ARAŞTIRMA MAKALESİ / *RESEARCH ARTICLE*

Does the Use of an Access Sheath in Flexible Ureteroscopic Stone Surgery Affect the Stone-Free Rate in the Late Postoperative Period?

Fleksible Üreteroskopik Taş Cerrahisinde Erişim Kılıfı Kullanımı Postoperatif Geç Dönemde Taşsızlık Oranını Etkiliyor mu?

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ABSTRACT

Aim: *Studies indicate that a ureteric access sheath (UAS) is unnecessary for retrograde intrarenal surgery 5 (RIRS) if the surgeon enters the ureter directly. This research aims to look back on our case series in light of the existing literature and directly compare cases with and without a UAS in terms of efficacy, safety, and stone-free rates in the late postoperative period (3rd month).*

Materials and Methods: *From January 2019 to June 2022, a retrospective screening of kidney stone cases treated with RIRS in our clinic was carried out. The study included one hundred fifty-three participants who complied with all inclusion and exclusion criteria. Group UAS was created for individuals who received UAS applications, and Group N for those who did not. The demographics, preoperative and postoperative laboratory, and radiographic data have been compared between the two groups.*

Results: *A comparable distribution in terms of gender and age (50.85±13.20 vs. 52.84±14.27; p=0, 476) was seen between the groups. The Charlson Comorbidity Indexes were found to have a similar distribution [median (IQR): 1 (0.5–2.5) vs. 1 (0–3); p=0.986]. Serum creatinine levels (0.92±0.27 vs. 0.97±0.34; p=0, 560), fever or sepsis (0.0% vs. 1.0%; p=0, 686), and hospital stay (2.15±0.65 vs. 2.31±0.74; p=0, 691) were comparable between the groups during the surgical follow-up. Even though Group UAS was superior in the postoperative three-month stone-free assessment with computerized tomography, this difference was not statistically significant (72.9% vs. 73.3%; p=0, 552).*

Conclusion: *In the surgical management of kidney stones, RIRS can be used safely and effectively whether or not UAS is used. Complications and success rates in the late postoperative phase (3 months) are not significantly impacted by UAS use.*

Keywords: *access sheath; renal stones; retrograde intrarenal surgery*

ÖZET

Amaç: *Yapılan bazı çalışmalar, retrograd intrarenal cerrahi (RIRS) için cerrahın doğrudan üretere girmeyi seçmesi durumunda üreter erişim kılıfının (UAS) gerekli olmadığını göstermektedir. Bu araştırmanın amacı, vaka serilerimizi mevcut literatür ışığında geriye doğru incelemek ve UAS kullanılan ve kullanılmayan vakalar arasında etkinlik, güvenlik ve ameliyat sonrası geç dönemde (3. ay) taşsızlık oranları açısından doğrudan bir karşılaştırma yapmaktır.*

Gereç ve Yöntem: *Ocak 2019- Haziran 2022 tarihleri arasında kliniğimizde RIRS ile tedavi edilen böbrek taşı olgularının retrospektif taraması yapıldı. Dahil etme ve hariç tutma kriterlerinin tümüne uyan 153 katılımcı çalışmaya dahil edildi. Üreter erişim kılıfı kullanılan vakalar için Grup UAS, kullanılmayanlar için Grup N oluşturuldu. Demografik veriler, ameliyat öncesi ve sonrası laboratuvar sonuçları ve radyografik veriler iki grup arasında karşılaştırıldı.*

Bulgular: *Gruplar arasında cinsiyet ve yaş açısından karşılaştırılabilir bir dağılım (50,85±13,20 ve 52,84±14,27; p=0,476) görüldü. Charlson Komorbidite İndekslerinin benzer bir dağılıma sahip olduğu bulundu [medyan (IQR): 1 (0,5–2,5) vs. 1 (0–3); p=0,986]. Serum kreatinin düzeyleri (0,92±0,27 vs. 0,97±0,34; p=0,560), ateş veya sepsis (%0,0 vs. %1,0; p=0,686) ve hastanede kalış süresi (2,15±0,65'e karşı 2,31±0,74; p=0,691) cerrahi takipte gruplar arasında benzerdi. Bilgisayarlı tomografi ile postoperatif üç aylık taşsızlık değerlendirmesinde Grup UAS üstün olmasına rağmen bu fark istatistiksel olarak anlamlı değildi (%72,9'a karşı %73,3; p=0,552).*

Sonuç: *Böbrek taşlarının cerrahi tedavisinde UAS kullanılsın veya kullanılmasın RIRS güvenli ve etkili bir şekilde kullanılabilir. Postoperatif geç dönemdeki (üç ay) komplikasyonlar ve başarı oranları UAS kullanımından önemli ölçüde etkilenmez.*

Anahtar Kelimeler: *erişim kılıfı; böbrek taşları; retrograd intrarenal cerrahi*

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Introduction

Recent years have shown an increase in the incidence of urinary stone disease [1]. This improvement coincides with a general convergence in the technological sophistication of the instruments employed in the minimally invasive treatment of urinary stones [2]. Thanks to these remarkable technological developments, retrograde intrarenal surgery (RIRS) has emerged as a viable option for the minimally invasive therapy of stones between 10 and 20 millimeters in size[3]. According to the European Association of Urology's (EAU) Urolithiasis Guidelines, single-session external shock wave lithotripsy (ESWL) and RIRS are effective treatment modalities for kidney stones under 20 mm in diameter. In comparison, percutaneous nephrolithotomy (PCNL) is still used for stones over 20 mm due to its higher stone-free rates after a single session [4]. In addition, unlike ESWL or flexible ureterorenoscopy (URS), PCNL outcomes are less dependent on stone size. Nonetheless, PCNL is more invasive than RIRS and carries a higher risk of serious complications (bleeding, sepsis) [5].

Most endourologists routinely place a ureteral access sheath (UAS) during RIRS. Surgeons using UAS argue that the use of UAS provides repeated access to the ureter and kidney, reduces the internal pressure created by continuous irrigation in the kidney, and protects the ureter and ureteroscope from possible damage [6]. However, despite the number of pluses, UAS is not entirely innocent. In the literature, varying rates of minor and major complications related to the use of UAS have been reported [7]. And this has brought to mind the question of whether the use of UAS is an indispensable surgical necessity.

According to recent studies, depending on the surgeon's preference, retrograde intrarenal surgery can be successfully performed by directly entering the ureter without a UAS [8,9]. Therefore, this study's objective is to retrospectively review our case series in light of the literature and compare cases with and without a UAS regarding efficacy, safety, and stone-free rates in the late postoperative period (3rd month).

Material and Methods

Retrospective screening of kidney stone cases treated with RIRS in our clinic was done from January 2019 to June 2022. Our institute's ethics committee approved our study (80576354–050–99/96), and we abided by the Declaration of Helsinki's ethical principles. Patients undergoing uncomplicated RIRS to treat kidney stones met the inclusion criteria. Preoperatively implanted ureteral stents, ureteral stenosis, solitary kidneys, ectopic kidneys, and other anatomical anomalies were all excluded from the study. The study includes 153 individuals that met all inclusion and exclusion requirements.

In every instance, kidney-ureter-bladder graphy (KUB) and non-contrast computer tomography (NCCT) were used to assess the renal collecting system's kidney stone characteristics and morphological features. In addition, urinary USG examinations and radiographic evaluation procedures were carried out when needed during the pre-treatment. The biggest diameter was measured in the KUB for opaque stones, and for lucent stones, the NCCT. The parenchymal thickness was determined by measuring the thickest area on transverse sections on preoperative CT.

Before surgery, it was anticipated that all patients would have negative urine cultures. Those with confirmed urinary tract infections received the proper antibiotic treatment before the surgery. Throughout the surgery, prophylactic antibiotics were administered to all patients (single dose of 2nd generation cephalosporin). Non-contrast computer tomography was used to ascertain the patients' stone-free status three months after surgery. A satisfactory outcome was defined as the lack of any leftover fragments or the presence of tiny stone particles (<3 mm).

Under general anesthesia, all procedures were carried out while the patient was in the lithotomy position. Under the assistance of a fluoroscope, a 9.5 Fr semi-rigid ureteroscope was used to insert a 0.038 Fr guide wire into the renal pelvis. Retrograde pyelography was used to investigate the pelvicalyceal system. In the UAS group of patients, a UAS (9.5/11.5 Fr, Cook Medical, Bloomington, IN) was introduced under fluoroscopy before a flexible ureteroscope was used to access the collecting system (Storz FLEX-X2). Then, a 7.5 Fr fiberoptic flexible ureteroscope was used to directly access the remaining individuals' ureters (Storz FLEX-X2). Using a 273 fiber and a holmium laser, stones were disintegrated. In patients with a UAS, fragments bigger than 3 mm were removed using a nitinol basket (ZeroTipTM; Cook Urological Inc.). Smaller pieces were left open for natural passage. In patients for UAS was not used, it was impossible to extract fragments with a basket; instead, laser lithotripsy was used to ensure that no large fragments were left behind. Patients were split into two groups depending on whether UAS

was utilized during surgery according to the surgeon's preference. Those that submitted a UAS application were placed in Group UAS, while those who did not were placed in Group N. The two groups have compared certain preoperative and postoperative laboratory and radiological parameters.

Statistical Evaluation

IBM Statistical Package for Social Sciences (SPSS) program version 22.0 was used for the statistical evaluation (IBM Inc., Chicago, IL, USA). The presentation of continuous variables was as mean and standard deviation. When a normal distribution was not seen in these variables, the median and IQR were used to present the data. These variables were compared using either a Mann-Whitney U test or an independent T-test. Categorical variables were expressed using numbers and percentages (%). The Fisher's exact test or the Chi-square test was used to compare these variables. For all statistical studies, a p-value of <0.05 was used.

Results

When the received data are evaluated: A comparable distribution in terms of gender and age (50.85±13.20 vs. 52.84±14.27; p=0, 476) was seen between the groups. Body mass indices (27.38±4.21 vs. 28.39±4.54; p=0, 201), the frequency of diabetes (10.4% vs. 14.3%; p=0, 353), and the usage of anticoagulants (18.8% vs. 17.1%; p=0, 487) were comparable between the groups. The Charlson Comorbidity Indexes were found to have a similar distribution [median (IQR): 1 (0.5–2.5) vs. 1 (0–3); p=0.986]. There was no discernible difference between the two groups regarding stone lateralization, size (11.92±4.56 vs. 11.90±5.93; p=0, 998), opacity status, or location in the collecting system when the characteristic data of the stones were compared. In a similar vein, there was no statistically significant difference between the groups in terms of stone number (single, multiple) and density. There was no evident difference between the groups in terms of the frequency of hydronephrosis (45.8% vs. 40.0%; p=0, 307), infundibulopelvic angle (46.30±15.03 vs. 45.40±15.24; p=0, 648), or renal parenchymal thickness (26.19±7.31 vs. 26.46±7.81; p=0, 646) during the anatomical evaluation of the kidney and collecting system. The groups' creatinine and (0.92±0.25 vs. 0.98±0.35; p=0, 520) GFR (81.74±35.27 vs. 79.21±39.56; p=0, 563) values in the preoperative test results were comparable. Similar rates were found in terms of both past endoscopic stone therapy (62.5% vs. 55.2%; p=0, 253) and usage of alpha-blockers (4.2% vs. 5.7%; p=0, 515).

Last but more importantly, creatinine levels (0.92±0.27 vs. 0.97±0.34; p=0, 560), fever or sepsis (0.0% vs. 1.0%; p=0, 686), and hospital stay (2.15±0.65 vs. 2.31±0.74; p=0, 691) were comparable between the groups during the surgical follow-up. Even though Group UAS was superior in the postoperative three-month stone-free assessment with CT, this difference was not statistically significant (72.9% vs. 73.3%; p=0, 552). Patient demographics, pre-and post-operative clinical characteristics, and laboratory findings are given in Table 1.

Discussion

One of the primary objectives of current endourologic stone management is to achieve a completely stone-free status in a single session. To predict the ultimate success of this procedure in this aspect, some stone– and patient-related factors have been evaluated, including stone size, location, and hardness. The use of UAS is one of the issues that have already been looked into. Depending on the surgeon doing the surgery's clinical background and the institution's unwritten clinical protocols, different UAS may be used.

Ureteric access sheath use has consistently been promoted for RIRS [10]. Proponents of UAS point to the following advantages of the technology: they simplify various access to the ureter, which greatly facilitates flexible URS; they are expected to improve vision by optimizing irrigation flow; and they decrease pressure in the collecting system, which may lead to kidney injury and sepsis [11,12]. However, there are no formal suggestions for using UAS during RIRS. Additionally, there is very little data supporting the impact of UAS on perioperative outcomes and stone-free rates[13].

Various research looks into the impact of UAS in terms of stone-free rates following RIRS. Traxer et al.[14] stated that success rates were greater in patients where UAS was not utilized, contrary to Berquet et al.[15], who claimed that UAS use did not influence stone-free rates. The findings of our investigation supported Berquet et al. by demonstrating no distinction in stone-freeness between the two groups.

Huang et al. released a meta-analysis assessing the advantages and disadvantages of using UAS in 2018. This analysis identified 3127 surgeries after analyzing data from 8 studies with 3099 individuals. The length of the

Table 1. *Patient demographics, pre- and post-operative clinical characteristics, and laboratory findings*

		Group N		Group UAS		p
Gender	Male	25	52.1%	60	57.1%	0.341
	Female	23	47.9%	45	42.9%	
Age		50.85	±13.20	52.84	±14.27	0.476
Body Mass Index (kg/m²)		27.38	±4.21	28.39	±4.54	0.201
Diabetes		5	10.4%	15	14.3%	0.353
Anticoagulant Use		9	18.8%	18	17.1%	0.487
Charlson Comorbidity Index [median (IQR)]		1	(1–2.5)	1	(0–3)	0.986
Stone Lateralization	Right	22	45.8%	47	44.8%	0.520
	Left	26	54.2%	58	55.2%	
Stone Size (mm)		11.92	±4.56	11.90	±5.93	0.998
Opacity Status	Opaque	25	52.1%	52	49.5%	0.453
	Non-opaque	23	47.9%	53	50.5%	
Localization	Pelvis	20	41.7%	51	48.6%	0.689
	Lower	23	47.9%	40	38.1%	
	Midle	3	6.3%	7	6.7%	
	Upper	2	4.2%	7	6.7%	
Stone Number	Single	26	54.2%	56	53.3%	0.532
	Multiple	22	45.8%	49	46.7%	
Stone Density (Hounsfield Unit)		828.04	427.46	788.51	±394.43	0.750
Presence of Hydronephrosis		22	45.8%	42	40.0%	0.307
Infundibulopelvic Angle (°)		46.30	±15.03	45.40	±15.24	0.648
Renal Phrencymal Thickness (mm)		26.19	±7.31	26.46	±7.81	0.646
Preoperative Creatine (mg/dL)		0.92	±0.25	0.98	±0.35	0.520
Glomerular Filtration Rate (ml/min/1.73 m²)		81.74	±35.27	79.21	±39.56	0.563
Alpha-blocker Use		2	4.2%	6	5.7%	0.515
Previous Endoscopic Stone Treatment		30	62.5%	58	55.2%	0.253
Postperative Creatine (mg/dL)		0.92	±0.27	0.97	±0.34	0.560
Postoperative Fever/Sepsis		0	0.0%	1	1.0%	0.686
Hospitalization (days)		2.15	±0.65	2.31	±0.74	0.691
Postoperative 3rd Month Stone Free Rate		35	72.9%	77	73.3%	0.552

hospital stay, intraoperative problems, or stone-free results did not reveal appreciable variations. However, the UAS group had a greater rate of postoperative complications. The results of this meta-analysis largely support our conclusions that there are no appreciable benefits to using UAS during ureteroscopy. In our investigation, the incidence of postoperative complications was comparable among groups[16]. Similar to our study, some studies found each group to be similar regarding postoperative complications[17]. Also, about complications and success rates in RIRS, Yigit et al. discovered no noteworthy variations when comparing employing UAS or not[18].

A significant ureteral damage rate from UAS was found to be 13.3 % by Traxer et al. 7 In either group in our series; we did not document a significant ureteral injury. The practice of RIRS surgery at our clinic by surgeons nearing the end of their learning curve can be hypothesized as the cause.

Studies utilizing ultrasonography or KUB may overestimate the actual stone-free percentage because most of these investigations frequently need attention to very small fragments[19]. In our clinical protocol, we perform residual stone control with NCCT within three months postoperatively. Studies in the literature found stone-free rates above 90% after RIRS20. In our study, it is a fact that we could not achieve these rates within each group.

Limitations

The primary drawback of this study is that it was carried out retrospectively. Patients for whom UAS was not used may have been subject to selection bias in this retrospective analysis. In addition, we could not obtain other information, such as the operating durations. The findings may also have been impacted by the fact that the data originated from a single source and that many surgeons with varying degrees of experience performed the surgeries. Despite these drawbacks, this study will add to the literature because of the control of stones in the late postoperative period.

Conclusion

Whether or not UAS is utilized, RIRS can be employed safely and efficiently in the surgical management of kidney stones. In the late postoperative phase (3 months), complications and success rates are not significantly affected by UAS use. Undoubtedly, additional randomized controlled clinical studies on this topic are needed. Surgeon practice habits and unwritten regulations of the institution will continue to factor into UAS use until research with more exact and binding data on the subject is incorporated into the recommendations.

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