Int. J Med. Pharm. Res.
E-ISSN: 2958-3683 | **P-ISSN**: 2958-3675
Available on: https://ijmpr.in/

International Journal of
Medical and Pharmaceutical Research

Original Article **Open Access**

Flexible Ureterorenoscopy for Renal Stones-A Single Centre Experience

Dr. Dawar Masood Bhat[1], Dr. Syed Javid Qadri[1], Dr. Mufti Mahmood Ahmed[1], Dr Yaser Hussain Wani[1]

[1] Postgraduate Department of General and Minimal Access Surgery, Government Medical College Srinagar

OPEN ACCESS

*Corresponding Author:

Dr Yaser Hussain Wani
Senior Resident, Post Graduate Department of General and Minimal Access Surgery, GMC Srinagar

Received: 25-07-2025
Accepted: 16-08-2025
Available Online: 31-08-2025

©Copyright: IJMPR Journal

A B S T R A C T

Objective: The aim of this study was to evaluate the safety and efficacy of flexible ureterorenoscopy (fURS) for the management of renal stones less than 2cm.

Material and methods: This prospective observational study included a total of 73 cases with renal stones less than 2cm who were managed by fURS. Pre-operative, peri-operative and post-operative information was collected, and the overall outcome was observed in terms of: Success of accessing the pelvicalyceal system, Operative time, Intra-operative and post-operative complications, Duration of post-operative hospital stay and Stone free rate.

Results: Our study consisted of 48(66%) males and 25(34%) females with a mean age of 37.5 years. The majority (29, 40%) of the renal stones were in the Inferior calyx followed by renal pelvis (15, 20%). Solitary calculus was present in the majority (44, 60%) of patients while 28(40%) patients had multiple calculi with a mean stone size of 11.85mm. The mean operative time was 57.89 minutes and 12(16%) patients developed complications (Clavien-Dindo -2) all of which were managed conservatively. Mean post-operative hospital stay was 1.19 days. The Stone Free Rate (SFR) was observed to be 91.78% with 6 (8.2%) patients requiring a secondary procedure. Mean follow up of 7.89 months with no mortality was observed.

Conclusion: Flexible Ureterorenoscopy is a safe and efficacious procedure for renal stones less than 2cm with low morbidity and an excellent stone free rate. It can be routinely recommended for renal stones appropriate for the procedure with satisfactory follow-up results

Key words- Flexible Ureterorenoscopy (fURS); Renal Stones; Stone Free Rate (SFR); Operative Outcomes

INTRODUCTION

Urinary stone disease is a prevalent ailment encountered in surgical practice, and its existence has been documented since ancient times. The prevalence of kidney stone disease varies according to age, gender, race, and geographic location and it has increased over the past 3 decades reaching a lifetime rate of approximately 14%[1] . Open stone surgery used to be the standard method for removing stones before the era of endourology, which resulted in high rates of stone-free outcomes but also had a high incidence of complications. However, in the early 1980s, SWL emerged which was shown to have a good safety record and produced satisfactory stone-free results. Meanwhile, PCNL was also developed and improved to become the preferred approach for managing large and complex kidney stones in most patients. When endourologic technology is readily accessible, open stone surgery is performed in less than 1% of cases[2]. In the last three decades, there has been a rise in the usage of URS for the management of renal stones due to advancements in technology and the spread of surgical expertise. Based on recent research, URS performed by skilled surgeons has been found to be exceptionally safe, with better stone-free rates and treatment efficacy than SWL, especially for small renal stones[3,4].

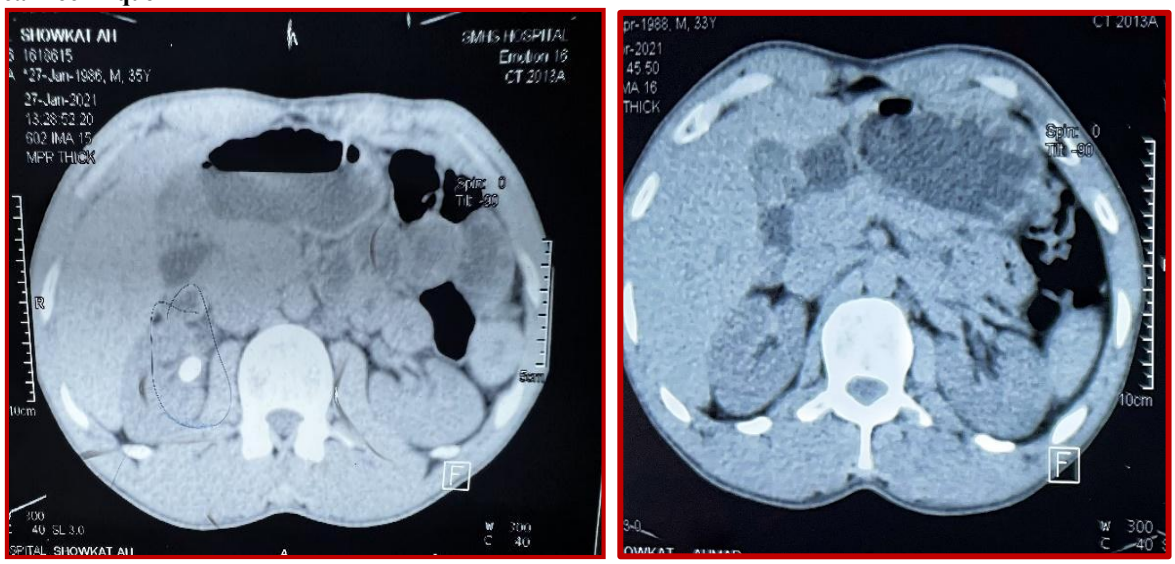
In this study patients who underwent fURS for renal stones less than 2cm were observed and the safety and efficacy of the procedure was evaluated.

Material and methods

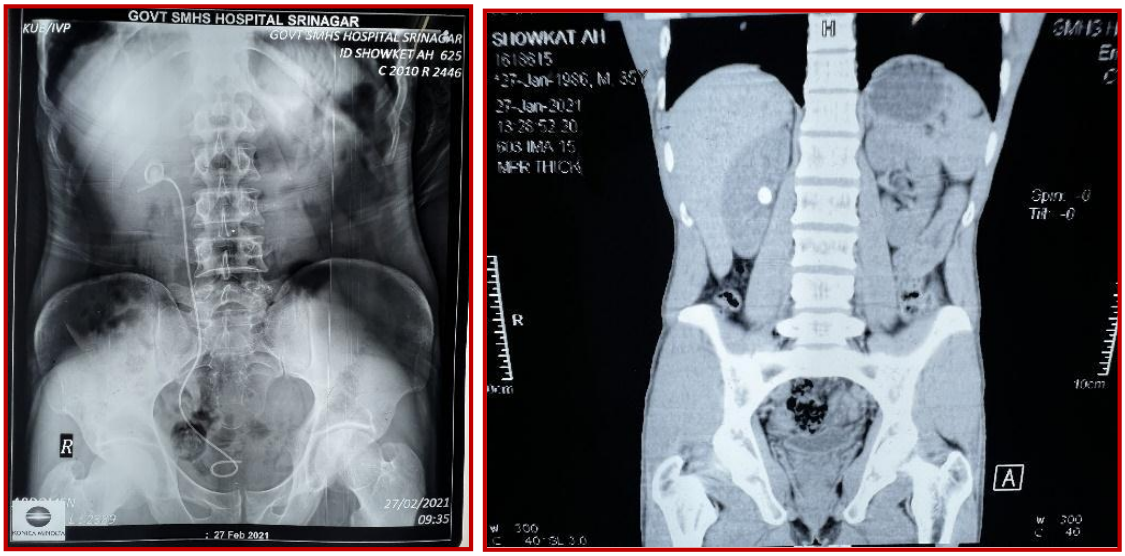
This was a prospective observational study conducted in the Postgraduate Department of General Surgery, GMC Srinagar and a total of 73 patients were included in this study from 1st August 2020 to 31st July 2022. After taking proper approval from the institutional ethical committee and informed consent from the patients, the patients admitted with renal stones and fitting the inclusion criteria were taken as subjects. The information about the treatment was explained to the patient in th e

local language clearly till they understood. All patients were assessed by elaborate history taking and thorough clinical examination. NCCT KUB was done preoperatively to confirm the diagnosis besides other routine investigations. Preoperative stenting was done using 5F DJ stent for at least 2 weeks. fURS was performed in all patients using Holmium: YAG laser. After the procedure 3.5 Fr DJ stent was placed. Follow up was done after 1 week, 6 weeks & 6 months. After 6 weeks NCCT KUB was done. In patients with complete clearance or CIRF (4mm) , the stent was removed. If there was a residual stone a second sitting of RIRS was done.

Surgical Technique



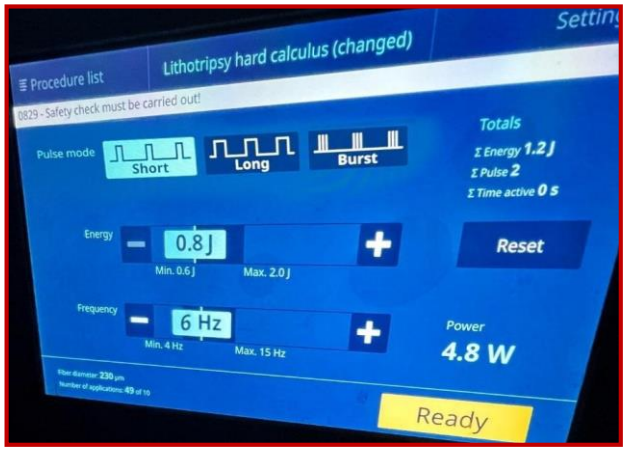
All procedures were performed under General Anaesthesia in lithotomy position with i/v Meropenum used for surgical prophylaxis. Part preparation was done by 2% Chlorhexidine and 70% Alcohol. 17.5 Fr Cystoscope was used to remove previously placed DJ stent. Semirigid ureteroscopy (8-8.9 Fr) was done. 0.035" Straight tip hydrophilic guidewire was introduced into the pelvicalyceal system of intended side via ureteric orifice under C-arm guidance followed by 12/14Fr or 10/12 Fr Ureteral Access Sheath (UAS). 8.5 Fr Flex X^{c} flexible urteteroscope was introduced via UAS and stone was ablated by Holmium: YAG Laser by fragmentation (0.8J x 6Hz), Dusting (0.6J x 15Hz) and popcorning (1.2J x 15Hz). After ablation the ureteroscope and UAS was removed and 3.5Fr/26cm DJ stent was placed. Guidewire was removed and catheterization by Foley catheter was done which was connected to urobag.



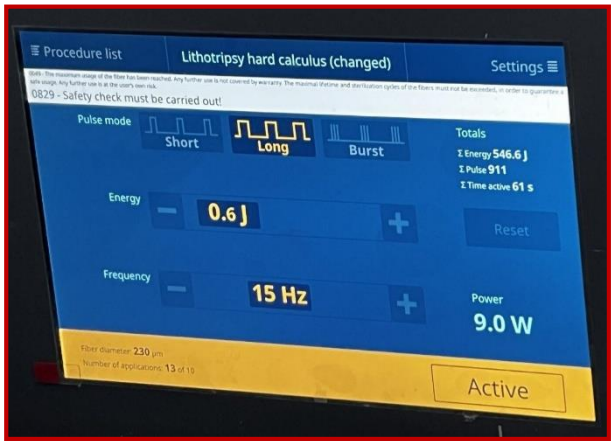
30 year old male with 11 mm calculus in Right renal pelvis

5F /26cm DJ stent placed 2 weeks preoperatively

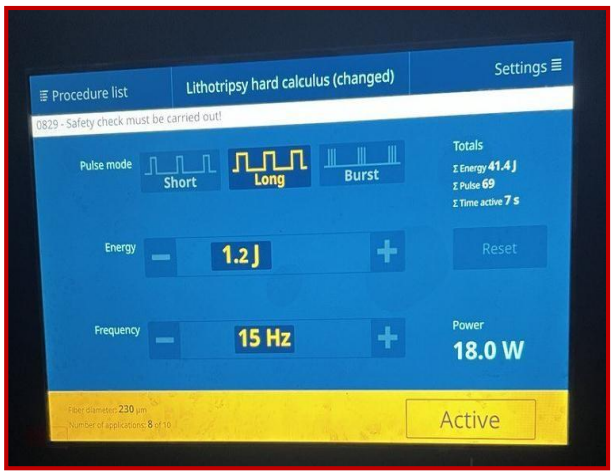
NCCT KUB 6weeks postoperatively shows complete clearance



Fragmentation (0.8J x 6Hz)



Dusting (0.6J x 15Hz)



Popcorning (1.5J x 15Hz)

Figure no 2. Laser settings used – Holmium : YAG Laser

Results

A total of 73 patients were taken for the study. 48 (66%) of the patients in our study were males and 25 (34%) were females. The patients ranged from 10 to 78 years of age with the majority belonging to 21 -30 years age group (27, 36%). The mean age in our study was 37.5 years.

Majority (62, 85%) of the patients in our study presented as flank pain followed by dysuria (8, 11%) as the chief complaint. In our study unilateral kidney stones were present in 62 (85%) patients and 11 (15%) patients had bilateral kidney stones. Right side was affected in 30 (41%) and left side was affected in 32 (44%) cases. The majority (29, 40%) of the renal stones were located in the Inferior Calyx followed by the renal pelvis (15, 20%). Solitary calculus was present in the majority (44, 60%) of patients while 29 (40%) had multiple renal calculi. The kidney stone size ranged from 4 to 19mm (mean 11.85mm).

Majority of the patients had kidney stones in the range of 9-12mm (32, 44%). The CT attenuation values of renal stones ranged from 432 to 1453 Hounsfield Units on NCCT-KUB with a mean of 971 HU. It was observed in our study that 27 (36.9%) patients had hydronephrosis on presentation and a majority 46 (63.1%) had no hydronephrosis. The data regarding stone characteristics is summarized in table no 1.

The duration of procedure was observed to range from 20-210 minutes (mean 57.89) in our study. PCS was successfully accessed in the majority (65, 89.04%) of the cases and in 8 (11%) patients required conversion to PCNL. 3 (4%) were converted to mini PCNL and 5 (7%) to standard PCNL. 12 (16%) patients in our study developed complications. 7 patients (9.5%) had gross hematuria, 4 (5.4%) patients developed post- operative fever and 1 patient developed urosepsis (CD Grade II) which was managed conservatively. The post-operative hospital stay (days) ranged from 1 to 5 days with a mean of 1.19 days. Perioperative data is shown in table no 2.

The Stone Free Rate (SFR) was observed to be 91.78% with 67 patients being stone free. 6 (8.2%) patients had residual stones >4mm requiring a secondary procedure (fURS 4, mini-PCNL 1, ESWL 1) and 6 (8.2%) patients had <4mm residual stone fragments requiring no intervention. The patients were followed up for at least 6 months with a mean follow up of 7.89 months (range 6-18 months.) No patient developed hydronephrosis on the operated side during follow up. There was no mortality.

Table no. 1

Renal units		**73**
Laterality	Unilateral Right side Left side Bilateral	62 (85%) 30 (41%) 32 (44%) 11 (15%)
Location	Inferior Calyx Renal Pelvis PUJ Middle Calyx Superior Calyx Multiple	29 (40%) 15 (20%) 10 (14%) 7 (10%) 4 (5%) 8 (11%)
Number	Single Multiple	44 (60%) 29 (40%)
Size (mm)		4 – 19 (mean 11.85)
Hardness (HU)		432-1453 (mean 971)

Table no. 2

Preoperative DJ Stenting		73(100%)
Operative Time (minutes)		20-210 (mean 57.89)
Conversion to PCNL		8 (11%)
Postoperative DJ Stenting		73 (100%)
Postoperative Hospital Stay (days)		1-5 (mean 1.19)
Complication(s)	 Hematuria Fever Urosepsis	12 (16%) 7 (9.5%) 4 (5.4%) 1 (1.37%)
Stone Free Rate (SFR)		91.78%
CIRF		6(8.2%)
Residual Stone		6 (8.2%)
Secondary Procedure	fURS mini PCNL ESWL	4 (5.47%) 1 (1.37%) 1 (1.37%)

Discussion

Flexible Ureterorenoscopy (fURS) also known as Retrograde Intrarenal Surgery (RIRS) is now considered one of the first-line treatment options for removal of renal stones[5,6]. The advancement of technology in recent years has been focused on making scopes smaller, more durable, and capable of providing better image quality. As a result, the technique of Retrograde Intrarenal Surgery (RIRS) has been continuously developed to keep up with these technological advancements. Currently, the primary objective of RIRS is to remove kidney stones that are 1-2cm in size, although some tertiary centres are exploring the use of RIRS for larger stones. RIRS is a well-established procedure that is constantly evolving due to

improvements in both technique and technology. Its popularity has grown globally due to its minimally invasive nature and successful outcomes. To increase its cost-effectiveness and expand its applications to a wider range of indications, further development and advancement are necessary. In the past, fURSs were used only for the observation and diagnosis of diseases in the pelvicalyceal system because of the lack of a useful working channel. In 1986, Streem et al.[7] first described the use of ureteropyeloscopy for evaluation of upper tract filling defects. In 1990, Bagley and Rivas[8] subsequently reported the diagnosis and management of upper urinary tract filling defects using a fURS. In 1994, Abdel-Razzak et al.[9] first described the performance of biopsy of upper urinary tract tissues through a small working channel in a fURS. Furthermore, Bagley and Erhard[10] reported the first use of a Holmium: YAG laser for ureteral stones through the working channel in clinical practice in 1995. Finally in 1998, Bagley published the first ureteroscopic laser treatment of upper urinary tract tumours, which was accomplished using a Holmium: YAG laser and neodymium-doped YAG laser. It has become possible to perform certain procedures through the working channel, such as stone removal, since Grasso and Bagley[11] reported a fURS with a more useful 3.6- Fr working channel. In addition, successful use of the Holmium: YAG laser as a flexible lithotripter expedited the treatment of upper urinary tract stones in the late 1990s. In 1998, Grasso et al.[12] reported the clinical outcomes of 51 patients with medical comorbidities who underwent RIRS for upper urinary tract stones. They used small-diameter fibreoptic ureteroscopes and a holmium laser lithotripter with a 200-micron laser fibre. The stone-free rate (SFR) was encouraging at 76% in the first procedure and the postoperative complication rate was 6.2%.[12] Thereafter, many endourologists increasingly utilized the fURS for treatment of upper urinary stones. Sofer et al.[13] reported their experience with 598 patients who underwent ureteroscopy and holmium laser lithotripsy from 1993 to 1999. The average stone size was 11.3 mm, and 56 patients with intrarenal stones were treated using a fURS. The SFR among patients with kidney stones was 84% with a low complication rate of 4%[13]. Until the 1990s, the definite indications for use of a fURS were unclear except for evaluating and diagnosing certain upper urinary tract diseases.

The main clinical indications for RIRS seemed to be upper urinary tract stones, especially kidney stones of various sizes. The advancements of fURS and the introduction of Holmium: YAG lasers to the clinical setting have promoted progression of urolithiasis treatment.[14] The treatment indications for RIRS have been markedly extended with the advancements in endoscopic technology and lithotripters, such as laser systems. The European Association of Urology (EAU) guidelines on urolithiasis state that RIRS can generally be applied in patients without specific contraindications, such as an untreated urinary tract infection (UTI). The guidelines also suggest that the indications for RIRS include renal stones of <20 mm that are unsuitable for shock wave lithotripsy (SWL); an unfavourable anatomy for SWL, such as a steep infundibular-pelvic angle, long lower pole calyx, and narrow infundibulum; lower pole stones of >15 mm not feasible for SWL; the patient's preference.[5,15] The other possible indications for RIRS in patients with kidney stones include radiolucent stones, multiple renal stones unfeasible for SWL, treatment with anticoagulants, coexistence of renal and ureteral stones, and bleeding disorders.[15] Preoperative stenting for kidney stone treatment has advantages including a higher SFR, lower incidence of intraoperative complications (especially ureteral injuries), and greater facilitation of UAS placement. Preoperative stenting for patients without perioperative infection, severe self- symptom, anatomical abnormalities, and/or tortuous ureters is not mandatory in most clinical settings for access to the upper urinary tract because it induces hematuria, pain, urgency, and a risk of febrile UTI. However, most endourologists have experienced failed access to the upper urinary tract because of a tight or difficult ureter (8.4%–16.0%).[16,17] Once failed access has occurred, staged procedures are required to achieve passive ureteral dilation 1 to 2 weeks after placing the ureteral stent in the first ureteroscope.

Postoperative stenting is a quite standard procedure after ureteroscopic surgery not only to prevent ureteral obstruction due to mucosa edema and ureteral healing but also to avoid ureteral injury, perforation, residual fragments, bleeding, and UTI. However, the optimal duration of postoperative ureteral stenting is unknown. The indwelling time preferred by most urologists appears to be 1 to 2 weeks after ureteroscopy. However, routine postoperative stenting is not required if no ureteral injury is observed under direct ureteroscopic vision at the end of the ureteroscopic surgery, even in patients who undergo uncomplicated ureteroscopy for impacted ureteral stones.[18,19] Postoperative stenting might be associated with higher postoperative morbidity and costs. Byrne et al.[20] reported that flank discomfort on postoperative day 1 was significantly less common in patients who did not undergo stenting; however, there was no significant difference in patient-reported postoperative hematuria between those who did and did not undergo stenting.

As observed in our study it can be concluded that fURS is a safe and efficacious procedure for renal stones less than 2cm with minimum complications and excellent stone free rate. It is a feasible procedure and it can be routinely recommended for renal stones appropriate for the procedure. It has faster recovery and satisfactory follow-up results. However, how to determine which patients do not require postoperative stenting after ureteroscopic surgery remains unclear and needs further assessment.

Ethical Committee Approval: This study was approved by the Institutional Ethical Committee of GMC Srinagar.
Informed Consent: Written and verbal informed consent was obtained from patients who participated in this study.
Conflict of Interest: No conflict of interest was declared by the authors.
Financial Disclosure: The authors declared that this study has received no financial support.

REFERENCES

1. Rukin, Nicholas & Siddiqui, Zain & Chedgy, Edmund & Somani, Bhaskar. (2016). Trends in Upper Tract Stone Disease in England: Evidence from the Hospital Episodes Statistics Database. Urologia Internationalis. 98. 10.1159/000449510.
2. Honeck P, Wendt-Nordahl G, Krombach P, et al: Does open stone surgery still play a role in the treatment of urolithiasis? Data of a primary urolithiasis center, J Endourol 23(7):1209–1212, 2009.
3. de la Rosette J, Denstedt J, Geavlete P, et al: The Clinical Research Office of the Endourological Society ureterorenoscopy global study: indications, complications, and outcomes in 11,885 patients, J Endourol 28(2):131–139, 2014.
4. Sener NC, Imamoglu MA, Bas O, et al: Prospective randomized trial comparing shock wave lithotripsy and flexible ureterorenoscopy for lower pole stones smaller than 1 cm, Urolithiasis 42(2):127–131, 2014.
5. Turk C, Petrik A, Sarica K, et al. EAU guidelines on interventional treatment for urolithiasis. Eur Urol 2016;69:475–82.
6. Assimos D, Krambeck A, Miller NL, et al. Surgical management of stones: American Urological Association/Endourological Society Guideline, part I. J Urol 2016;196:1153–60.
7. Streem, S B et al. "Ureteropyeloscopy in the evaluation of upper tract filling defects." The Journal of urology vol. 136,2 (1986): 383-5. doi:10.1016/s0022-5347(17)44875-0
8. Bagley, D H, and D Rivas. "Upper urinary tract filling defects: flexible ureteroscopic diagnosis." The Journal of urology vol. 143,6 (1990): 1196-200. doi:10.1016/s0022-5347(17)40223-0
9. Abdel-Razzak, O M et al. "Ureteroscopic biopsy in the upper urinary tract." Urology vol. 44,3 (1994): 451-7. doi:10.1016/s0090-4295(94)80116-9
10. Erhard, M J, and D H Bagley. "Urologic applications of the holmium laser: preliminary experience." Journal of endourology vol. 9,5 (1995): 383-6. doi:10.1089/end.1995.9.383
11. Grasso, M, and D Bagley. "Small diameter, actively deflectable, flexible ureteropyeloscopy." The Journal of urology vol. 160,5 (1998): 1648-53; discussion 1653-4.
12. Grasso M, Conlin M, Bagley D. Retrograde ureteropyeloscopic treatment of 2 cm. or greater upper urinary tract and minor Staghorn calculi. J Urol. 1998;160:346–351.
13. Sofer M, Watterson JD, Wollin TA, Nott L, Razvi H, Denstedt JD. Holmium:YAG laser lithotripsy for upper urinary tract calculi in 598 patients. J Urol. 2002;167:31–34.
14. Van Cleynenbreugel B, Kılıç Ö, Akand M. Retrograde intrarenal surgery for renal stones - part 1. Turk J Urol. 2017;43:112–121.
15. Inoue T, Okada S, Hamamoto S, Yoshida T, Matsuda T. Current trends and pitfalls in endoscopic treatment of urolithiasis. Int J Urol. 2018;25:121–133.
16. Cetti RJ, Biers S, Keoghane SR. The difficult ureter: what is the incidence of pre-stenting? Ann R Coll Surg Engl. 2011;93:31–33.
17. Viers BR, Viers LD, Hull NC, Hanson TJ, Mehta RA, Bergstralh EJ, et al. The difficult ureter: clinical and radiographic characteristics associated with upper urinary tract access at the time of ureteroscopic stone treatment. Urology. 2015;86:878–884.
18. Haleblian G, Kijvikai K, de la, Preminger G. Ureteral stenting and urinary stone management: a systematic review. J Urol. 2008;179:424–430.
19. Cevik I, Dillioglugil O, Akdas A, Siegel Y. Is stent placement necessary after uncomplicated ureteroscopy for removal of impacted ureteral stones? J Endourol. 2010;24:1263–1267.
20. Byrne RR, Auge BK, Kourambas J, Munver R, Delvecchio F, Preminger GM. Routine ureteral stenting is not necessary after ureteroscopy and ureteropyeloscopy: a randomized trial. J Endourol. 2002;16:9–13.