

Does Passive Ureteral Dilation Matter? Outcomes of Retrograde Intrarenal Surgery in Pre-Stented Versus Stent-Naïve Patients: A Retrospective Cohort Study

Settigiri Avinash¹, Dr. Bhaskarappakash. A. R², Dr. V. Selvaraj³, Dr. Vijaya Suriya. R⁴

¹Senior Resident Department of Urology, Meenakshi Medical College Hospital & Research Institute (MMCH&RI), Kanchipuram, Tamil Nadu, India.

²Associate Professor Department of Urology, Meenakshi Medical College Hospital & Research Institute (MMCH&RI), Kanchipuram, Tamil Nadu, India. Email: drbhaski5@gmail.com. (corresponding author)

³Professor & HOD Department of Urology, Meenakshi Medical College Hospital & Research Institute (MMCH&RI), Kanchipuram, Tamil Nadu, India.

⁴Assistant Professor Department of Urology, Meenakshi Medical College Hospital & Research Institute (MMCH&RI), Kanchipuram, Tamil Nadu, India.

Abstract

Background: Passive ureteral dilation achieved through pre-operative Double-J (DJ) ureteral stenting may facilitate ureteral access during retrograde intrarenal surgery (RIRS). However, the routine use of pre-stenting remains controversial because of conflicting evidence regarding its effect on surgical outcomes. This study compared the perioperative outcomes of RIRS in pre-stented and stent-naïve patients.

Methods: A retrospective cohort study was conducted in the Department of Urology, Meenakshi Medical College Hospital & Research Institute, Kanchipuram, Tamil Nadu, India. Medical records of 80 adult patients who underwent RIRS for renal calculi between January 2022 and December 2025 were reviewed. Patients were divided into a pre-stented group (n = 38) and a stent-naïve group (n = 42). The primary outcome was successful ureteral access sheath (UAS) placement. Secondary outcomes included operative duration, stone-free rate, postoperative complications, length of hospital stay, and the need for secondary procedures. Statistical analysis was performed using Student's t-test, the chi-square test, Fisher's exact test, and multivariable logistic regression; p < 0.05 was considered statistically significant.

Results: Baseline demographic and stone characteristics were comparable between the two groups (p > 0.05). Successful UAS placement was significantly higher in the pre-stented group than in the stent-naïve group (97.4% vs. 81.0%; p = 0.024). The requirement for intraoperative ureteral dilation was significantly lower in pre-stented patients (5.3% vs. 26.2%; p = 0.011). Mean operative duration was significantly shorter in the pre-stented group (59.8 ± 13.4 vs. 69.5 ± 15.8 minutes; p = 0.004), and hospital stay was reduced (1.4 ± 0.6 vs. 1.9 ± 0.8 days; p = 0.003). Although stone-free rates (92.1% vs. 85.7%; p = 0.37), secondary procedures (5.3% vs. 14.3%; p = 0.18), and overall complication rates (10.5% vs. 21.4%; p = 0.18) favored the pre-stented group, these differences were not statistically significant. Multivariable logistic regression identified pre-operative stenting as an independent predictor of successful UAS placement (adjusted OR = 6.82; 95% CI: 1.18–39.41; p = 0.032).

Conclusion: Pre-operative ureteral stenting significantly improves ureteral access sheath placement, reduces the need for active ureteral dilation, shortens operative time, and decreases hospital stay during RIRS. However, routine pre-stenting does not significantly improve stone-free rates or reduce postoperative complications. Selective pre-operative stenting should be considered in patients with anticipated difficult ureteral access rather than adopted as a routine strategy.

Keywords: passive ureteral dilation; pre-operative ureteral stenting; renal calculi; retrograde intrarenal surgery; stone-free rate; ureteral access sheath; ureteroscopy.

Introduction

Urolithiasis is a common urological disorder with an increasing global prevalence, affecting approximately 10–15% of the population during their lifetime. Its incidence has risen steadily over recent decades owing to changes in dietary habits, obesity, metabolic disorders, and environmental factors. Renal calculi account for a substantial proportion of urinary stone disease and are associated with considerable morbidity, including flank pain, recurrent urinary tract infections, hematuria, and deterioration of renal function if left untreated. Advances in minimally invasive surgical techniques have transformed the management of renal stones, with retrograde intrarenal surgery (RIRS) emerging as one of the preferred treatment modalities for small- to medium-sized renal calculi.^{1,2}

RIRS utilizes flexible ureteroscopy combined with laser lithotripsy to achieve effective stone fragmentation while minimizing patient morbidity. The widespread availability of high-definition digital ureteroscopes, improved deflection mechanisms, ureteral access sheaths, and holmium:YAG or thulium-fiber lasers has significantly enhanced the efficacy and safety of RIRS. Current international guidelines recommend RIRS as an effective treatment option for renal stones up to 20 mm and as an alternative to percutaneous nephrolithotomy in selected patients with larger stone burdens. The procedure offers several advantages over more invasive approaches, including reduced postoperative pain, shorter hospital stay, lower complication rates, and faster recovery.^{1,3}

Successful RIRS depends on atraumatic access to the upper urinary tract. Placement of a ureteral access sheath (UAS) facilitates repeated passage of the flexible ureteroscope, reduces intrarenal pressure, improves visualization, and may decrease operative time. However, insertion of the access sheath can be technically challenging in patients with a narrow or non-compliant ureter, increasing the risk of ureteral injury, access failure, or the need to abandon the procedure. To overcome these difficulties, pre-operative ureteral stenting has been employed to achieve passive ureteral dilation before definitive stone surgery.^{4,5}

Passive ureteral dilation induced by temporary Double-J stenting is believed to enlarge the ureteral lumen, facilitate ureteroscope and access sheath insertion, and potentially reduce intraoperative ureteral trauma. Several studies have reported higher rates of successful access sheath placement and lower rates of ureteral injury in pre-stented patients. In contrast, routine pre-stenting requires an additional procedure, exposes patients to stent-related symptoms such as urinary frequency, urgency, dysuria, flank pain, and hematuria, increases healthcare costs, and may adversely affect quality of life. Consequently, the routine use of pre-operative ureteral stenting before RIRS remains controversial.⁶

Previous studies evaluating the impact of pre-stenting on RIRS outcomes have produced conflicting results. While some investigators have demonstrated improved stone-free rates, shorter operative times, and fewer access-related complications in pre-stented patients, others have found no significant differences in surgical success or postoperative outcomes compared with stent-naïve patients. Variations in patient selection, stone characteristics, surgical technique, and the definition of treatment success have further contributed to inconsistent findings across the literature. As a result, there is no universal consensus regarding the routine use of passive ureteral dilation before RIRS, and current clinical practice varies among institutions and individual surgeons.^{6,7}

Given these uncertainties, further evaluation of the clinical benefit of passive ureteral dilation is warranted. Understanding whether pre-operative stenting improves operative efficiency, facilitates ureteral access, enhances stone clearance, or reduces complications would assist urologists in optimizing patient selection and avoiding unnecessary procedures.^{4,5}

The present retrospective cohort study was undertaken to compare the perioperative and postoperative outcomes of RIRS in pre-stented and stent-naïve patients. The study specifically evaluated operative time, successful UAS placement, stone-free rate, postoperative complications, length of hospital stay, and the need for secondary procedures, to determine whether passive ureteral dilation confers a meaningful clinical advantage in patients undergoing RIRS.

Materials and Methods

Study Design and Setting

This retrospective observational cohort study was conducted in the Department of Urology, Meenakshi Medical College Hospital & Research Institute (MMCH&RI), Kanchipuram, Tamil Nadu, India. Hospital records of adult patients who underwent RIRS for renal calculi between January 2022 and December 2025 were reviewed.

Study Population

A total of 80 patients were included, comprising 38 patients who underwent pre-operative Double-J (DJ) ureteral stenting (pre-stented group) and 42 patients who underwent primary RIRS without prior stenting (stent-naïve group). Patients aged ≥ 18 years with renal calculi measuring 5–25 mm and complete clinical and radiological records were included. Patients with ureteric strictures, congenital urinary tract anomalies, previous ureteral reconstructive surgery, active untreated urinary tract infection, incomplete records, or simultaneous bilateral RIRS were excluded.

Study Procedure

All patients underwent standard pre-operative evaluation, including clinical examination, laboratory investigations, urine culture, renal function tests, ultrasonography, and non-contrast computed tomography. Demographic characteristics, comorbidities, stone size, stone burden, stone location, hydronephrosis, and previous urological interventions were recorded. All RIRS procedures were performed by experienced consultant urologists using a standardized technique. A ureteral access sheath was inserted whenever feasible, followed by flexible ureteroscopy and holmium:YAG laser lithotripsy using dusting or fragmentation techniques, as appropriate. Postoperative DJ stent placement was performed according to intraoperative findings and surgeon preference.

Outcome Measures

The primary outcome was successful UAS placement during RIRS. Secondary outcomes included operative duration, stone-free rate, postoperative complications graded using the Clavien–Dindo classification, length of hospital stay, and the requirement for secondary procedures. Stone-free status was defined as the absence of residual fragments >2 mm on postoperative ultrasonography or non-contrast computed tomography performed 4–6 weeks after surgery.

Statistical Analysis

Statistical analysis was performed using IBM SPSS Statistics version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean $\pm$ standard deviation and compared using the independent Student's t-test or the Mann–Whitney U test, as appropriate, while categorical variables were analyzed using the chi-square test or Fisher's exact test. Multivariable logistic regression analysis was performed to identify independent predictors of successful UAS placement and stone-free status. A two-sided $p < 0.05$ was considered statistically significant.

Ethical Considerations

The study was approved by the Institutional Ethics Committee of Meenakshi Medical College Hospital & Research Institute (Approval No. [insert]). Owing to the retrospective design, the requirement for informed consent was waived, and patient confidentiality was maintained throughout in accordance with the Declaration of Helsinki.

Results

A total of 80 patients were included in the study, comprising 38 pre-stented and 42 stent-naïve patients. Baseline demographic and stone characteristics were comparable between the two groups ($p > 0.05$; Table 1).

Table 1. Baseline demographic and stone characteristics of the study groups.

Variable	Pre-stented (n = 38)	Stent-naïve (n = 42)	p-value
Age, years (mean $\pm$ SD)	—	—	—
Sex, male / female, n	—	—	—
Body mass index, kg/m ² (mean $\pm$ SD)	—	—	—
Stone size, mm (mean $\pm$ SD)	—	—	—
Stone laterality, right / left, n	—	—	—
Stone location (renal pelvis / calyceal), n	—	—	—
Hydronephrosis present, n (%)	—	—	—
Comorbidities present, n (%)	—	—	—

SD, standard deviation. Values to be completed by the authors from the original dataset before submission. Successful ureteral access sheath placement was significantly higher in the pre-stented group than in the stent-naïve group (97.4% vs. 81.0%; $p = 0.024$). The need for intraoperative ureteral dilation was significantly lower among pre-stented patients (5.3% vs. 26.2%; $p = 0.011$). Operative time was also significantly shorter in the pre-stented group (59.8 ± 13.4 vs. 69.5 ± 15.8 minutes; $p = 0.004$), and hospital stay was reduced (1.4 ± 0.6 vs. 1.9 ± 0.8 days; $p = 0.003$; Table 2).

Although the pre-stented group demonstrated a higher stone-free rate (92.1% vs. 85.7%; $p = 0.37$), fewer secondary procedures (5.3% vs. 14.3%; $p = 0.18$), and a lower overall complication rate (10.5% vs. 21.4%; $p = 0.18$), these differences were not statistically significant (Table 2).

Table 2. Comparison of perioperative and postoperative outcomes between the pre-stented and stent-naïve groups.

Outcome	Pre-stented (n = 38)	Stent-naïve (n = 42)	p-value
Successful UAS placement, n (%)	37 (97.4)	34 (81.0)	0.024

Outcome	Pre-stented (n = 38)	Stent-naïve (n = 42)	p-value
Intraoperative ureteral dilation required, n (%)	2 (5.3)	11 (26.2)	0.011
Operative duration, min (mean ± SD)	59.8 ± 13.4	69.5 ± 15.8	0.004
Hospital stay, days (mean ± SD)	1.4 ± 0.6	1.9 ± 0.8	0.003
Stone-free rate, n (%)	35 (92.1)	36 (85.7)	0.37
Secondary procedure required, n (%)	2 (5.3)	6 (14.3)	0.18
Overall complications, n (%)	4 (10.5)	9 (21.4)	0.18

UAS, ureteral access sheath.

On multivariable logistic regression analysis, pre-operative ureteral stenting was an independent predictor of successful ureteral access sheath placement (adjusted OR = 6.82; 95% CI: 1.18–39.41; p = 0.032), while stone size >15 mm independently predicted a lower stone-free rate (adjusted OR = 0.41; 95% CI: 0.18–0.93; p = 0.034; Table 3).

Table 3. Multivariable logistic regression analysis of independent predictors of outcome.

Predictor	Outcome	Adjusted OR (95% CI)	p-value
Pre-operative ureteral stenting	Successful UAS placement	6.82 (1.18–39.41)	0.032
Stone size >15 mm	Stone-free rate	0.41 (0.18–0.93)	0.034

OR, odds ratio; CI, confidence interval.



Figure 1. Comparison of successful ureteral access sheath placement between the pre-stented and stent-naïve groups.

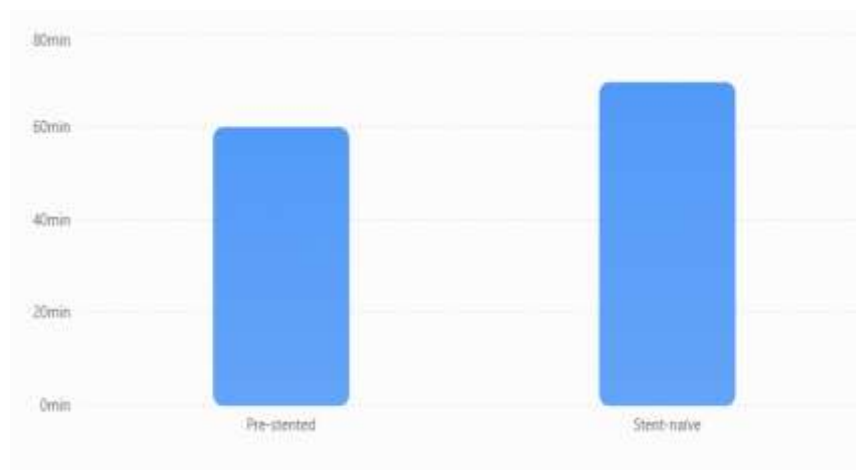


Figure 2. Comparison of mean operative duration between the pre-stented and stent-naïve groups.

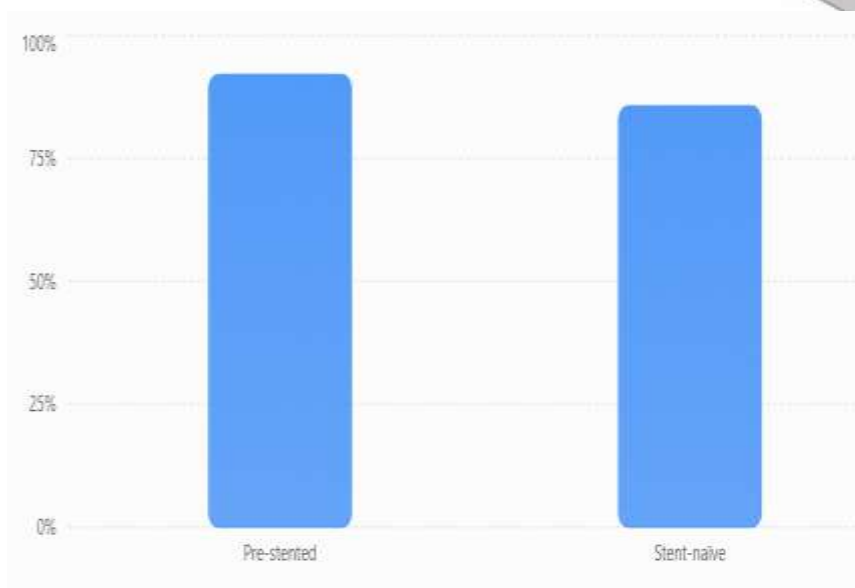


Figure 3. Comparison of stone-free rate between the pre-stented and stent-naïve groups.

Discussion

The present study demonstrated that pre-operative Double-J stenting significantly improved successful ureteral access sheath (UAS) placement, reduced the need for active ureteral dilation, shortened operative duration, and decreased hospital stay. Although the pre-stented group achieved higher stone-free rates and lower postoperative complication rates, these differences were not statistically significant.

In the present study, successful UAS placement was significantly higher in the pre-stented group (97.4%) than in the stent-naïve group (81.0%; $p = 0.024$). This finding is consistent with the meta-analysis by Law et al.⁷, which included 14 studies involving 3,831 patients and demonstrated significantly higher UAS insertion success rates and fewer ureteral injuries in pre-stented patients. The authors also reported improved stone-free rates with pre-stenting, although subgroup analysis suggested that this advantage was less evident in Asian populations. Similarly, Yuk et al.⁸ reported significantly higher UAS placement success in pre-stented patients (93.8% vs. 85.3%), supporting the role of passive ureteral dilation in facilitating ureteral access.

Operative time was significantly shorter in the pre-stented group (59.8 ± 13.4 vs. 69.5 ± 15.8 minutes; $p = 0.004$). Passive ureteral dilation likely facilitated easier insertion of the ureteroscope and repeated instrumentation, thereby improving operative efficiency. This finding differs from that of Jeong et al.³, who observed no significant reduction in operative duration despite improved UAS placement. Assantachai et al.⁹ similarly reported no significant benefit of pre-stenting on operative time and suggested that routine pre-stenting may not offer additional benefit when modern flexible ureteroscopes and access sheaths are used routinely. These differences may be attributable to variations in patient selection, stone complexity, surgical technique, and institutional practice patterns.

Although the stone-free rate was higher in the pre-stented group (92.1% vs. 85.7%), the difference was not statistically significant ($p = 0.37$). This observation is comparable to the findings of Jeong et al.³ and Assantachai et al.⁹, both of whom reported similar stone-free rates between pre-stented and stent-naïve patients. In contrast, Law et al.⁷ demonstrated a modest improvement in stone-free rates in the overall pooled analysis, although this benefit was not consistently observed across all populations. These findings suggest that while pre-stenting facilitates access to the collecting system, stone clearance is primarily influenced by factors such as stone size, location, stone burden, and surgeon expertise.

Overall postoperative complications were lower in the pre-stented group (10.5% vs. 21.4%), although the difference did not reach statistical significance ($p = 0.18$). Most complications were minor and classified as Clavien–Dindo grade I or II. These findings are in agreement with the studies by Law et al.⁷, Yuk et al.⁸, and Jeong et al.³, all of which reported no significant differences in overall postoperative complications between pre-stented and non-pre-stented patients. However, Yildiz et al.¹⁰ observed that while postoperative outcomes were comparable, minor intraoperative complications occurred significantly more frequently in non-pre-stented patients, suggesting that passive ureteral dilation primarily improves procedural safety rather than overall treatment success.

The requirement for secondary procedures was lower in the pre-stented group (5.3% vs. 14.3%), although the difference was not statistically significant ($p = 0.18$). Multivariable logistic regression analysis demonstrated that pre-operative stenting independently predicted successful UAS placement, whereas larger stone size was independently associated with a lower stone-free rate. Together, these findings indicate that the principal advantage of pre-stenting lies in facilitating ureteral access rather than in directly improving stone clearance. Overall, the findings of the present study are consistent with the current literature, which suggests that pre-operative ureteral stenting improves technical aspects of RIRS — particularly successful UAS placement and operative efficiency — but does not consistently improve stone-free rates or reduce postoperative complications. Routine pre-stenting for all patients undergoing RIRS therefore cannot be recommended. Instead, selective pre-operative stenting should be considered in patients with anticipated difficult ureteral access, previous failed ureteroscopy, obstructive uropathy, or other clinical situations in which passive ureteral dilation is likely to facilitate the procedure.

Strengths and Limitations

This study benefits from a well-defined, homogeneous surgical cohort managed by experienced consultant urologists using a standardized technique, and from the inclusion of both technical (UAS placement, operative time) and patient-centered (stone clearance, complications, hospital stay) outcomes. Nonetheless, several limitations warrant consideration. First, the retrospective, single-center design is subject to selection bias, as the decision to place a pre-operative stent was based on surgeon preference and clinical judgement rather than randomization. Second, the relatively modest sample size, particularly for uncommon complications, may have limited the statistical power to detect true differences in secondary outcomes such as complication and stone-free rates. Third, indications for pre-stenting were not standardized across the study period, which may have introduced heterogeneity in patient selection and in stenting duration. Finally, the study did not systematically capture stent-related morbidity (irritative urinary symptoms, additional cost, quality-of-life impact) in the pre-stented group, and follow-up did not extend beyond the immediate postoperative stone-free assessment. Prospective, multicenter studies — ideally randomized — are needed to validate these findings and to define objective criteria for selective pre-stenting before RIRS.

Conclusion

Pre-operative Double-J ureteral stenting significantly improved ureteral access sheath placement, reduced the need for active ureteral dilation, shortened operative time, and decreased hospital stay in patients undergoing retrograde intrarenal surgery. However, it did not significantly improve stone-free rates or reduce postoperative complications. These findings support the selective use of pre-operative ureteral stenting in patients with anticipated difficult ureteral access, rather than its routine use before RIRS.

Declarations

Conflict of Interest

The authors declare no conflict of interest.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Ethical Approval

This study was approved by the Institutional Ethics Committee of Meenakshi Medical College Hospital & Research Institute. All procedures were performed in accordance with the ethical standards of the institutional research committee and with the 1964 Declaration of Helsinki and its later amendments.

Informed Consent

Owing to the retrospective design of the study, the requirement for individual informed consent was waived by the Institutional Ethics Committee.

Data Availability Statement

The datasets analyzed during the current study are available from the corresponding author upon reasonable request.

Acknowledgements

None.

References

1. Yuk HD, Park J, Cho SY, Sung LH, Jeong CW. The effect of preoperative ureteral stenting in retrograde intrarenal surgery: a multicenter, propensity score-matched study. *BMC Urol.* 2020;20(1):147. doi:10.1186/s12894-020-00715-1.
2. Sung LH, Cho DY. The role of preoperative ureteral stenting in retrograde intrarenal surgery in renal stone patients: a propensity score-matched study. *Transl Androl Urol.* 2020;9(2):276-283. doi:10.21037/tau.2020.03.09.
3. Jeong JY, Cho KS, Jun DY, Moon YJ, Kang DH, Jung HD, Lee JY. Impact of preoperative ureteral stenting in retrograde intrarenal surgery for urolithiasis. *Medicina (Kaunas).* 2023;59(4):744. doi:10.3390/medicina59040744.
4. Assimos D, Crisci A, Culkin D, Xue W, Roelofs A, Duvdevani M, Desai M, de la Rosette J. Preoperative JJ stent placement in ureteric and renal stone treatment: results from the Clinical Research Office of the Endourological Society Ureteroscopy Global Study. *BJU Int.* 2016;117(4):648-654.
5. Türk C, Petřík A, Sarica K, Seitz C, Skolarikos A, Straub M, Knoll T. EAU guidelines on interventional treatment for urolithiasis. *Eur Urol.* 2016;69(3):475-482.
6. Traxer O, Thomas A. Prospective evaluation and classification of ureteral wall injuries resulting from insertion of a ureteral access sheath during retrograde intrarenal surgery. *J Urol.* 2013;189(2):580-584.
7. Law YXT, Teoh JYC, Castellani D, Lim EJ, Chan EOT, Wroclawski M, et al. Role of pre-operative ureteral stent on outcomes of retrograde intra-renal surgery (RIRS): systematic review and meta-analysis of 3831 patients and comparison of Asian and non-Asian cohorts. *World J Urol.* 2022;40(6):1377-1389. doi:10.1007/s00345-022-03935-2.
8. Kim JW, Lee YJ, Chung JW, Ha YS, Kim WT, Yun SJ, et al. The effect of preoperative ureteral stenting in retrograde intrarenal surgery: a multicenter propensity score-matched study. *BMC Urol.* 2020;20:147.
9. Assantachai K, Srinualnad S, Leewansangtong S, Taweemonkongsap T, Liangkobkit K, Chotikawanich E. Surgical outcomes of patients who underwent retrograde intrarenal surgery using a ureteral access sheath to manage kidney stones sized 1-2 cm compared between patients who did and did not undergo preoperative ureteral stenting. *Heliyon.* 2023;9(5):e15801. doi:10.1016/j.heliyon.2023.e15801.
10. Yildiz Y, Karakoyunlu N, Kizilkan Y, Ozgor F. The role of preoperative ureteral stenting in retrograde intrarenal surgery outcomes for renal stones: a matched-pair analysis. *Cent European J Urol.* 2025;78:54-61.