

Rethinking postoperative drainage after ureteroscopy with flexible and navigable ureteral access sheaths (FANS): Is Same-Day MonoJ Stenting Safe?

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Research Article

Keywords: Ureteroscopy, Urolithiasis, FANS, UAS

Posted Date: October 18th, 2026

DOI: <https://doi.org/10.21203/rs.3.rs-11019866/v1>

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Additional Declarations: No competing interests reported.

Abstract

Introduction

Postoperative drainage following ureteroscopy remains a matter of debate, particularly regarding the optimal stenting strategy after uncomplicated procedures. The advent of flexible and navigable ureteral access sheaths (FANS) has improved intrarenal visibility, fragment evacuation, and pressure control during retrograde intrarenal surgery (RIRS), potentially allowing safer postoperative drainage approaches. We aimed to evaluate the safety and feasibility of same-day MonoJ stenting after FANS-assisted ureteroscopy in carefully selected patients.

Material and Methods

A retrospective observational study was performed including patients who underwent FANS-assisted RIRS with same-day MonoJ stenting. Only selected cases were included: patients without preoperative urinary tract infection, complete stone clearance at the end of the procedure, and absence of visible ureteral injury following ureteral access sheath placement and removal. Demographic, perioperative, laser-related, and postoperative outcomes were analyzed. Stone free rate was defined as no stone fragments in a non-contrast abdominal computed tomography four weeks after the procedure.

Results

A total of 167 procedures were included. Median age was 61.5 years, and 54.5% of patients were female. Bilateral procedures were performed in 16.7% of cases. Median stone volume was 943 mm³ and median stone density was 871 HU. Prestenting was present in 62.8% of patients. The overall SFR was 100%. No postoperative complications Clavien–Dindo were recorded and no patients required secondary postoperative drainage due to pain, obstruction, or infectious complications.

Conclusions

In selected patients undergoing FANS-assisted RIRS, same-day MonoJ stenting appears to be a safe and feasible postoperative drainage strategy. Careful patient selection seems essential for optimal outcomes. Further prospective studies are required to validate these preliminary findings and better define the role of reduced postoperative drainage strategies after modern ureteroscopy.

Introduction

Flexible ureteroscopy (RIRS) has become one of the standard treatment options for renal stones, particularly for stones measuring up to 20 mm, owing to its high efficacy and favorable safety profile. Despite continuous advances in endoscopic technology and surgical technique, postoperative urinary drainage remains a matter of ongoing debate. Current international guidelines discourage routine ureteral stenting following uncomplicated ureteroscopy and recommend reserving postoperative drainage for patients with specific risk factors, including ureteral injury, significant bleeding, residual

stone fragments, urinary tract infection, solitary kidney, or pregnancy [1]. Nevertheless, clinical practice differs substantially from these recommendations. Large international surveys have shown that the vast majority of urologists continue to place a postoperative ureteral stent even after uncomplicated procedures. This practice is primarily driven by concerns regarding transient ureteral obstruction secondary to postoperative edema, facilitation of residual fragment passage, prolonged operative time, impacted stones, and the desire to minimize the risk of unplanned postoperative complications [2]. Consequently, a considerable discrepancy persists between guideline recommendations and real-world clinical practice. In recent years, the incorporation of suction technology into RIRS has modified the intraoperative environment and may influence postoperative drainage strategies. Continuous aspiration reduces intrarenal pressure and temperature while facilitating the evacuation of stone dust, debris, and small fragments, resulting in improved stone-free rates (SFR), lower infectious morbidity, and shorter hospital stays compared with conventional ureteroscopy [3]. Among these technological advances, the Flexible and Navigable Suction Ureteral Access Sheath (FANS) has demonstrated excellent perioperative outcomes, providing enhanced visibility, efficient fragment evacuation, and effective intrarenal pressure control [4]. Furthermore, recent evidence has demonstrated that surgeon-reported complete intraoperative stone clearance is highly predictive of postoperative imaging-confirmed stone-free status, with a positive predictive value approaching 99% [5]. This finding challenges the traditional need to rely exclusively on delayed postoperative imaging to define surgical success and suggests that, in carefully selected patients with complete intraoperative clearance, prolonged postoperative urinary drainage may not be necessary. Consequently, a short-term drainage strategy using a same-day MonoJ catheter represents an attractive alternative that could preserve adequate urinary drainage while reducing stent-related morbidity and improving postoperative patient comfort [6]. Therefore, these improvements raise the question of whether routine postoperative double-J stenting remains necessary after uncomplicated FANS-assisted ureteroscopy. By minimizing intrarenal pressure, reducing ureteral manipulation, and facilitating complete stone clearance, FANS may allow a less invasive postoperative drainage strategy in carefully selected patients. Therefore, the present study aimed to evaluate the safety and feasibility of same-day MonoJ stenting following FANS-assisted flexible ureteroscopy in a selected cohort of uncomplicated cases.

Material and Methods

A retrospective observational study was conducted including consecutive patients who underwent RIRS using FANS followed by same-day MonoJ stenting. To ensure a homogeneous low-risk cohort, only carefully selected patients were included. Eligibility criteria comprised the absence of preoperative urinary tract infection, complete stone clearance at the end of the procedure, and no visible ureteral injury after both insertion and removal of the ureteral access sheath. The degree of ureteral injury was classified according to the Traxer grading system [7]. Demographic characteristics, stone-related variables, perioperative parameters, laser-related data, and postoperative outcomes were prospectively collected and retrospectively analyzed. Stone density was measured on preoperative non-contrast computed tomography (NCCT) and expressed in Hounsfield Units (HU). Stone volume was calculated

using the ellipsoid formula [8]. All procedures were performed using either a 10/12 Fr or 11/13 Fr FANS in combination with a 7.5 Fr single-use flexible ureteroscope and a 272- μ m laser fiber. Lithotripsy was performed using either a Thulium Fiber Laser (TFL; Fiber Dust®, Quanta System, Samarate, Italy) or a Magneto Holmium:YAG laser (M-Ho:YAG; Cyber Ho Magneto®, Quanta System, Samarate, Italy), according to surgeon preference. The recommended endoscope-to-sheath diameter ratio of < 0.85 (approximately 1.5 Fr clearance) was maintained in all cases to optimize irrigation outflow and suction efficiency [9]. Gravity irrigation was set at 40 cmH₂O, while manual irrigation was selectively applied when reduced visibility caused by floating stone dust required additional flushing during active suction. Laser fiber tips were routinely cleaved using metallic scissors after every 15 minutes of laser activation or after the delivery of 10 kJ of energy to maintain optimal laser performance [10]. In all selected cases, a 7 Fr MonoJ ureteral catheter was placed at the end of the procedure for temporary postoperative drainage. The distal end of the catheter was either inserted into the Foley catheter lumen or connected to a separate drainage bag, according to surgeon preference. Regardless of the drainage configuration, the MonoJ catheter was securely fixed to the Foley catheter to minimize the risk of accidental traction or spontaneous dislodgement during the immediate postoperative period (Fig. 1). The MonoJ catheter and Foley catheter were removed simultaneously within the first 6–8 hours after surgery, and all patients included in this series were discharged on the same day of the procedure (same-day discharge). Operative time was defined as the interval from endoscope insertion to placement of the bladder catheter at the completion of the procedure. SFR was defined as the absence of residual stone fragments on non-contrast abdominal computed tomography performed four weeks after surgery. Lithotripsy performance was assessed according to recently proposed laser efficiency metrics, including lithotripsy efficiency (ablated stone volume per unit of delivered energy, mm³/J), lithotripsy efficacy (ablated stone volume per operative time, mm³/min), and laser energy consumption (delivered energy per unit of ablated stone volume, J/mm³) [11]. Postoperative complications were graded according to the Clavien–Dindo classification [12]. The study was approved by the Institutional Review Board (Approval No. 2026-12; July 12, 2026) and was conducted in accordance with the ethical principles of the Declaration of Helsinki.

Results

A total of 167 patients met the inclusion criteria and underwent FANS-assisted flexible ureteroscopy followed by same-day MonoJ drainage. Baseline demographic and stone characteristics are summarized in Table 1. The median age was 61.5 years (range 29–81), with 91 women (54.5%), and the median body mass index was 24.7 kg/m² (IQR 22.9–28.8). Stone location was right-sided in 76 patients (45.5%), left-sided in 63 (37.8%), and bilateral in 28 (16.8%). The median stone volume was 943 mm³ (IQR 452–1280), with a median stone density of 871 HU (IQR 448–1207). Preoperative ureteral stenting had been performed in 105 patients (62.8%). Perioperative and postoperative outcomes are presented in Table 2. A 10/12 Fr FANS was used in 47 procedures (28.2%), whereas an 11/13 Fr sheath was used in 120 cases (71.8%). Dusting was the predominant lithotripsy strategy, performed in 153 patients (91.6%), while a combined dusting and popcorning technique was required in 14 cases (8.4%). The median total

laser energy delivered was 11.2 kJ (IQR 7.8–14.5), with a median laser activation time of 17.5 minutes (IQR 12.5–24.3) and a median operative time of 45 minutes (IQR 30–90). Median lithotripsy efficiency was 0.12 mm³/J (IQR 0.08–0.20), laser energy consumption was 11.8 J/mm³ (IQR 7.4–14.1), and lithotripsy efficacy reached 26.4 mm³/min (IQR 22.6–31.1). No postoperative complications (Clavien–Dindo grade ≥ I) were observed. All patients remained suitable for same-day discharge after removal of the Foley catheter and MonoJ catheter within 6–8 hours of surgery. Complete stone clearance was achieved in every patient, resulting in a 100% SFR confirmed by non-contrast computed tomography performed four weeks after the procedure.

Table 1
Demographics parameters.

Age	All (n = 167)
	61.5 (29–81)
Female n (%)	91 (54.49)
BMI	24.7 (22.9–28.8)
Right n (%)	76 (45.5)
Left n (%)	63 (37.75)
Bilateral n (%)	28 (16.75)
Stone volume (mm ³)	943 (452–1280)
Stone density (HU)	871 (448–1207)
Prestenting	105 (62.8)

Table 2
Intraoperative and Postoperative Results.

Total energy (kJoules)	All (n = 167)
	11.2 (7.8–14.5)
Surgical time (min)	45 (30–90)
Laser time (min)	17.5(12.5–24.3)
Sheath Size	47 (28.2)
10/12Fr n (%)	120 (71.8)
11/13Fr n (%)	
Dusting Techinche	153 (91.6)
Dusting + Popcorning	14 (8.4)
Joules/mm3	11.8 (7.4–14.1)
mm3/Joules	0.12 (0.08–0.20)
mm3/min	26.4 (22.6–31.1)
Complications Clavien-Dindo < = 2	0 (0)
SFR	167 (100)
SFR = Stone Free-Rate	

Discussion

Ureteral stents remain one of the main contributors to postoperative morbidity after RIRS. Although they effectively guarantee urinary drainage in selected patients, their use is frequently associated with lower urinary tract symptoms, flank pain, hematuria, sexual dysfunction, and a substantial deterioration in health-related quality of life [13]. In addition to patient discomfort, retained or forgotten stents represent a well-recognized clinical problem that may lead to encrustation, infection, and the need for complex secondary interventions, placing responsibility on the treating surgeon to ensure timely removal [14]. Growing evidence suggests that avoiding routine postoperative stenting, whenever clinically appropriate, may substantially improve early postoperative recovery. A recent meta-analysis demonstrated that omitting a double-J stent or replacing it with a short-term ureteral catheter significantly reduced postoperative pain during the first two weeks after ureteroscopy. Overall, patients managed without a conventional stent experienced a 37% reduction in postoperative pain, a benefit that increased to 45% after excluding studies at high risk of bias [15]. Notably, among prestented patients, the use of a short-term ureteral catheter was associated with a 78% reduction in postoperative pain compared with conventional double-J stenting. Our findings further support this concept. By carefully selecting patients with complete intraoperative stone clearance, no evidence of ureteral injury, and no preoperative urinary

tract infection, temporary drainage with a same-day MonoJ catheter provided a safe alternative to conventional double-J stenting. All patients were successfully discharged on the day of surgery without postoperative complications while maintaining a 100% stone-free rate, suggesting that prolonged ureteral stenting may not be necessary in appropriately selected FANS-assisted procedures.

Although international guidelines discourage routine ureteral stenting after uncomplicated ureteroscopy, postoperative drainage remains common in daily practice. One of the main reasons for this discrepancy is the lack of a universally accepted definition of an "uncomplicated" procedure [16]. In the absence of clear intraoperative criteria, many urologists continue to place a double-J stent to minimize the perceived risk of postoperative obstruction, pain, or unplanned readmission, even when no evident indication exists. Evidence from randomized trials suggests that conventional stenting may offer only a modest reduction in unplanned return visits, with low-certainty evidence [17]. Conversely, previous studies have demonstrated that temporary overnight ureteral catheterization provides comparable drainage while avoiding the prolonged exposure to stent-related morbidity associated with indwelling double-J stents [18]. Our study reinforces this concept by proposing objective intraoperative selection criteria for patients who may safely undergo short-term drainage. We limited same-day MonoJ placement to patients with complete endoscopic stone clearance, absence of ureteral injury following ureteral access sheath insertion and removal, and no preoperative urinary tract infection. Under these conditions, temporary drainage for only 6–8 hours proved sufficient to achieve excellent perioperative outcomes without postoperative complications or hospital readmissions. Most of the available evidence comparing double-J stents with short-term ureteral catheters was generated before the widespread adoption of suction-assisted RIRS. Therefore, the applicability of these findings to contemporary endourological practice may be limited. One of the principal reasons for leaving an open-end ureteral catheter or MonoJ catheter for only a few hours after surgery is to ensure adequate urinary drainage while allowing the spontaneous passage of any residual stone fragments. However, the introduction of suction-assisted RIRS, particularly with the FANS, has substantially increased SFR by improving fragment evacuation, maintaining low intrarenal pressure, and enhancing endoscopic visualization [4, 19]. In a recent multicenter study including 540 patients undergoing FANS-assisted RIRS, all patients managed with a ureteral catheter had it removed within 12–24 hours after surgery, according to surgeon preference. The authors concluded that, following meticulous endoscopic inspection confirming both complete stone clearance and the absence of ureteral injury, temporary overnight ureteral catheterization represents a safe alternative to conventional double-J stenting [6]. Our findings build upon this concept by demonstrating that, in an even more carefully selected cohort, postoperative drainage can be further shortened. All patients underwent removal of both the MonoJ catheter and Foley catheter within 6–8 hours after surgery and were discharged on the same day without postoperative complications while maintaining a 100% CT-confirmed stone-free rate.

An essential prerequisite for adopting a short postoperative drainage strategy is the absence of ureteral injury following ureteral access sheath (UAS) placement. In the present series, no visible ureteral wall injuries were identified after insertion or removal of the access sheath, despite the frequent use of the larger 11/13 Fr FANS. This finding may be partially explained by the high proportion of prestented

patients (62.8%) which likely facilitated passive ureteral dilation and safe sheath insertion. Consequently, the use of a larger-caliber suction sheath did not translate into ureteral trauma or postoperative complications attributable to ureteral injury. Equally important was the surgeon's ability to perform a meticulous endoscopic inspection at the end of the procedure. After careful evaluation of all calyces and complete removal of residual dust, fragments, and debris, together with the absence of endoscopic evidence of ureteral injury, temporary MonoJ drainage represented a logical and safe postoperative strategy. This approach was further supported by the characteristics of FANS-assisted ureteroscopy, which combines continuous fragment aspiration with effective intrarenal pressure control. Previous experimental and clinical studies have demonstrated that suction significantly lowers intrarenal pressure, thereby reducing the risk of postoperative infectious complications, with FANS outperforming conventional ureteral access sheaths in pressure control [20]. Consistent with these observations, our series showed no infectious complications, no ureteral obstruction requiring secondary drainage, and no postoperative interventions related to urinary drainage failure after same-day MonoJ removal.

This study has several limitations. First, its retrospective design may have introduced inherent selection and information biases. Second, this was a single-center experience performed by two experienced endourologists using a standardized surgical technique and a flexible and navigable ureteral access sheath (FANS), which may limit the generalizability of the findings. Third, patients were highly selected, as same-day MonoJ stenting was reserved only for cases without preoperative urinary tract infection, complete intraoperative stone clearance, and no evidence of ureteral injury. Furthermore, the decision to use a same-day MonoJ catheter was based on predefined intraoperative criteria and surgeon judgment rather than random allocation, introducing potential treatment selection bias. Consequently, these findings should not be extrapolated to all patients undergoing flexible ureteroscopy. In addition, the absence of a control group managed with conventional Double-J stenting precludes direct comparison between postoperative drainage strategies. Finally, although no delayed drainage-related complications were observed, the follow-up period remains relatively short and was not specifically designed to assess long-term ureteral sequelae. Prospective multicenter comparative studies with longer follow-up are needed to validate these findings and define the optimal indications for same-day MonoJ stenting after FANS-assisted ureteroscopy.

Conclusion

Same-day MonoJ stenting represents a safe and feasible postoperative drainage strategy in carefully selected patients undergoing FANS-assisted flexible ureteroscopy. The combination of complete stone clearance, absence of ureteral injury, and appropriate patient selection appears to allow a less invasive drainage approach without compromising early postoperative outcomes. Larger prospective comparative studies are needed to confirm these findings and to establish the role of stent minimization strategies in contemporary ureteroscopy.

Abbreviations

FANS
Flexible and Navigable Suction Ureteral Access Sheath
NCCT
non-contrast computed tomography
Ho:YAG
Holmium:Yttrium-Aluminum-Garnet
TFL
thulium fiber laser
RIRS
retrograde intrarenal surgery
BMI
body mass index
IQR
interquartile range
HU
Hounsfield Units
SFR
stone-free Rate
UAS
Ureteral Access Sheath

Declarations

Authors' contribution LR: manuscript writing and editing. LR, IP, FM, JAJ, LB and PC: data analysis and data management. LR: project development.

Funding: None

Conflict of Interest: Luis Rico certifies that all conflicts of interest, including specific financial interests and relationships and affiliations relevant to the subject matter or materials discussed in the manuscript (eg, employment/affiliation, grants or funding, consultancies, honoraria, stock ownership or options, expert testimony, royalties, or patents filed, received, or pending), are the following: The authors have no conflicts of interest to declare.

Human Ethics and Consent to Participate declarations: not applicable

Informed consent: I hereby confirm that all participants included in this study were duly informed about the nature and purpose of the research and provided their informed consent for the use of their clinical, imaging, and procedural data for scientific and academic purposes. All data were collected and analyzed in accordance with applicable ethical standards and institutional regulations. Patient confidentiality and anonymity have been strictly maintained throughout the study, and no identifying personal information is

disclosed in this manuscript. The study was conducted in compliance with the principles outlined in the Declaration of Helsinki and relevant local ethical requirements.

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Figures



Figure 1. Postoperative MonoJ drainage after FANS-assisted flexible ureteroscopy. The MonoJ catheter was secured to the Foley catheter to reduce the risk of accidental displacement during the immediate postoperative period. **(A)** Unilateral FANS with the MonoJ catheter connected to a separate drainage bag **(B)** Bilateral FANS with both MonoJ catheters inserted into the Foley catheter lumen

Figure 1

See image above for figure legend