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Retrograde Intrarenal Surgery Without JJ Stent Placement in Selected Cases of Renal Stones of 1 cm or Less Requirement of Ureteral Catheterization: Retrospective Observational Study

1 cm veya Daha Küçük Böbrek Taşları Seçilmiş Olgularında JJ Stent Yerleştirilmeden Yapılan Retrograd İntrarenal Cerrahi Üreteral Kateterizasyonun Gereksinimi: Retrospektif Gözlemsel Çalışma

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ABSTRACT Objective: To evaluate the safety, efficacy of without JJ stent of retrograde intrarenal surgery (RIRS) for the management of renal stones of 1 cm or less, and to determine the advantages and disadvantages. **Material and Methods:** The data of 103 patients who underwent uncomplicated RIRS for kidney stones of 1 cm or less were retrospectively analyzed. We formed 3 groups. Group 1 consisted of 33 patients were not placed JJ stent, Group 2 consisted of 36 patients were placed open-tip ureteral stent and Group 3 consisted of 34 patients were placed JJ stent in the RIRS procedure. Demographic data of patients and stone characters, as well as operative and postoperative data were analysed. Postoperative pain in all patients was evaluated using visual analog scale (VAS). **Results:** There were no significant differences between the groups for demographic data and stone characteristics. While the VAS scores were significantly higher in Group 1 in the early postoperative period (first 24 hours), a significant higher was found in Group 3 in the postoperative 1st week control. There were no significant difference between the 3 groups in terms postoperative febrile urinary tract infection. **Conclusion:** Although there may be an increase in the need for analgesia in the early postoperative period, we support that effective and safe RIRS can be performed without JJ stent placement in selected cases. It should be kept in mind that there are no JJ stent symptoms and no additional intervention is required for its removal.

Keywords: Retrograde intrarenal surgery; ureteral catheterization; visual analogue scale; stent-related complaints

ÖZET Amaç: Bu çalışmanın amacı, 1 cm veya daha küçük böbrek taşlarının tedavisinde JJ stentsiz retrograd intrarenal cerrahinin (RİRC) güvenilirliğini, etkinliğini değerlendirmek, avantaj ve dezavantajlarını belirlemektir. **Gereç ve Yöntemler:** Bir cm veya daha küçük böbrek taşları nedeniyle komplike olmayan RİRC uygulanan 103 hastanın verileri retrospektif olarak incelendi. Üç grup oluşturuldu. RİRC işleminde 33 hastadan oluşan Grup 1'e JJ stent yerleştirilmedi, 36 hastadan oluşan Grup 2'ye açık uçlu üreteral stent yerleştirildi ve 34 hastadan oluşan Grup 3'e JJ stent yerleştirildi. Hastaların demografik verileri, taş karakterleri ile operatif ve postoperatif verileri analiz edildi. Tüm hastalarda postoperatif ağrı görsel analog skala [visual analog scale (VAS)] ile değerlendirildi. **Bulgular:** Demografik veriler ve taş özellikleri açısından gruplar arasında anlamlı fark yoktu. Postoperatif erken dönemde (ilk 24 saat) Grup 1'de VAS skorları anlamlı olarak yüksek iken, postoperatif 1. hafta kontrolünde Grup 3'te anlamlı olarak daha yüksek bulundu. Postoperatif erken dönemde rutin olmayan analjezik ilaç kullanımı diğer gruplara kıyasla Grup 1'de daha fazla hastada gerekti. Ameliyat sonrası ateşli idrar yolu enfeksiyonu açısından 3 grup arasında anlamlı fark yoktu. **Sonuç:** Postoperatif erken dönemde analjezi ihtiyacında artış olsa da seçilmiş olgularda JJ stent takılmadan da etkili ve güvenli RİRC'nin yapılabileceğini destekliyoruz. JJ stent semptomlarının olmadığı ve çıkarılması için ek bir müdahaleye gerek duyulmadığı unutulmamalıdır.

Anahtar Kelimeler: Retrograd intrarenal cerrahi; üreter kateterizasyonu; görsel analog skala; stent ile ilgili şikâyetler

Retrograde intrarenal surgery (RIRS) is used quickly and safety in the surgical treatment of kidney stones due to development laser technology and thinning of flexible ureteroscopes.[1] The new generation flexible ureteroscopes have allowed ureteroscopy to be progressively less traumatic which increasing success rates and decreasing complication rates in the treatment method of kidney stones. In addition, ad-

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vancement of surgical techniques has made ureteroscopy safer and more effective.[2,3]

Ureteral stents disturbs patients and negatively affects patients' social live although technical advances have increased their tolerance and durability. Several studies have reported some complications of ureteral stenting such as incomplete emptying (76%), urgency (60%), urination frequency (60%), dysuria (40%), pain (30%), and hematuria (25%).[4-6]

Considering the complaints caused by the ureteral stent placement in patients, how necessary is ureteral stent placement after a fast and successful RIRS procedure without complications?

In our study, we investigated the effects of not placing a ureteral stent on patient comfort and returning to social life in the RIRS procedure that was applied the dusting method in middle and upper calyx stones 1 cm or less, lasting less than 30 minutes in total.

MATERIAL AND METHODS

The data of 103 patients who underwent RIRS for the treatment of renal stones with a diameter of 10 mm or less in upper and middle calyceal stones in our clinic were analyzed retrospectively. We performed 3 groups. Group 1 consisted of 33 patients were not placed JJ stent, Group 2 consisted of 36 patients were placed open-tip ureteral stent and Group 3 consisted of 34 patients were placed JJ stent in the RIRS procedure. Patients read and completed a comprehensive, validated written informed consent that appropriately explaining both the surgical procedures and the potential risks and benefits preoperatively. Ethics committee approval was obtained from İstinye University Clinical Research Ethics Committee (date: October 6, 2022, no: 3/2022.K-77). All the study process was carried out in accordance with the ethical rules and the principles of the Declaration of Helsinki. Patients with renal transplant, soliter kidney, horseshoe kidney, lower calyx stones regardless of size, patients with residual stones after the procedure, age <18 years, active urinary tract infections (UTI) and uncorrected coagulopathy were excluded. Preoperative demographic data of the patients were noted and blood tests, urinalysis and urine culture were routinely performed as a preoperative research protocol. All patients were scanned with computed tomography (CT) without contrast, and the stone size was defined as the longest diameter of the renal stone on the CT scan. The patients were checked for stone free rates with radiograph of the kidneys-ureter-bladder or CT at the postoperative 10th day and 3rd month. Stone-free was considered a residual fragment smaller than 2 mm.[7]

SURGICAL TECHNIQUE

Diagnostic ureteroscopy was performed with an ultra-thin ureterorenoscope under general anesthesia to investigate the presence of ureteral pathological situations in all patients. The procedure was initiated by placing a 0.035 inch PTFE guide catheter up to renal pelvis under fluoroscopy and routinely reaching the ureteropelvic junction to dilate the ureter with semi-rigid ureterorenoscopy (URS), and this procedure was repeated twice. Kidney stones were fragmented using a 7.95 fr flexible ureteroscope. Lithotripsy is performed by dusting technique using 272 lm fiber with Holmium:YAG laser. Stone-free was confirmed using fluoroscopy after the procedure. Five fr ureteral catheter was inserted in Group 2 and 4.8 fr JJ stent was inserted in Group 3 while JJ stent was not inserted in Group 1 patients in the operation. The open-tip ureteral stent was removed on the first day after surgery in Group 2 while JJ stent was removed between 2-4 weeks after operation in Group 3. The ureteral access sheath was not used in any of the cases.

Postoperative pain follow-up was started after the patients were admitted to the sickroom. Patients were told calling the nurse when they felt pain. Pain-free patients were routinely evaluated at 2nd, 6th, 12th and 24th hour after they were taken to the sickroom. The pain of after the operation was assessed using the visual analog scale (VAS) on the day of surgery and at the postoperative 1st week control in all patients. Patients were shown the VAS which was a 10 cm long horizontal line. After that they were asked to mark the degree of pain they felt at that moment on the line. VAS points were defined from 0 to 10 for each patient.

STATISTICAL ANALYSIS

SPSS version 18.0 (SPSS, Inc., Chicago, IL, USA) was used for statistical analysis and data were presented as mean±standard deviation (range). Mann-Whitney U test and Wilcoxon rank test were used to find significance diffirence between groups before and after treatment according to variable distribution. A p value<0.05 was acceptanced significant.

RESULTS

RIRS was performed in 33 (32%) patients in Group 1, 36 (35%) patients in Group 2 and 34 (33%) patients in Group 3. The mean age of the patients was 42.3±14.7 (19-66), 40.6±14.5 (18-69) and 43.5±15.7 (19-71) years old while the ratio male/female was 22/11, 21/15 and 18/16 in Group 1, 2 and 3, respectively. There was no significant difference between each groups for age, gender, preoperative creatinine value, stone size-side-location-density (Hounsfield unit), and hydronephrosis grade. The stones were localized in middle and upper calyx in each groups and mean stone sizes was similar (Group 1: 8.9 mm, Group 2: 9.1 mm and Group 3: 9.4 mm) (Table 1). The mean operation time was 33.3±7.2 minutes in Group 1, 36.1±7.7 minutes in Group 2 and 38.8±6.9 in Group 3 respectively. Flexible-URS (f-URS) time was 22.7±5.3 minutes in Group 1, 24.5±4.4 minutes in Group 2 and 26.2±3.8 in Group 3 respectively. Flouroscopy time was 3.8±2 seconds in Group 1, 4.3±2.5 seconds in Group 2 and 5.6±2.8 seconds in Group 3. We noticed that operation, f-URS and flouroscopy times were significantly lower in Group 1 (Table 2).

The VASs, which were evaluated on the day of the operation and at the postoperative 1st week, were significantly higher in Group 1 and Group 3, respectively, compared to the other groups.

Non-routine analgesic medication was required for pain relief in the early postoperative period (first 24 hours) in 12 (36%), 3 (8%) and 2 (6%) patients in Groups 1, 2 and 3, respectively. In Group 1, pain complaints were significantly higher than other groups in the early postoperative period (first 24 hours). Postoperative febrile UTI was detected in 3 patients in Group 1, 4 patients in Group 2 and 2 patients in Group 3. We observed no statistical difference between the 3 groups in terms postoperative febrile UTI (Table 2).

DISCUSSION

RIRS has become a widely used procedure with an increasing number of indications in the surgical treatment of kidney stones. A ureteral stent for drainage of the upper urinary tract has become traditional for possible ureteral obstruction due to ureteral inflammation-edema, stone fragments or blood clots developed after RIRS.[8,9] Using ureteral catheterization after ureteroscopy is recommended to prevent late complications such as ureteral strictures in cases of sus-

TABLE 1: Demographic and preoperative parameters of RIRS patients with JJS, placed OUS and without JJS.

	Group 1 JJS (-)	Group 2 OUS (+)	Group 3 JJS (+)	p value
Patients, n	33	36	34	-
Age (years)	42.3±14.7	40.6±14.5	43.5±15.7	0.568
Gender, male/female	22/11	21/15	18/16	0.236
BMI (kg/m^2)	24.8±2.5	25.6±3.0	26.2±3.4	0.823
ASA category I+II (n)	26	30	25	0.135
ASA category III (n)	7	6	9	0.206
Stone side (R/L)	16/17	20/16	15/19	0.341
Stone location (upper/middle calyx)	13/20	17/19	18/16	0.257
Stone size (mm)	8.9±1.1	9.1±0.9	9.4±0.7	0.135
Hydronephrosis (+/-)	20/13	24/12	23/11	0.846
Hounsfield units	778±133	823±159	908±177	0.694

RIRS: Retrograde intrarenal surgery; JJS: JJ stent; OUS: Open-tip ureteral stent; BMI: Body mass index; ASA: American Society of Anesthesiologists.

TABLE 2: Comparison of operative parameters of RIRS patients with JJS, placed OUS and without JJS.

	Group 1 JJS (-)	Group 2 OUS (+)	Group 3 JJS (+)	p value
Operation time (min)	33.3±7.2 (25-50)	36.1±7.7 (25-50)	38.8±6.9 (30-52)	**<0.021***
F-URS time (min)	22.7±5.3 (15-30)	24.5±4.4 (17-30)	26.2±3.8 (20-30)	**<0.04***
Flouroscopy time (sec)	3.8±2 (0-9)	4.3±2.5 (1-10)	5.6±2.8 (1-12)	**<0.01***
VAS_1	4.7±1.8	3.6±1	3.3±1.2	**<0.034****
VAS_2				
• Flank pain	1.35±0.57	1.73±1.76	3.40±3.85	**<0.001*****
• Suprapubic pain	1.18±0.78	1.39±0.98	3.13±1.31	
• Inguinal pain	1.08±0.34	1.40±0.42	2.27±1.34	
• Genitalia pain	1.20±1.28	1.70±1.10	2.04±3.02	
Non-routine analgesic medication	12 (36%)	3 (8%)	2 (6%)	**<0.001**
Febrile UTI	3 (9%)	4 (11%)	2 (6%)	**0.682**

VAS1=Visual analogue scale evaluated on the day of operation; VAS_2=Visual analogue scale evaluated at the postoperative 1st week control; Non-routine analgesic medication: Opioid agents; Febrile UTI: Definition of febrile urinary tract infection was patients with a fever of over 38˚C persisting for 48 h and positive urine culture after RIRS; *JJ stent-free group showed significant shorter operation, f-URS and flouroscopy times; **The VASs were significantly higher in Group 1 on the day of the operation; ***The VASs were significantly higher in Group 3 at the postoperative 1st week; RIRS: Retrograde intrarenal surgery; JJS: JJ stent; OUS: Open-tip ureteral stent; F-URS: Flexible ureterorenoscopy; VAS: visual analog scale; UTI: Urinary tract infection.

pected ureteral injury, performed dilation of the ureter, or complicated treatment situations. In addition, ureteral stent is routinely performed to facilitate passage of stone fragments after RIRS.[10,11] However, ureteral stent complications may occur during stent placement, such as ureteral perforation and stent malposition.[5,12] The routine use of ureteral stents in the treatment of uncomplicated kidney stones has become questionable thanks to the development and thinning of new generation flexible ureteroscopes.[13,14]

Patients experience stent-related complaints such as dysuria, hematuria, and pain after ureteral stent placement. It is thought that these complaints may be related to ureteral spasm and trigonal irritation.[4,15] According to the results of our study, while VAS_1 evaluated in the early postoperative period was high in Group 1, VAS_2 evaluated in the 1st week was detected to be significantly higher in Group 3. We attribute the high VAS_1s in Group 1 to early postoperative ureteral edema due to the RIRS procedure. Approximately 36% of patients were required the use of opioid agents to reduce their early postoperative pain in this group. However, patients in Group 1 were discharged at the postoperative 24th hour with pain scores similar to those in the other groups. On the other hand we think that VAS_2, which was evaluated at the postoperative 1st week control, was detected to be significantly higher, especially in Group 3 with JJ stent placement due to stent-related symptoms. These results demonstrate that after RIRS procedure stented patients have significantly more irritating and painful symptoms than those without a stent except in the early postoperative period.

Placement of the ureteral stent should also be considered increasing the cost of the procedure and also auxiliary cystoscopy will be required to remove the stent.[8,16] In our study, because no auxiliary cystoscopy was required in Group 1 and Group 2, superiority was achieved in terms of both cost and patient comfort. We think that the prolongation of the operation time with JJ stent insertion and the additional attempt to remove the stent will be reflected in the cost.

It has been mentioned in previous studies that the main factors determining the success and complications of the surgery are stone size, stone localization, duration of the procedure, difficult anatomy and comorbidities.[17-19] In our study, RIRS procedures that lasted less than 30 minutes in the middle and upper calyx stones 10 mm or less were evaluated. All patients were stone-free by using the dusting method. There was no statistical difference between the groups in terms of febrile UTI. Performing the RIRS procedure without JJ stent placement or placing a 1-

day open-tip ureteral stent will reduce stent-related pain and voiding symptoms in patients without increasing the rate of postoperative febrile UTI in suitable and selected cases. Previous studies mentioned that increased intrarenal pressure during RIRS is important in terms of postoperative complications such as bleeding, subcapsular hematoma and urosepsis. It was also emphasized that the associasted risk increases with the intrarenal pressure especially above 40 cm H_2O.[20-22] In studies on intrarenal pressure in the literature, it has been stated that the use of a ureteral access sheath will reduce the complication rates by reducing the pressure.[2,20,21] We did not use a ureteral access sheath in all 3 groups in the operations in our study. Thanks to the low irrigation pressure we applied during the operation, complications such as bleeding, subcapsular hematoma and urosepsis were not observed in all 3 groups.

Our study has some limitations. We evaluated our results retrospectively. Data on late complications such as ureteral stenosis have not yet been collected because patients do not have long-term follow-up. Randomized and controlled studies with larger patient groups would better validate our results.

CONCLUSION

Although there is a high level of pain in the early postoperative period, a safe and comfortable RIRS without JJ stent can be performed with the application of dusting method in kidney middle and upper calyx stones of 1 cm and smaller, which are completed in less than 30 minutes in uncomplicated cases. Considering the complications and side effects, we think that routine ureteral catheterization is unnecessary after uncomplicated RIRS procedure.

Source of Finance

During this study, no financial or spiritual support was received neither from any pharmaceutical company that has a direct connection with the research subject, nor from a company that provides or produces medical instruments and materials which may negatively affect the evaluation process of this study.

Conflict of Interest

No conflicts of interest between the authors and / or family members of the scientific and medical committee members or members of the potential conflicts of interest, counseling, expertise, working conditions, share holding and similar situations in any firm.

Authorship Contributions

Idea/Concept: *Yasin Yitgin, Ayhan Karaköse;* ***Design:*** *Yasin Yitgin;* ***Control/Supervision:*** *Ayhan Karaköse;* ***Data Collection and/or Processing:*** *Yasin Yitgin, Ayhan Karaköse;* ***Analysis and/or Interpretation:*** *Yasin Yitgin;* ***Literature Review:*** *Ayhan Karaköse;* ***Writing the Article:*** *Yasin Yitgin;* ***Critical Review:*** *Ayhan Karaköse;* ***References and Fundings:*** *Yasin Yitgin, Ayhan Karaköse;* ***Materials:*** *Yasin Yitgin, Ayhan Karaköse.*

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