ± 2.89 in group B. In group A, the post op values were 28.31 ± 5.68 mL/s, 21.89 ± 6.72 mL, and 6.89 ± 3.15. In group B, they were 23.59 ± 6.74 mL/s, 28.69 ± 7.42 mL, and 9.32 ± 4.21. The early recurrence rates were found to be 11.43% (n=8) in group A and 31.43% (n=22) in group B. Conclusion: Holmium laser urethrotomy may be the best option, especially for bulbar urethral strictures, based on the demonstrated decreased recurrence rates, less complications, and better functional results.

Keywords: Cold Knife Urethrotomy. Holmium Laser Urethrotomy. Urethral Stricture**.**

II, em Faisalabad, de agosto de 2025 a janeiro de 2026. Foram incluídos homens com idades entre 18 e 70 anos com diagnóstico de estenose uretral bulbar medindo ≤ 2 cm. Pacientes com outras causas de obstrução da saída da bexiga que resultassem em sintomas do trato urinário inferior (LUTS), estenoses uretrais numerosas ou recorrentes, estenoses uretrais bulbares superiores a 2 cm e lesões uretrais decorrentes de fratura pélvica foram excluídos. A decisão do cirurgião responsável e a preferência do paciente determinaram em qual dos dois grupos os pacientes foram colocados: Grupo A: Pacientes submetidos à uretrotomia a laser de Holmium:YAG; Grupo B: Pacientes submetidos à uretrotomia interna óptica com bisturi frio. Uma pontuação padronizada de Sintomas do Trato Urinário Inferior (LUTS) pela IPSS foi utilizada para registrar a intensidade dos sintomas basais. Os pacientes de ambos os grupos foram monitorados no 7º dia, às 6 semanas e aos 3 meses após o procedimento. Resultados: Os valores médios de Qmax, PVR e IPSS antes da cirurgia foram 9,31 ± 2,01 mL/s, 92,32 ± 23,91 mL e 19,49 ± 3,91 no grupo A, e 8,92 ± 2,72 mL/s, 95,69 ± 31,26 mL e 21,32 ± 2,89 no grupo B. No grupo A, os valores pós-operatórios foram 28,31 ± 5,68 mL/s, 21,89 ± 6,72 mL e 6,89 ± 3,15. No grupo B, foram 23,59 ± 6,74 mL/s, 28,69 ± 7,42 mL e 9,32 ± 4,21. As taxas de recorrência precoce foram de 11,43% (n=8) no grupo A e 31,43% (n=22) no grupo B. Conclusão: A uretrotomia a laser de holmium pode ser a melhor opção, especialmente para estenoses uretrais bulbares, com base na comprovada redução das taxas de recorrência, no menor número de complicações e nos melhores resultados funcionais.

Palavras-chave: *Uretrotomia Com Bisturi Frio. Uretrotomia A Laser De Holmium. Estenose Uretral.*

1 INTRODUCTION

Bulbar urethral stricture is a common condition in urology. Patients typically exhibit lower urinary tract symptoms (LUTS), primarily characterized by a weak urine stream, straining during micturition, incomplete bladder emptying, and occasionally, urinary retention. These symptoms might make it hard for patients to go about their

everyday lives and enjoy their quality of life. For most of the instances, surgery is needed to give enough alleviation.[1,2] For short segment bulbar urethral stricture, two of the most popular endoscopic procedures are holmium YAG laser urethrotomy and cold knife optical urethrotomy. The Holmium YAG laser makes a precise cut in tissue with little harm to the surrounding area, whereas cold knife optical urethrotomy makes a direct cut through the stricture using a cold blade that can be seen directly through an endoscope. Both methods are thought to work well and be safe, but there is still a lot of discussion regarding whether one works better to improve symptoms and keep them from coming back.[3]

Ali et al. in a randomized trial indicated that both Holmium laser and cold knife optical urethrotomy led to substantial improvement in voiding LUTS, as assessed by IPSS, with a decreased recurrence rate observed in the Holmium laser group.[4] Mostafa et al. It was said that both laser and cold knife optical urethrotomy greatly improved IPSS, and the Holmium laser group had fewer recurrences after six months.[5] In a prospective research conducted by Rehan et al., both Holmium laser and cold knife urethrotomy significantly improved the International Prostate Symptom Score (IPSS) at 3 and 6 months. The laser group had fewer cases of recurrence.[6] Akdemir et al. It was reported that both methods greatly improved IPSS in the weeks after surgery, with 78.2% and 82.6% of patients in the laser and cold knife groups at 1 month, and 68% and 79.1% of patients in the cold knife group at 6 months. At long-term follow-up, the recurrence rate was lower in the laser group (10.63%) than in the cold knife group (29.56%).[7] Nebioğlu et al. showed that Holmium laser urethrotomy (8.4±3.2) worked far better than cold knife (10.2±3.5) at 3 months after surgery, which supports its use for relieving symptoms.[8]

Bulbar urethral stricture has a big impact on quality of life, and treating it is hard because it often comes back. Although cold knife urethrotomy is commonly utilized, growing research indicates that Holmium:YAG laser may provide enhanced precision and reduced recurrence rates. Nonetheless, comparison data comparing the two approaches are still few, especially in local clinical environments. This study fills that gap by looking at and comparing the results of both strategies. The findings seek to influence evidence-based management and improve treatment procedures for urethral strictures.

2 METHODOLOGY

This quasi-experimental study was done in Department of Urology Allied-II Hospital, Faisalabad from August 2025 to January 2026. The ethical review committee approved the trial before it started. The WHO calculator is used to figure out the sample size so that the recurrence rate between the Holmium laser and cold knife groups may be compared. To find a statistically significant difference (power=80%, significance level=5%), at least 70 patients per group (140 total) were needed.[7] Males aged 18-70 years with a diagnosis of bulbar urethral stricture (characterized by a narrowing of the bulbar segment of the anterior urethra, validated by retrograde urethrography (RUG), and accompanied by obstructive lower urinary tract symptoms such as diminished urinary stream, straining, or incomplete bladder emptying) measuring ≤ 2cm, and without uncontrolled medical conditions that contraindicate surgical intervention, were included. Patients with alternative etiologies of bladder outlet obstruction resulting in lower urinary tract symptoms (LUTS), numerous or recurring urethral strictures, bulbar urethral strictures exceeding 2cm, and pelvic fracture urethral damage were excluded. The treating surgeon's decision and the patient's preference determined which of two groups the patients were put in:

Group A: Patients receiving Holmium:YAG laser urethrotomy; Group B: Patients receiving cold knife optical internal urethrotomy.

The preoperative assessment comprised clinical history, physical examination, and retrograde urethrography (RUG) to validate the diagnosis and ascertain the stricture's location. A standardized Lower Urinary Tract Symptoms (LUTS) score by IPSS was used to record the intensity of baseline symptoms. A urethral catheter was retained for one week post-surgery in both groups, thereafter replaced with clean intermittent catheterization (CIC) utilizing a 16 Fr Nelaton catheter. We compared the results by looking at how much better LUTS got with the IPSS, using ultrasonography to measure post-void residual urine volume, and using cystoscopy on some individuals. To compare the early recurrence of stricture, retrograde urethrogram and cystoscopy under local anaesthesia were performed in selective patients from both groups. Patients in both groups were monitored on day 7, at 6 weeks, and at 3 months post-procedure.

To avoid bias in the measurements, the same techniques were used in the hospital to assess the diagnostic and follow-up IPSS. Strict exclusion criteria were used to control for possible confounding factors. The applicant documented patient demographic information, including age, gender, and stricture length, as well as treatment outcomes, in a standardized proforma.

SPSS version 26 was used to enter and evaluate the data. For example, age, stricture length, and IPSS were shown as mean ± standard deviation. For example, early recurrence was shown as frequencies and percentages. The Chi-square test was used to compare the outcome variable, recurrence, between the two groups (Holmium:YAG laser vs. cold knife urethrotomy); a p-value < 0.05 was considered statistically significant. In order to control for effect modifiers via post-stratified chi-square tests and independent sample t-tests, data were stratified by age and IPSS in both groups using an independent t-test. A statistically significant p-value was defined as less than 0.05.

3 RESULTS

The average age was found to be 55.5 ± 7.23 years in group A and 57.89 ± 8.33 years in group B. In both groups, iatrogenic factors were the most common causes of the disease. The length of the stricture in all patients included in the study was determined to be ≤2 cm. The average length of the stricture in group A was 1.45 ± 0.39 cm, while in group B it was 1.51 ± 0.34 cm. (Table 1)

It was discovered that the surgery times were much lower in the cold-knife group than in the Ho-Laser group. In group A, the average time for the procedure was 26.21 ± 7.32 minutes, while in group B, it was 15.61 ± 5.59 minutes. The mean values of Qmax, PVR, and IPSS before surgery were 9.31 ± 2.01 mL/s, 92.32 ± 23.91 mL, and 19.49 ± 3.91 in group A, and 8.92 ± 2.72 mL/s, 95.69 ± 31.26 mL, and 21.32 ± 2.89 in group B. In group A, the post op values were 28.31 ± 5.68 mL/s, 21.89 ± 6.72 mL, and 6.89 ± 3.15. In group B, they were 23.59 ± 6.74 mL/s, 28.69 ± 7.42 mL, and 9.32 ± 4.21 (Table 1). The recurrence rates were found to be 11.43% (n=8) in group A and 31.43% (n=22) in group B (Table 2). The most prevalent surgical consequences were urinary tract infections. Nonetheless, there was no statistically significant disparity between the two groups for postoperative problems.

Table 1

Descriptive statistics (n=140)

	Group A (n=70)	Group B (n=70)	p-values
	Mean ± SD	Mean ± SD	
Age (years)	55.50 ± 7.23	57.89 ± 8.33	**0.072**
Stricture length (cm)	1.45 ± 0.39	1.51 ± 0.34	**0.342**
Operative time (min)	26.21 ± 7.32	15.61 ± 5.59	**0.0001**
Pre-op Qmax (mL/s)	9.31 ± 2.01	8.92 ± 2.72	**0.336**
Post-op Qmax (mL/s)	28.31 ± 5.68	23.59 ± 6.74	**0.0001**
Pre-op PVR (mL)	92.32 ± 23.91	95.69 ± 31.26	**0.475**
Post-op PVR (mL)	21.89 ± 6.72	28.69 ± 7.42	**0.0001**
Pre-operative IPSS	19.49 ± 3.91	21.32 ± 2.89	**0.002**
Post-op IPSS	6.89 ± 3.15	9.32 ± 4.21	**0.0001**

Table 2

Comparison of recurrence (n=140).

	Group A (n=70)		Group B (n=70)		P-value
	Yes	No	Yes	No	
Recurrence	08 (11.43%)	62 (88.57%)	22 (31.43%)	48 (68.57%)	**0.0039**

Table 3

Comparison of complications (n=140).

	Group A (n=70)	Group B (n=70)	p-values
	N (%)	N (%)	
Hematuria	00 (0.0%)	02 (2.86%)	**0.0154**
Urinary extravasation	01 (1.43%)	03 (4.29%)	**0.310**
UTI	03 (4.29%)	06 (8.57%)	**0.301**
Urinary incontinence	01 (1.43%)	03 (4.29%)	**0.310**
Epididmoorchitis	01 (1.43%)	04 (5.71%)	**0.172**

4 DISCUSSION

Our study revealed no significant difference between the groups concerning stricture length; the cold-knife group measured 1.51 ± 0.34 cm and the holmium laser group measured 1.45 ± 0.39 cm. This finding aligns with the study by Atak et al.[9], which indicated no significant difference (cold-knife: 1.23 ± 0.29 cm; holmium laser: 1.10± 0.32 cm). Additionally, Solakhan and Bayrak[10] determined that there was no significant difference between the two groups (p=0.321; cold-knife: 1.03 ± 0.31 cm; holmium laser: 1.08 ± 0.30 cm). Jhanwar et al.[11] found no significant difference, just like we did (for the Cold-knife group it was 1.31 ± 0.25 and for the holmium laser group it was 1.34 ± 0.25).

However, the studies conducted by Solakhan and Bayrak[10], Jhanwar et al.[11], and Atak et al.[9] indicate that the stricture lengths are less than the ≤ 2 cm threshold we established.

In our study, we found that the cold knife group had a shorter surgery duration than the laser group, with a significant difference between the two groups (15.61 ± 5.59 min and 26.21 ± 7.32 min, respectively). This contradicts the findings of Atak et al.[9], who reported a significantly shorter operation time in the laser group (16.4 ± 8.04 min) compared to the cold knife group (23.8 ± 5.47 min). It aligns with the study by Jain et al.[12], which indicated a significantly longer operative time in the laser group (range 15-30 min) than in the cold knife group (range 5-10 min), and the study by Yenice et al.[13], which found that the operation time for the laser group as 21.9 ± 3.8 min, longer than the cold knife group at 18.4 ± 2.3 min. The disparity in these results may be attributed to technological challenges and insufficient experience in laser treatment, or to stricture lengths exceeding those chosen in our study.

Our investigation revealed no significant difference between the groups concerning PVR at pre-operative assessment (92.32 ± 23.91 mL for the laser group and 95.69 ± 31.26 mL for the cold-knife group). However, both groups exhibited a considerable reduction from pre-operative to three months post-operative (21.89 ± 6.72 mL for the laser group and 28.69 ± 7.42 mL for the cold-knife group), corroborating the findings of Zhang et al.[14], which indicated a significant difference between the two groups. Dutkiewicz and Wroblewski[15] indicated that preoperative PVR levels were significantly different between the two groups, with notable differences persisting during the follow-up period.

The present investigation indicated no significant difference concerning Qmax pre-operatively, with values of 9.31 ± 2.01 mL/s for the laser group and 8.92 ± 2.72 mL/s for the cold-knife group. But both groups showed a big change from before the surgery to three months after it. For the laser group, it was 28.31 ± 5.68 mL/s and for the cold-knife group, it was 23.59 ± 6.74 mL/s. This is in line with the study by Yenice et al.[13], which found that there was no big difference in terms of Qmax before the surgery (6.5 ± 0.7 for the laser group and 6.5 ± 0.7 for the cold-knife group) and three months after the surgery (16.9 ± 1.4 for the laser group and 17.0 ± 1.4 for the cold-knife group). Atak et al.[9] similarly found no statistically significant differences in terms of Qmax before surgery or during the follow-up period. Solakhan and Bayrak[10] indicated no statistically

significant differences regarding Qmax pre-operatively. However, contrary to our follow-up results, the Qmax values at the 3rd and 6th months post-operatively demonstrated a significant difference favoring the laser group. This may be due to the selection of a substantial number of patients in the laser group.

The current study demonstrated a significant difference regarding IPSS scores pre-operatively, with scores of 19.49 ± 3.91 for the laser group and 21.32 ± 2.89 for the cold knife group. However, both groups exhibited a significant decrease from pre-operative to three months post-operative, with scores of 6.89 ± 3.15 for the laser group and 9.32 ± 4.21 for the cold knife group. This finding aligns with the study by Dutkiewicz and Wroblewski[15], which concluded that there was no significant difference between the groups pre-operatively, but a significant difference at the three-month follow-up. Chen et al.[16] concurs with our preoperative findings, indicating no significant difference between the groups regarding IPSS scores, with values of 23.5 ± 2.6 for the laser group and 24.0 ± 2.8 for the cold-knife group. However, their post-operative results differ from ours, showing scores of 5.9 ± 1.8 for the laser group and 7.0 ± 2.0 for the cold-knife group at three months post-operation.

In our study, early recurrence occurred within three months in both groups. We observed that the laser group exhibited a lower recurrence rate (8 patients, 11.43%) compared to the cold-knife group (22 patients, 31.43%), indicating a significant difference. This corresponds with Castellanos et al.[17], which demonstrated that laser urethrotomy had a lower recurrence rate than cold-knife urethrotomy, highlighting a substantial difference between the two groups. Solakhan and Bayrak[10] also discovered that the laser group had a lower recurrence rate (18.4%) than the cold-knife group (52.8%). Conversely, Yenice et al.[13] indicated that recurrence rates were lower in the cold knife group (20.7%) compared to the laser group (32.4%), with no significant difference observed across the examined groups. The low recurrence rates we observe may be attributed to the short-term follow-up and stringent inclusion criteria.

Our study found no statistically significant difference in terms of complications related to bleeding per urethra. In the laser group, no patients experienced bleeding, while in the cold knife group, two patients (2.86%) did, and these patients were treated conservatively. Chen et al.[16] observed the same thing: that bleeding per urethra was much lower in the laser group than in the cold knife group. This means that the holmium laser

approach is less harmful. Kegham et al.[18] indicated that the cold-knife group experienced one patient (6.6%) with bleeding per urethra, whereas the laser group exhibited no postoperative problems, including bleeding per urethra or urinary tract infection (UTI). Solakhan and Bayrak[10] reported that bleeding per urethra occurred in 3 patients (4.61%) of the laser group and in 10 patients (18.8%) of the cold-knife group, with no statistically significant difference.

Our investigation indicated no significant difference for urinary tract infection (UTI), with occurrences documented in 3 patients (4.29%) in the laser group and 6 patients (8.57%) in the cold-knife group. They were given antibiotics and were seen again in the outpatient clinic. Kegham et al.[18] indicated that 2 out of 19 patients (13.3%) in the cold-knife group experienced urinary tract infections, but no postoperative problems were observed in the laser group. Solakhan and Bayrak[10] indicated that 2 out of 53 patients (3.7%) in the cold-knife group and 7 out of 65 patients (10.7%) in the laser group acquired urinary tract infections. This may be attributed to the substantial patient population and comorbidities within the laser group.

The primary limitation of this study was the sample size, which was not very large, and the follow-up time, which was not very long. We suggest more research using a more extensive sample size and an extended follow-up period.

5 CONCLUSION

According to this study, urethral strictures may benefit from holmium laser urethrotomy over cold knife urethrotomy. Holmium laser urethrotomy may be the best option, especially for bulbar urethral strictures, based on the demonstrated decreased recurrence rates, less complications, and better functional results. These results may assist guide clinical judgment in the treatment of urethral strictures and add to the mounting evidence in favor of laser technology in urological treatments.

REFERENCES

Ahmed MK, Ali AR, Ali MM, Abd Alraheem AS. Holmium laser versus cold knife in visual internal urethrotomy for management of short segment urethral stricture. *Egyptian Journal of Hospital Medicine*. 2023;91(1):4896–902.

Akdemir F, Okulu E, Kayıgil Ö. Comparison of using cold knife and holmium laser in urethral stricture: long-term outcomes. *Journal of Urological Surgery*. 2023;10(4):315–320.

Ali MM, Kamel M, Ragab A, Hegazy E, Abdallah E, Salem M, et al. Holmium laser versus cold knife visual internal urethrotomy for management of short segment urethral stricture: a prospective randomized clinical trial. *World Journal of Urology*. 2023;41(8):1897–904.

Atak M, Tokgöz H, Akduman B. Low power holmium:YAG laser urethrotomy for urethral stricture disease: comparison of outcomes with the cold-knife technique. *Kaohsiung Journal of Medical Sciences*. 2011;27(11):503–507.

Castellanos L, Bencardino M, Bravo-Balado A. Evaluation of the efficacy and safety of laser versus cold knife urethrotomy in the management of patients with urethral strictures: a systematic review and meta-analysis of randomized clinical trials. *Urologia Internationalis*. 2017;99(4):453–459.

Chen J, Qian L, Zheng B. Comparison of holmium laser combined ureteroscopy and cold knife urethrotomy in treatment of simple urethral stricture: a 5 year follow-up study. *International Journal of Clinical and Experimental Medicine*. 2018;11(12):13792–13796.

Dutkiewicz S, Wroblewski M. Comparison of treatment results between holmium laser endourethrotomy and optical internal urethrotomy for urethral stricture. *International Urology and Nephrology*. 2012;44(3):717–724.

Gamal MA, Higazy A, Ebsheron SF, Radwan A. Holmium:YAG versus cold knife internal urethrotomy in the management of short urethral strictures: a randomized controlled trial. *Journal of Lasers in Medical Sciences*. 2021;12:e35.

Jain S, Kaza R, Singh B. Evaluation of holmium laser versus cold knife in optical internal urethrotomy for the management of short segment urethral stricture. *Urology Annals*. 2014;6(4):328–336.

Jhanwar A, Kumar M, Sankhwar S. Holmium laser vs. conventional (cold knife) direct visual internal urethrotomy for short-segment bulbar urethral stricture: outcome analysis. *Canadian Urological Association Journal*. 2016;10(5–6):161–166.

Kegham H, Khudhur A, Ameen A. Comparison between holmium laser and cold knife direct vision internal urethrotomy for treatment of urethral stricture. *International Surgery Journal*. 2017;4(8):2424–2428.

Nebioğlu A, Arici C, Başaranoğlu M, Akbay E. Comparison of holmium laser and cold knife internal urethrotomy in the treatment of urethral strictures: a retrospective study. *Journal of Reconstructive Urology*. 2025; in press.

Osman NI, Mangera A, Chapple CR. Urethral strictures and their management. *Nature Reviews Urology*. 2020;17(8):485–497.

Rehan M, Elnady EA, Khater S, Ragab O, Hamdy A, Abdelrahman A, et al. Comparative study between thulium laser and cold knife visual urethrotomy for treatment of short bulbomembranous urethral stricture. *Medicine*. 2022;101(35):e30235.

Solakhan M, Bayrak Ö. Endoscopic surgery of urethral strictures: laser versus knife. *Yeni Üroloji Dergisi*. 2020;15(1):39–44.

Yenice M, Seker K, Sam E. Comparison of cold-knife optical internal urethrotomy and holmium:YAG laser internal urethrotomy in bulbar urethral strictures. *Central European Journal of Urology*. 2018;71(1):114–120.

Zekri A, Gad M, El-Anany F, Rashed A, Shalaby M. Holmium laser versus cold knife optical internal urethrotomy in short segment bulbar urethral stricture: a randomized prospective study. *Arab Journal of Urology*. 2023;21(1):41–47.

Zhang Y, Zhang X, Liu Y. Comparison of therapeutic outcomes between thulium laser and cold-knife optical internal urethrotomy for short segment urethral stricture. *Journal of Urology and Renal Diseases*. 2018;112(10):2575–7903.

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)

Haji, M., Akmal, M., Sohail, Z., Dastgir, M. B., Irshad, R. F., & Hussain, Q. (2026). COMPARATIVE STUDY BETWEEN LASER (HOLMIUM YAG) AND COLD KNIFE OPTICAL URETHROTOMY FOR THE TREATMENT OF BULBAR URETHRAL STRICTURE. Veredas Do Direito, 23(6), e235980. https://doi.org/10.18623/rvd.v23.5980