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Değerli Meslektaşlarımız,

Endoüroloji Bülteni Editör Kurulu olarak, bilimsel bilginin yaygınlaşmasına ve üroloji alanındaki yenilikçi araştırmaların uluslararası düzeyde tanınmasına katkıda bulunmayı en önemli hedefimiz olarak görüyoruz. Bültenimizde yayımlanan makalelerin hem bilim dünyasına katkı sunmasını hem de küresel akademik platformlarda yer almasını sağlamak için çalışmalarımızı sürdürüyoruz. Bu doğrultuda, dergimizin uluslararası indekslerdeki görünürlüğünü artırmak adına yoğun çaba gösteriyoruz.

2025 yılının bu son sayısında, bilimsel kalitesi yüksek ve üroloji alanına önemli katkılar sağlayan dokuz araştırma makalesi ve bir olgu sunumu yer alıyor. Bu çalışmalar, kendi alanlarında uzman akademisyenler tarafından titizlikle hazırlanmış olup, ürolojinin çeşitli alt disiplinlerine ışık tutmaktadır. Yazarlar, güncel araştırma bulguları ve sonuçlarıyla hem bilimsel literatüre hem de klinik pratiğe önemli katkılar sunuyor.

Alanımızdaki en güncel bilgileri meslektaşlarımızla paylaşarak hem klinik hem de akademik anlamda üroloji camiasına katkı sağlamayı sürdürüyoruz. Ayrıca, siz değerli meslektaşlarımızın desteğiyle büyüyen Endoüroloji Bülteni, www.endourolojibulteni.com adresindeki web sitemiz üzerinden daha geniş bir erişime açıldı. Web sitemiz aracılığıyla bültenimizin tüm sayılarına ulaşabilir, yayımlanan makaleleri inceleyebilir ve dergimiz hakkında güncel bilgilere kolayca erişebilirsiniz.

Bugüne kadar çalışmalarını bizimle paylaşan ve bilimsel katkılarıyla bültenimizi zenginleştiren tüm meslektaşlarımıza içten teşekkürlerimizi sunarız. Bilim dünyasını daha ileriye taşımak adına yaptığınız katkılar bizim için büyük bir değer taşımaktadır. Dergimizin akademik ve bilimsel faaliyetlere olan katkısını artırarak sürdürmeyi hedefliyor, bu süreçte sizlerin desteğinin ne kadar önemli olduğunu bir kez daha vurgulamak istiyoruz.

2025 yılı ve sonrasında da bilimsel faaliyetlerinizi Endoüroloji Bülteni aracılığıyla paylaşmaya devam etmenizi temenni eder, katkılarınızın ve desteğinizin devamını dileriz.

Saygılarımızla,

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Original Article
Özgün Araştırma

Endourol Bull. 2025;17(3):105-110. doi: 10.54233/endourolbull-1667983

The Effect of Ureteral Double-J Stent Removal Methods on Pain Intensity in Male Patients Under Local Anesthesia

Lokal Anestezi ile Üreteral Çift-J Stent Çekilme Yöntemlerinin Erkek Hastalarda Ağrı Şiddeti Üzerine Etkisi

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ABSTRACT

Objective: Ureteral stents are commonly used, especially in the treatment of ureteral stones, and are removed endoscopically after a certain period following the procedure. The removal of these stents under local anesthesia, particularly in male patients, can cause pain. Rigid cystoscopes are typically used, but the use of thinner and more flexible endoscopic instruments is considered an alternative to reduce pain. This study aims to compare the pain experienced during Double-J stent removal using a rigid cystoscope versus a semirigid ureterorenoscope (URS).

Materials and Methods: Our study included patients who underwent unilateral endoscopic ureteral stone treatment followed by Double-J stent placement. Patients were divided into two groups based on whether their stent removal was performed using a rigid cystoscope or a semirigid URS. All stent removals were performed by the same surgeon. Immediately after the ureteral stent removal, the pain score was evaluated and recorded by the operating physician using the Visual Analog Scale (VAS).

Results: Among the 120 patients included in the study, 57 (47.5%) were in the cystoscopy group (group 1) and 63 (52.5%) were in the URS group (group 2). There was no significant difference between the groups in terms of stent side (p=0.47) and average age (p=0.16). However, group 1 had a significantly higher VAS score (3.6±1.7) compared to group 2 (1.9±0.8) (p<0.001).

Conclusion: Due to the long and complex structure of the male urethra, men may experience more pain than women during ureteral stent removal under local anesthesia. Our study found that the use of semirigid URS caused less pain than a rigid cystoscope. Flexible cystoscopes are not commonly used due to their high cost and durability issues, while semirigid URS presents a more cost-effective alternative. The single-center and small sample size of our study indicates the need for larger-scale studies. In conclusion, semirigid URS causes less pain compared to rigid cystoscopes in male patients and is better tolerated.

Keywords: local anesthesia, stent removal, ureteral stone, VAS score

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ÖZET

Amaç: Üreteral stentler, özellikle üreter taşlarının tedavisinde yaygın olarak kullanılmakta olup, operasyonda belirli bir süre sonra endoskopik yöntemle çıkarılmaktadır. Özellikle erkek hastalarda lokal anestezi ile çıkarılması ağrıya neden olabilmektedir. Genellikle rigid sistoskop kullanılmakta olup hastanın daha az ağrı duyması için daha ince ve esnek endoskopik aletlerin kullanımı alternatif olarak görülmektedir. Bu çalışmada, üreteral çift-J stent çıkarımında rigid sistoskop ile semirigid üreterorenoskop (URS) kullanımının ağrı açısından karşılaştırılması hedeflenmektedir.

Gereç ve Yöntemler: Çalışmamıza tek taraflı endoskopik üreter taş tedavisi sonrası üreteral çift-J stent yerleştirilen hastalar dahil edildi. Hastalar stent çekimlerinin rigit sistoskop ile veya semirigid URS ile olması durumuna göre Sistoskopi ve URS grubu olarak ikiye ayrıldı. Tüm stent çekimleri aynı cerrah tarafından gerçekleştirildi. Üreteral stent çıkarıldıktan hemen sonra, işlemi yapan doktor tarafından görsel analog skala (VAS) ağrı skoru değerlendirildi ve kaydedildi.

Bulgular: Çalışmaya dahil edilen 120 hastanın, 57'si (%47,5) sistoskopi (grup 1), 63'ü (%52,5) URS (grup 2) gruplarını oluşturdu. Gruplar arasında stentin tarafı ($p = 0,47$) ve yaş ortalaması ($p = 0,16$) açısından anlamlı fark yoktu. Ancak, grup 1'in VAS skoru ($3,6 \pm 1,7$), grup 2'ye ($1,9 \pm 0,8$) göre anlamlı derecede yüksekti ('$p<0,001$).

Sonuç: Erkek üretrası uzun ve karmaşık bir yapıya sahip olduğundan, lokal anestezi ile üreteral stent çıkarımında erkekler, kadınlara göre daha fazla ağrı hissedebilir. Çalışmamızda, semirigid URS kullanımının rigid sistoskopa göre daha az ağrıya yol açtığı görüldü. Flexible sistoskoplar yüksek maliyet ve dayanıklılık sorunları nedeniyle yaygın kullanılmazken, semirigid URS daha uygun bir alternatif olarak öne çıkmaktadır. Çalışmamızın tek merkezli ve küçük örneklemli olması, daha geniş çaplı araştırmalara ihtiyaç duyulduğunu göstermektedir. Genel olarak, erkek hastalarda semirigid URS'nin, rigid sistoskopa göre daha az ağrıya neden olduğu ve bu cihazın daha iyi tolere edildiği sonucuna varılmıştır.

Anahtar Kelimeler: lokal anestezi, stent çekimi, üreter taşı, VAS skoru

INTRODUCTION

Since the introduction of double-J (DJ) stents in 1978, ureteral stents have become an important and almost indispensable tool in modern urological practice, particularly in the treatment of ureteral stones (1). The use of ureteral stents has emerged as an effective method to prevent ureteral obstruction, postoperative pain, hydronephrosis, and ureteral stricture after ureteral stone surgeries (2). These stents are removed endoscopically after a certain period following the stone surgeries. The removal of ureteral stents under local anesthesia can cause discomfort and pain in male patients due to the length of the urethra.

Ureteral stent removal is usually performed in an outpatient setting under local anesthesia using a rigid cystoscope. Although the analgesic effect provided using lidocaine gels before or during the procedure is debated in various studies, there are meta-analyses indicating that it provides analgesia (3-5). However, due to the rigid structure and larger diameter of rigid cystoscopes, many patients require analgesics during DJ stent removals, and some procedures may require deep sedation (6). Performing the ureteral stent removal procedure with smaller diameter semirigid ureterorenoscopes (URS) under local anesthesia may result in less perceived pain during the procedure. Although studies have been conducted on performing this procedure with flexible cystoscopes as an alternative to rigid cystoscopes, there are no studies in the literature using semirigid URS to reduce the diameter of the endoscopic tool used for ureteral stent removal (7). On the other hand, the cost and accessibility problems of flexible cystoscopes still exist. Therefore, in this study, we aim to evaluate the difference in pain experienced between performing ureteral DJ stent removal under local anesthesia using a rigid cystoscope versus a semirigid URS.

MATERIALS AND METHODS

Between 2021 and 2024, male patients who underwent unilateral endoscopic ureteral stone surgery and required ureteral stent removal were included in the study. Written informed consent forms were obtained from all patients confirming their participation in the study. The study was conducted by the Helsinki Declaration, and ethical approval was obtained from the Etlik City Hospital of Medicine Ethics Committee on (March 26, 2025), approval number (AESH-BADEK-2025-0160). Patients were assigned to two groups based on whether their stent removal was performed with

a rigid cystoscope or semirigid URS: the cystoscopy group (group 1) and the URS group (group 2). Patients were randomly assigned to either group in a 1:1 ratio according to the order in which they agreed to undergo ureteral stent placement for their ureteral stone operation. After all stone treatments, a 4.8 Fr, 24 cm Plastimed brand polyurethane double-J ureteral catheter was placed, and its position was confirmed with fluoroscopy. After the ureteral stone surgery, patients were instructed to return within 3-4 weeks for stent removal. Prior to all ureteral stent removal procedures, a sterile urine culture was confirmed. Ten minutes before the procedure, in the local procedure room, a lubricant containing 0.05% antiseptic Chlorhexidine Digluconate and 2% Lidocaine Hydrochloride local anesthetic (Konix brand Katejel) was instilled into the urethra. All ureteral stent removal procedures were performed by the same urologist (E.H.) under local anesthesia in the lithotomy position, following appropriate draping and sterilization. In the Cystoscopy group, a 19 Fr Karl-Storz rigid cystoscope and forceps were used. In the URS group, a 9.8 Fr (thick) Karl-Storz ureterorenoscope and forceps were used. Immediately after the ureteral stent was removed, the pain score was assessed by the performing physician using the Visual Analog Scale (VAS). The VAS pain score was determined by measuring the pain the patient felt on a scale from 0 (no pain) to 10 (severe pain).

Inclusion Criteria

The study included male patients aged 18-80 years who underwent their first unilateral ureteral stone surgery and had a ureteral DJ stent placed. Patients were included regardless of their use of alpha-blockers.

Exclusion Criteria

Patients with an active urinary tract infection during ureteral stent removal, those with encrusted or migrated DJ stents, those with residual stones around the DJ stent in the ureter, those who had previously undergone urological surgery before the DJ stent placement, patients with bleeding diathesis, those with anatomical variations of the collecting system such as a duplicated ureter, patients whose stent removal had been delayed beyond 45 days, patients who lacked cognitive function to indicate a VAS score, and those with urethral anomalies such as hypospadias, meatal stenosis, or urethral stricture that could increase pain during stent removal were excluded from the study.

Statistical Analysis

Statistical analyses were performed using the SPSS software package (IBM SPSS Statistics, version 21, New York, USA). Given the sample size and distribution characteristics, the Kolmogorov-Smirnov test was employed to evaluate the normality of the distribution of continuous variables. For comparisons between two groups involving normally distributed quantitative variables, such as the Visual Analog Scale (VAS) score, the independent samples t-test was utilized. For quantitative variables that did not meet the normality assumption, including the age parameter, the non-parametric Mann-Whitney U test was applied.

Categorical variables, such as the side of the stent and alpha-blocker usage, were compared using the chi-square test due to their nominal nature. Additionally, the correlation between Age and VAS scores was assessed using Spearman's rank correlation coefficient, as the data did not meet the parametric assumptions required for Pearson correlation analysis.

All statistical tests were two-tailed, and a p-value of less than 0.05 was considered statistically significant.

RESULTS

A total of 136 patients were initially included in the study, but four patients declined to participate, leaving 132 patients who were divided into two groups, each consisting of 66 patients. Due to intraoperative reasons, such as stone push-up to the kidney and residual stone, five patients from the cystoscopy group and two patients from the URS group were excluded from the study. Additionally, five patients were excluded because they did not show up for stent removal within the specified time frame or underwent general anesthesia for DJ stent removal. As a result, 120 patients were included in the final analysis, with 57 patients (47.5%) in the cystoscopy group (group 1) and 63 patients (52.5%) in the URS group (group 2) (Table 1). In group 1, 25 patients had right-sided stents (43.9%), and 32 had left-sided stents (56.1%). In group 2, 32 patients had right-sided stents (50.8%), and 31 had left-sided stents (49.2%). No statistically significant difference was observed between the groups in terms of stent laterality ($p = 0.47$). The

median ages of group 1 and group 2 were 49 (IQR: 41–60) and 45 (IQR: 36–58), respectively. No statistically significant difference was observed between the groups in terms of age (p = 0.16). In group 1, 11 patients (19.3%) and in group 2, 13 patients (20.6%) were using alpha-blockers. Chi-square analysis showed no statistically significant difference in alpha-blocker use between the groups (p = 0.39). The VAS scores for group 1 and group 2 were 3.6 ± 1.7 and 1.9 ± 0.8, respectively, with group 1 having a significantly higher VAS score (p<0.001) (Figure 1).

Table 1. Comparison of Side, Age, Alpha Blocker Use, and VAS Score between Groups

	Cystoscopy (Group 1) (n=57)	URS (Group 2) (n=63)	p-value
Side (Right/Left)	25(43.9%), 32(56.1%)	32(50.8%), 31(49.2%)	0.47
Age (median (IQR))	49 (IQR: 41–60)	45 (IQR: 36–58)	0.16
Alpha Blocker Use	11 (19.3%)	13 (20.6%)	0.39
VAS Score (mean ± SD)	3.6 ± 1.7 (1-9)	1.9 ± 0.8 (1-5)	<0.001

VAS Score: Visual Analog Scale (VAS) pain score, SD: Standard Deviation, IQR: Interquartile Range

In the Spearman correlation analysis, including all patients, there appeared to be a positive relationship between age and VAS score (r = 0.150); however, this correlation was not statistically significant (p = 0.101).

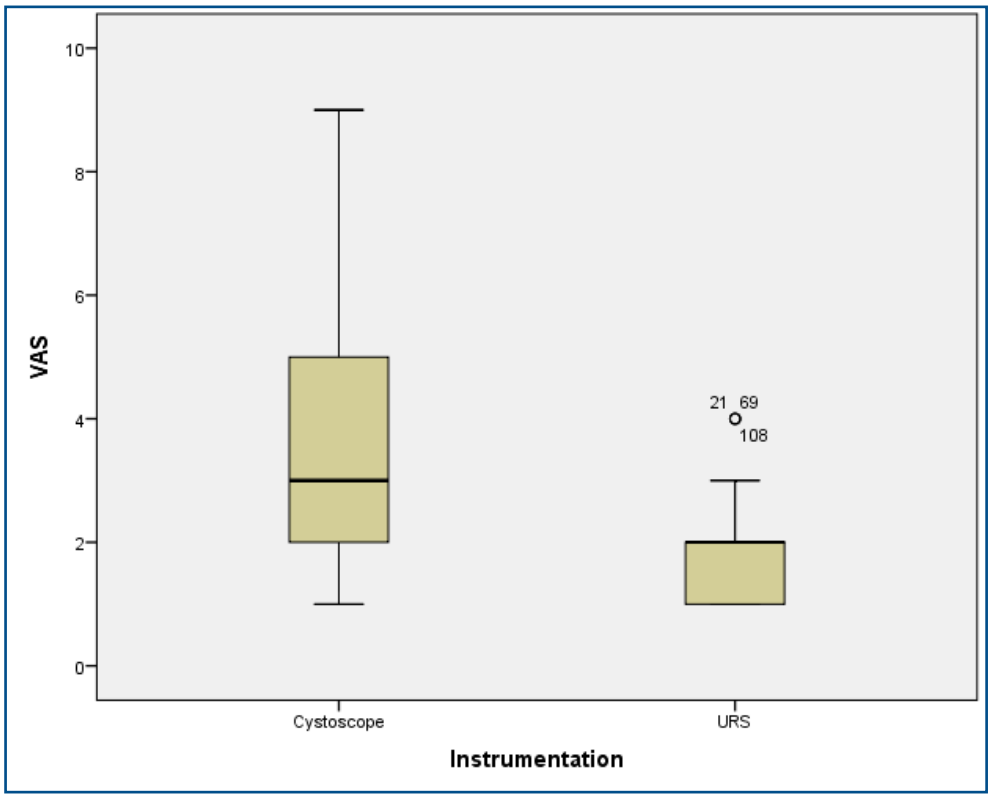

Figure 1. Comparison of VAS scores between group 1 and group 2 showing significantly higher pain in group 1 (p < 0.001).

DISCUSSION

The male urethra has a long and complex anatomical structure. While the distal part of the urethra is more flexible, the proximal membranous part is surrounded by the striated external urethral sphincter and continues as the prostatic urethra. The female urethra, on the other hand, is approximately 4 cm long from the bladder neck to the vaginal vestibule. Due to this anatomical difference between the male and female urethra, males may experience significantly

more severe pain than females when undergoing endoscopic removal of the ureteral stent with local anesthesia. Therefore, a less painful procedure may be required, especially for male patients.

In our study, no statistical differences were observed between the groups in terms of age and stent side, indicating that these two factors were appropriately randomized. The only statistical difference between the groups was the VAS score. We found that patients in the URS group, where the endoscopic instrument was thinner, experienced less pain.

The lack of a significant difference in alpha-blocker use between the two groups examined in the study has equated the patients' use of alpha-blockers, which could alleviate stent-related irritative symptoms. No correlation was found between age and VAS score in the included patients. Since similarity between the groups was achieved, it can be inferred that the primary factor affecting the VAS score was the surgical procedure during stent removal.

The process of DJ stent removal has become a concerning issue in the stone surgery process, particularly in male patients, due to the increased perception of pain. Although non-invasive methods such as magnetic systems and systems with strings extending outside the urethra can be used for ureteral stent removal, they are not widely used in practical urological practice due to difficulties in obtaining them, or because the ureteral stent may spontaneously dislodge before the desired time (8,9). Most previous studies have compared patient pain between flexible and rigid cystoscopes, with the majority finding flexible cystoscopes to be advantageous (7). However, flexible cystoscopes have cost-related problems due to their tendency to break down quickly, high repair costs, shorter lifespan compared to rigid cystoscopes, and high prices. Many health institutions in our country still lack flexible cystoscopes, and ureteral stent removal procedures are performed with rigid cystoscopes. In two studies in the literature comparing semirigid URS and flexible cystoscopes, the VAS pain scores were found to be similar, and as a result, semirigid URS was emphasized as a better alternative due to its lower cost (10,11). In our study, we found that semirigid URS caused less pain in male patients during ureteral stent removal with local anesthesia compared to rigid cystoscopes.

Factors that may increase pain during endoscopic interventions with local anesthesia in male patients include the length of the urethra, the active tone of the external urethral sphincter, prostatic hypertrophy, and the height of the bladder neck. Specifically, the greater active tone of the urethral sphincter in younger males compared to older males may lead to increased pain during the procedure. In older male patients, the narrowing of the urethral lumen due to prostatic hypertrophy will be alleviated by using thinner endoscopic devices, thus reducing pain. Both our study and that of Söylemez et al. (10) have shown that when the endoscopic device has a lower French size, less pain is experienced.

Although the use of flexible cystoscopes for ureteral stent removal with local anesthesia is a preferred approach, their high costs limit their usage. Lai et al. (11) compared flexible cystoscopes and semirigid URS for ureteral stent removal and found that both methods had similar results in terms of procedure duration, post-procedure hematuria, irritable bladder symptoms, and pain scores. In our study, we demonstrated that semirigid URS, which is widely used by urologists, caused less pain due to its thinner structure compared to rigid cystoscopes.

However, it should be noted that semirigid URS is longer and thinner, which may pose a higher risk of urethral injury when used by less experienced urologists under local anesthesia. In our study, no urethral injury occurred during the stent removal procedures using semirigid URS.

Although the fact that all ureteral stent removal procedures were performed by the same doctor is a strength of the study, the limitation of this study is that it was a single-center study with a relatively small sample size. There would be unavoidable inherent bias. A multi-center prospective randomized controlled study with a larger sample size would be ideal.

CONCLUSIONS

In the modern healthcare system, where minimally invasive approaches are prioritized across all surgical specialties,

the use of finer instruments will improve patient comfort. In male patients, the use of semirigid URS for ureteral stent removal with local anesthesia appears to be better tolerated compared to the use of rigid cystoscopes.

Data Availability Statement: Available from the author via email.

Conflict of Interest Statement: The authors declare no conflict of interest.

Consent to participate: Since the study was retrospective, consent was not obtained from the participants.

Research involving human participants and/or animals: All analyses performed involving human participants were in accordance with the 1964 Helsinki Declaration and its later amendments.

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Ethıcs Statement: The study protocol was approved by the Etlik City Hospital of Medicine Ethics Committee. Decision no: AEŞH-BADEK-2025-0160, Date: 2025/03/26.

Author Contributions: EH: first author, manuscript preparation, analysis and interpretation of data, data collection, manuscript writing/editing, İEE: manuscript editing, review of articles, supervising the manuscript. All the authors discussed the results and commented on the manuscript.

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Original Article
Özgün Araştırma

Endourol Bull. 2025;17(3):111-118. doi: 10.54233/endourolbull-1701002

Factors Affecting Forgotten Ureteral Stents

Unutulmuş Üreteral Stentleri Etkileyen Faktörler

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ABSTRACT

Objective: Ureteral double-J (DJ) stents are frequently used in urology. Overdue or forgotten DJ stents are associated with many complications. This study will examine the factors affecting the stent forgetting period of patients with forgotten DJ stents.

Materials and Methods:
It was reviewed by Ağrı İbrahim Çeçen University Scientific Research Ethics Committee and approved with the decision numbered 108 dated 27.03.2025. Data from 12 patients with DJ stent indwelling longer than 6 months between January 2017 and December 2024 at Ağrı Training and Research Hospital, a rural tertiary center in Türkiye, were examined. Two groups were formed according to the median stent indwelling time: short-term (group 1) and long-term (group 2). The patient's age, gender, DJ stent placement indication, additional endourological procedure need and duration, restenting rates, and distances to the hospital were compared.

Results: There was no difference between the two groups regarding gender, indication for stent placement, additional endourological procedures, and restenting rate after additional endourological procedures. The mean age was 43.5 years (SD: 11) in group 1 and 61.3 years (SD : 9.5) in group 2 (p: 0.012). Median additional endourological procedures' duration was 37.5 minutes (IQR:27.5-40) in group 1 and 67.5 minutes (IQR: 52.5-87.5) in group 2 (p = 0.005). Median distance to the hospital was 38.5 kilometers (IQR: 19.25-77.75) in group 1 and 85.5 kilometers (IQR: 75.75-91.5) in group 2 (p = 0.037).

Conclusion: Our study concluded that patients whose DJ stents were forgotten for longer were older and resided in a center farther from the hospital. It would be beneficial to be careful, especially in this patient group.

Keywords: distance, encrustation, forgotten ureteral stent

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ÖZET

Amaç: Üreteral double-j (DJ) stentler ürolojide sıklıkla kullanılır. Gecikmiş veya unutulmuş DJ stentler birçok komplikasyonla ilişkilidir. Bu çalışmada unutulmuş DJ stentli hastaların stent unutma süresini etkileyen faktörler incelenecektir.

Gereç ve Yöntemler: Ağrı İbrahim Çeçen Üniversitesi Bilimsel Araştırmalar Etik Kurulunca incelenmiş olup, 27.03.2025 tarih ve 108 sayılı karar ile onaylanmıştır. Türkiye'de perifer bir üçüncü basamak merkez olan Ağrı Eğitim ve Araştırma Hastanesi'nde Ocak 2017 ile Aralık 2024 arasında DJ stent kalma süresi 6 aydan uzun olan 12 hastanın verileri incelendi. Ortanca stent kalma süresine göre iki grup oluşturuldu: kısa süreli (grup 1) ve uzun süreli (grup 2). Hastaların yaşı, cinsiyeti, DJ stent yerleştirme endikasyonu, ek endoürolojik prosedür ihtiyacı ve süresi, tekrar stentleme oranları ve hastaneye olan mesafeleri karşılaştırıldı.

Bulgular: Cinsiyet, stent yerleştirme endikasyonu, ek endoürolojik prosedürler ve ek endoürolojik prosedürlerden sonra tekrar stentleme oranları açısından iki grup arasında fark yoktu. Grup 1'de ortalama yaş 43,5 yıl (SD: 11) ve grup 2'de 61,3 yıl (SD: 9,5) idi (p: 0,012). Ortanca ek endoürolojik prosedür süresi grup 1'de 37,5 dakika (IQR: 27,5-40) ve grup 2'de 67,5 dakika (IQR: 52,5-87,5) idi (p = 0,005). Hastaneye olan ortanca uzaklık grup 1'de 38,5 kilometre (IQR: 19,25-77,75) ve grup 2'de 85,5 kilometre (IQR: 75,75-91,5) idi (p = 0,037).

Sonuçlar: Çalışmamızda DJ stentleri daha uzun süre unutulan hastaların daha yaşlı olduğu ve hastaneye daha uzak bir merkezde ikamet ettiği sonucuna varılmıştır. Özellikle bu hasta grubunda dikkatli olmak faydalı olacaktır.

Anahtar Kelimeler: enkrustasyon, unutulmuş üreteral stent, uzaklık

INTRODUCTION

Ureteric double-J (DJ) stents are commonly used to manage obstructions resulting from urolithiasis, ureteral strictures, ureteropelvic junction (UPJ) obstruction, intraluminal ureteral lesions, and external compression. They are also indicated in cases of urine extravasation due to ureteral injury or to maintain ureteral patency following ureteral reconstructive procedures (1). Since their introduction in 1978, many improvements have been made in the design and biomaterials used (2). Nevertheless, ureteral stents remain associated with many morbidities. The most common complications include pain, urinary tract infection, hematuria, migration, encrustation, and fragmentation (3-6). In addition, prolonged stent indwelling may lead to more serious complications, increasing both morbidity and mortality risk (7). Delayed or forgotten stent removal carries a significant risk of obstruction and infection, particularly due to stent encrustation or fracture (4). The literature has emphasized that forgotten DJ stents not only pose serious health risks to patients but also carry medicolegal implications for physicians (8). Considering all these risks, it is seen that forgotten stents remain a significant clinical problem.

This study retrospectively evaluates the data of patients with forgotten DJ stents, aiming to identify the factors that influence the duration of stent retention.

MATERIALS AND METHODS

A retrospective review was conducted on data from patients who underwent DJ stent placement at Ağrı Training and Research Hospital, a tertiary care center in a peripheral region of Türkiye, between January 2021 and December 2024. The stent removal times of all patients were reviewed. Based on the manufacturer's recommendations, a maximum stent indwelling time of 6 months was determined, and this threshold was used as the inclusion criterion. Seventeen patients with indwelling stents exceeding 6 months were identified. Patients with missing surgical records, incomplete address information, or those who had undergone additional surgeries were excluded. Consequently, complete data were obtained for 12 patients. All patients' age, gender, indication for DJ stent placement, duration of stent retention, presence of encrustation, whether an additional endourological procedure was required, the type and duration of the auxiliary procedure, need for re-stenting afterward, and the distance between the patients' district of residence and Ağrı Training and Research Hospital were recorded. The residential distance was calculated using Google Maps (https://www.google.com/maps), based on the address registered in the hospital system. All data were analyzed to investigate the factors associated with prolonged DJ stent retention time.

Statistical Analysis

SPSS version 28.0.0.0 (IBM, Chicago) was used in statistical analysis. Two groups were created according to the median stent length of stay. Group 1 was designed for those who stayed for less than 290 days, and Group 2 for those who stayed for more than 290 days. Binomial variables between these two groups were compared with the chi-square test, and continuous variables were compared with the independent student t-test. Pearson correlation test was used to determine the correlation between distance and DJ stent length of stay. $p<0.05$ was considered statistically significant.

RESULTS

The median age of the patients was 54.5 years (40.8-61.8). The number of female patients was 7 (58.3%), while the number of male patients was 5 (41.7%). DJ stents were placed in 7 patients (58.3%) due to urolithiasis, one patient (8.3%) due to hydronephrosis during pregnancy, one patient (8.3%) due to external ureteral compression due to malignancy, and three patients (25%) due to iatrogenic injury during non-urological surgeries. There were 10 patients (83.3%) who required an additional urologic procedure during stent removal, while two patients (16.7%) did not require an additional urologic procedure. All 10 patients who needed an additional procedure underwent ureterorenoscopy and laser lithotripsy. The patients' median additional endourological procedure duration was 55 (37.5-80) minutes. Re-stenting was performed in 7 patients (58.3%) after the additional endourological procedure. The median distance of the patients to the hospital where the procedure was performed was 74.5 (35.3-87.5) kilometers. The median duration of stent indwelling in the patients was 290.5 (196.8-515.5) days (Table 1).

We divided the patients into two groups according to the median DJ stent indwelling time. While the stents of the patients in group 1 were forgotten for a relatively shorter time (<290.5 days), the stents of the patients in group 2 were forgotten for a longer time (>290.5 days). The mean age of the patients in group 1 was 43.5 (SD:11), while the mean age of the patients in group 2 was 61.3 (SD:9.5) ($p = 0.012$). The median additional endourological procedures duration was 37.5 (27.5 - 40) minutes in group 1 and 67.5 (52.5-87.5) in group 2 ($p = 0.005$). Median distance to the hospital was 38.5 (19.25-77.75) km in group 1 and 85.5 (75.75-91.5) km in group 2 ($p = 0.037$)(Table 2). There was no statistically significant difference between the two groups regarding gender distribution, indication for stent placement, need for additional endourological intervention, and re-stenting rate after the additional endourological procedure (Table 2). There was a positive correlation between the distance to the hospital and the DJ stent's forgotten time ($p = 0.04$) (Figure 1).

Table 1. Patient characteristics, demographic data, and operative data

Parameters (n=12)	
Age, year, median (IQR)	54.5 (40.8-61.8)
Gender, n (%)	
Female, n (%)	7 (58.3)
Male, n (%)	5 (41.7)
Indication for stent placement, n (%)	
Urolithiasis, n (%)	7 (58.3)
Hydronephrosis in pregnancy, n (%)	1 (8.3)
External compression (Malignancy), n (%)	1 (8.3)
Iatrogenic injury (during non-urologic surgery), n (%)	3 (25)
Additional endourological procedures, n (%)	
Yes	10 (83.3)
No	2 (16.7)
Additional endourological procedures duration (min), median (IQR)	55 (37.5-80)
Restenting rate after additional endourological procedure, n (%)	7 (58.3)
Distance to hospital (km), median (IQR)	74.5 (35.3-87.5)
Duration of stent indwelling (day), median (IQR)	290.5 (196.8-515.5)

Table 2. Comparison of two groups with short and long stent stays

Parameters	Group 1 (n=6) Stent duration is shorter	Group 2 (n=6) Stent duration is longer	p value
Age, year, mean (SD)	43.5 (11)	61.3 (9.5)	**0.012***
Gender, n (%)			
Female, n (%)	3 (50)	4 (66.7)	1
Male, n (%)	3 (50)	2 (33.3)	
Indication for stent placement, n (%)			
Urolithiasis, n (%)	5 (83.3)	2 (33.3)	0.242
Others, n (%)	1 (16.7)	4 (66.7)	
Additional endourological procedures, n (%)			
Yes	4 (66.7)	6 (100)	0.455
No	2 (33.3)	0 (0)	
Additional endourological procedures duration (min), median (IQR)	37.5 (27.5-40)	67.5 (52.5-87.5)	**0.005***
Restenting rate after additional endourological procedure, n (%)	3 (33.3)	6 (66.7)	0.181
Distance to hospital (km), median (IQR)	38.5 (19.25-77.75)	85.5 (75.75-91.5)	**0.037***

*clinically significant

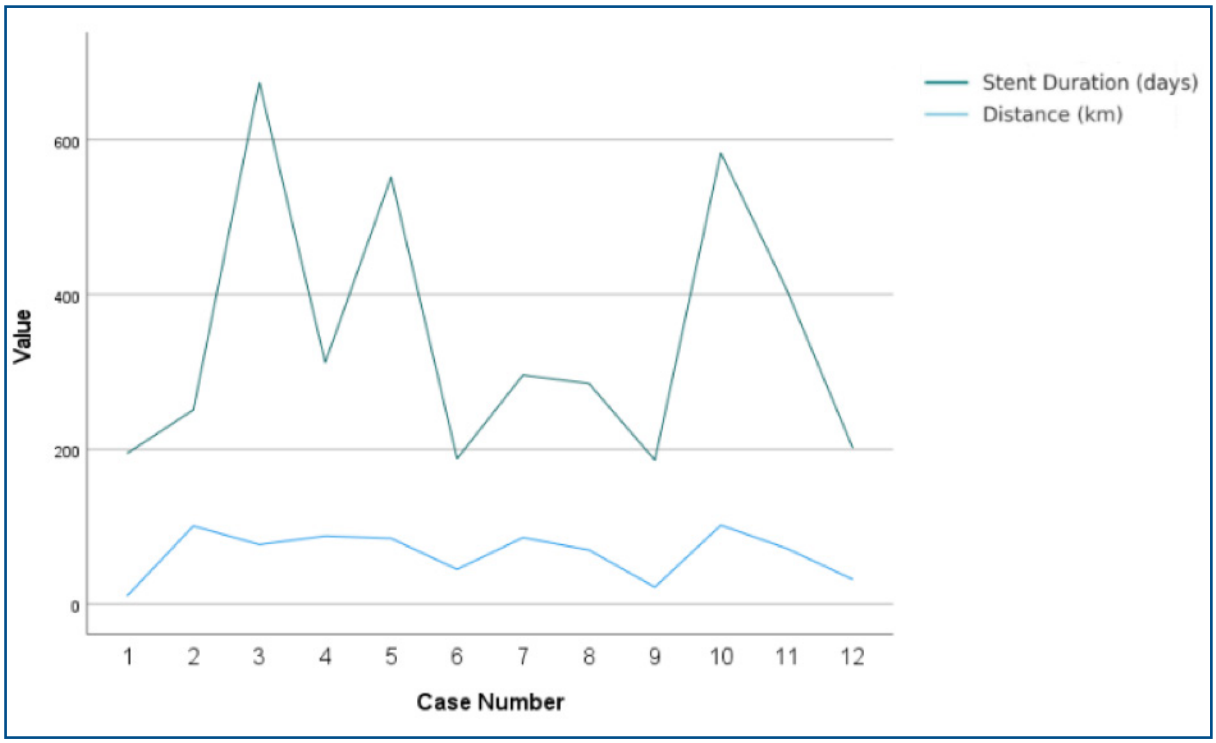

Figure 1. Correlation between distance to hospital and stent length of stay

DISCUSSION

Our study examined patients whose DJ stents were forgotten or removal was delayed. This study aimed to present the general data of these patients. In addition, when the DJ stent was forgotten, it was observed that it was forgotten longer in older patients and patients who lived farther from the hospital. In addition, it was concluded that the longer the DJ stent was forgotten, the higher the need for additional endourological interventions.

Keeping DJ stents for a long time for treatment purposes or forgetting to remove them accounts for 12% of all stents (9). Forgotten DJ stents lead to complications such as infection, fragmentation, or encrustation. In one study, the encrustation rate of stents removed before 6 weeks was 9.2%; however, when this period exceeded 12 weeks, this rate increased to 76.3% (10). In another study, encrustation rates increased from 42.8% in the fourth month to 75.5% in the sixth month (11). Considering that DJ stents have been reported to have a broad spectrum of complications ranging from renal failure to death and that the surgeon can be held medicolegally responsible, forgetting DJ stents is still a significant problem in urology practice (9,12).

In older studies on ureteral stents that have been forgotten in the literature, patients generally required between 1.94 and 4.2 attempts to be free of stones and stents. (1,11,13). In our study, ureterorenoscopy and laser lithotripsy were performed on 10 patients who required additional interventions. Seven of these patients required re-stenting. As a result, three patients were rendered stone- and stent-free in one session, and seven in two. The reduced need for percutaneous nephrolithotomy, extracorporeal shock wave lithotripsy, or open surgery in these patients can be attributed to increased surgeon experience, augmented auxiliary equipment, and recent technological advancements in urological instrumentation, particularly in laser and scope technologies.

In our study, the additional endourological intervention time was higher in the DJ stent group and was forgotten for a longer time. We believe this is due to increased calcification and encrustation, especially in DJ stents, and waiting longer. In a study conducted by El-Faqih et al., the encrustation time of stents was examined, and it was reported that this rate was 9.2% in DJ stents that were waited for less than 6 weeks, 47.5% in those that were waited between 6 and 12 weeks, and 76.3% in those that were waited for more than 12 weeks (10). Kawahara et al. reported these rates as 26.8%, 56.9%, and 75.9% in the same time intervals (14). Considering this situation, it is expected that calcification and encrustation will be higher in the patient group with a longer DJ stent waiting time in our study and, therefore, require a more extended intervention.

Our study found no difference between the two groups regarding the indication for DJ stent placement. However, it is noticeable that there were more patients with non-urolithiasis in the group where DJ stents were forgotten for longer. Despite this, the lack of a statistically significant difference between the groups is due to the small number of our patients. The reason for the difference in surgical indications is that urologists do not perform the primary follow-up of patients with non-urological intraoperative iatrogenic injuries and external ureteral compression due to malignancy. The fact that physicians other than urologists are not familiar with DJ stent management may have led to DJ stents being forgotten for a longer time in this patient group.

One of the interesting results of our study is that the patient group who were forgotten for a longer time was farther from the hospital. To the best of our knowledge, no previous study in the literature has specifically investigated the relationship between forgotten DJ stents and factors such as distance to the hospital and the means of transportation used. Our study was conducted in a tertiary hospital in a peripheral region in Turkey. Distance to the hospital and transportation problems may affect hospital admission. Therefore, patients who live in settlements farther from the hospital may be at a higher risk of forgetting a DJ stent. Being more careful about these patients may be beneficial in preventing DJ stent forgetfulness. In addition, we concluded in our study that patients who were forgotten for a longer time had a higher average age. A higher average age may be associated with more comorbidities, mobility problems, and cognitive problems.

Various methods have been tried for years to prevent DJ stents from being forgotten. For this purpose, paper card

records (15), electronic stent records (16), short message reminder systems (17), web-based e-mail reminder systems (18), and reminder systems with smartphone applications (19) are the most important ones. In a study that aimed to reduce DJ stent forgetfulness through a computer-based database, the rate of forgotten DJ stents decreased from 12.5% to 1.2% (8). In another study that tried to prevent DJ stent forgetfulness through a database reviewed monthly by the staff, the rate of forgotten DJ stents decreased from 3.6% to 1.1% (20). Although many methods have been tried for years to prevent DJ stents from being forgotten, it cannot be said that it is still wholly preventable. Therefore, we think the risk factors for DJ stent forgetfulness should be well investigated. We believe that DJ stent forgetfulness can be prevented to the maximum extent if patients with risk factors are treated more carefully.

In our study, we aimed to present the data of patients with forgotten DJ stents and to define the conditions that may be risk factors for forgotten DJ stents. In a previous study, male gender and being uninsured were identified as risk factors for forgotten DJ stents (9). Our study observed that the patient group with forgotten DJ stents for a longer period was older and lived in a center farther from the hospital. Although we cannot directly define them as a risk factor for forgotten DJ stents, we think that these two parameters may prolong the duration of forgotten DJ stents. Therefore, we believe being more careful in these two patient groups would be beneficial. Although we did not obtain a significant difference in our study, caution should also be exercised in patients with DJ stents who are followed up by physicians other than urologists. Considering that these physicians are unfamiliar with DJ stent management, we believe the risk of forgotten stents may increase.

In the literature, physicians have been given a serious medicolegal responsibility for forgetting DJ stents (8). However, leaving this to the surgeon alone will not prevent DJ stents from being forgotten. Patients should also share this responsibility. One study stated that 80% of patients were not satisfied with the information given about DJ stents (21). It would be wise to inform patients better and involve them in the process. Patients should be encouraged to participate actively in stent follow-up with methods such as cards (22), as in other specialties. We believe the rate of forgotten DJ stents will be minimized this way.

Our study had some significant limitations. Our limitations are the retrospective nature of our study, the small sample size, and the single-center nature. Additionally, the small number of patients may have made statistical analysis difficult and reduced its significance. Moreover, some of our patients were under primary follow-up by non-urology departments. This may pose a problem in terms of sample homogeneity. Therefore, larger, multicenter prospective studies are needed to confirm these associations and develop evidence-based interventions to improve stent management and patient safety.

CONCLUSION

The retention of forgotten DJ stents remains a serious clinical issue, associated with increased risks of encrustation, infection, additional surgical interventions, and even life-threatening complications. Our study observed that older age and longer distances between the patient's residence and the treating hospital were significantly associated with prolonged stent indwelling times. Given the preventable nature of such adverse outcomes, our results emphasize the importance of implementing structured follow-up protocols and patient education strategies, especially in high-risk groups. We believe that it would be beneficial to provide better information about forgetting a ureteral stent, especially for patients in peripheral and rural areas, those living in places where it is difficult to reach the hospital, those living far from the hospital, and those of advanced age who may have difficulty with transportation. Nevertheless, multicentric prospective randomized controlled studies with larger sample sizes and more effective preventive strategies are needed to support these results.

Data Availability Statement: Data available on request.

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Conflict of Interest: There is no conflict of interest in this study.

Ethics Committee Approval: This study was approved by the Ethics Committee of Ağrı İbrahim Çeçen University, on 2025/03/27 with approval number 108.

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Original Article
Özgün Araştırma

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Relationship of Muscle Mass Based on Psoas Muscle Index and Skeletal Muscle Index with Recurrence and Mortality Risk in Localized Renal Cell Carcinoma: A Comprehensive Retrospective Analysis

Lokalize Renal Hücreli Karsinomu Olan Hastalarda Psoas Kas İndeksi ve İskelet Kas İndeksine Dayalı Kas Kütlesinin Nüks ve Mortalite Riski ile İlişkisi: Kapsamlı Bir Retrospektif Analiz

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ABSTRACT

Objective: We aimed to determine the relationship between the Psoas Muscle Index (PMI) and Skeletal Muscle Index (SMI) and the risk of recurrence and mortality in patients with localized Renal Cell Carcinoma (RCC).

Material and Methods: SMI and PMI values were obtained from non-contrast computed tomography (NCCT) measurements on slices at the L3 level, normalized by height. Available survival data, including overall survival (OS) and recurrence-free survival (RFS), were collected at postoperative follow-up. Disease recurrence was defined as radiological evidence of disease on computed tomography (CT), magnetic resonance imaging, or bone scan.

Results: In the ROC analysis, the optimal cut-off value for PMI was ≤ 5.1 cm^2/m^2 and ≤ 3.1 cm^2/m^2 in male and female patients, while the cut-off value for SMI was ≤ 44 cm^2/m^2 and ≤ 30 cm^2/m^2 in male and female patients. In multivariate analyses, female gender, recurrence, clinical T stage ≥ T3b, pathological T stage ≥T3b, and sarcopenia according to PMI and SMI were independent predictors of worse OS and RFS ($p < 0.001$). In Kaplan-Meier analysis, OS in patients with and without sarcopenia was 74 vs 85 months ($p < 0.001$), respectively. RFS were shorter in patients with sarcopenia (PMI: 76 vs 84, SMI: 74 vs 85 months, both $p < 0.001$)

Conclusion: In patients with localized RCC, sarcopenia was associated with earlier recurrence, shorter OS, and RFS. Patients with sarcopenia had a worse prognosis in preoperative staging.

Keywords: psoas muscle index, renal cell carcinoma, sarcopenia, skeletal muscle index

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ÖZET

Amaç: Lokalize Renal Hücreli Karsinomlu (RHK) hastalarda Psoas Kas İndeksi (PMI) ve İskelet Kas İndeksi (SMI) ile nüks ve mortalite riski arasındaki ilişkiyi belirlemeyi amaçladık.

Gereç ve Yöntemler: SMI ve PMI değerleri, L3 seviyesindeki kesitlerde kontrastsız bilgisayarlı tomografi (BT) ölçümlerinden elde edildi ve yüksekliğe göre normalize edildi. Genel sağkalım (OS) ve nükssüz sağkalım (RFS) dahil olmak üzere mevcut sağkalım verileri ameliyat sonrası takipte toplandı. Hastalık nüksü BT, manyetik rezonans görüntüleme veya kemik taramasında hastalığın radyografik kanıtı olarak tanımlanmıştır.

Bulgular: ROC analizinde, PMI için optimal kesim değeri sırasıyla erkek ve kadın hastalarda ≤ 5,1 cm^2/m^2 ve ≤ 3,1 cm^2/m^2 iken, SMI için kesim değeri erkek ve kadın hastalarda ≤ 44 cm^2/m^2 ve ≤ 30 cm^2/m^2 idi. Çok değişkenli analizlerde, kadın cinsiyet, nüks, klinik T evresi ≥ T3b, patolojik T evresi ≥T3b ve PMI ve SMI'ye göre sarkopeni daha kötü OS ve RFS'nin bağımsız belirleyicileriydi (p<0,001). Kaplan-Meier analizinde, sarkopenisi olan ve olmayan hastalarda OS sırasıyla 74 vs 85 ay saptandı (p<0,001). RFS sarkopenisi olan hastalarda daha kısaydı (PMI: 76 vs 84, SMI: 74 vs 85 ay, her ikisi de p<0,001)

Sonuç: Lokalize RHK'li hastalarda sarkopeni daha erken nüks, daha kısa OS ve RFS ile ilişkiliydi. Sarkopenisi olan hastalar preoperatif evrelemede daha kötü prognoza sahipti.

Anahtar Kelimeler: iskelet kası indeksi, psoas kas indeksi, renal hücreli karsinom, sarkopeni

INTRODUCTION

Partial nephrectomy (PN) or radical nephrectomy (RN) is a common surgical procedure for the treatment of localized renal cell carcinoma (RCC) (1). Despite its clinical efficacy, the presence of sarcopenia in patients with localized RCC has garnered increasing attention due to its potential influence on postoperative outcomes and long-term prognosis (2). Sarcopenia, defined by the progressive and generalized loss of skeletal muscle mass and strength, transcends the mere process of aging and is frequently concurrent with various chronic conditions, including malignancies (3).

Emerging evidence underscores the detrimental impact of sarcopenia on surgical outcomes, leading to a higher incidence of postoperative complications, prolonged hospitalization, and increased mortality (4). The association between sarcopenia and cancer recurrence further emphasizes the need for a comprehensive understanding and proactive management. Quantitative measures such as the Psoas Muscle Index (PMI) and the Skeletal Muscle Index (SMI) are used to assess sarcopenia (5).

This article aims to highlight the association between sarcopenia, as measured by PMI and SMI, and recurrence and mortality rates in patients with localized RCC.

MATERIALS AND METHODS

We conducted a retrospective cohort study using our hospital database, identifying 487 patients diagnosed with localized RHK and operated on between January 2010 and January 2019. This study was approved by our institutional ethical review committee (Decision No: 2024/07-14 Date: 19.08.2024). It was conducted in accordance with the Declaration of Helsinki on human subjects. In our study, we extracted detailed data on variables such as age, gender, body mass index (BMI), Eastern Cooperative Oncology Group (ECOG) performance status, American Society of Anesthesiologists (ASA) score, type of operation, laboratory findings, tumor location, tumor size, SMI, PMI values obtained from Non-Contrast Computer Tomography (NCCT), pathological findings, recurrence and mortality status. We also collected available survival data, including overall survival (OS) and recurrence-free survival (RFS) at postoperative follow-up. All cases were staged preoperatively by Contrast-Enhanced computed tomography (CT) of the chest and abdomen. The pathological stage was re-staged according to the 2009 Tumor Node Metastasis (TNM) staging system. Exclusion criteria were absence of axial CT within 30 days after surgery, evidence of metastatic disease during surgery, lack of BMI, patients with hereditary RCC, and patients with missing data.

The psoas muscle was defined as an oval-shaped muscle adjacent to the vertebral column in axial view and measured between approximately -20 and 100 Hounsfield units on CT imaging. PMI was calculated by measuring the psoas muscle's cross-sectional area at the third lumbar vertebra (L3) level and normalized for length using Philips iSite PACS Version 3.6.96.0 Image Viewer Technology (6). Regarding SMI, the total muscle area of the psoas, paraspinal, internal oblique, external oblique, rectus abdominis, and transversus abdominis muscles on both sides was calculated at the L3 level on the same imaging system and normalized for height (6).

Disease recurrence was defined as radiological evidence of disease on CT, magnetic resonance imaging, or bone scan. Recurrence was accepted as detecting a new mass at the operation area in the radiologic imaging, but the suspicious lesion was biopsied and classified as disease recurrence after pathologic confirmation.

Statistical Analysis

The distribution of continuous variables was assessed by the Shapiro-Wilk test. Continuous variables are presented as mean and standard deviation (*SD*). Categorical variables were presented as numbers and frequencies. An independent sample t-test or Mann-Whitney U-test was used to compare the continuous variables based on the distribution. The chi-square test (Pearson Chi-Square) was used to compare the categorical variables. Data analyses were performed using IBM SPSS Statistics for Windows version 24.0 (IBM Corp., Armonk, NY, USA). The analysis of the receiver operating characteristic (*ROC*) curve associated with the area under the curve (*AUC*) was used to determine the optimal cutoff values of different scoring indices for mortality. Each optimal cutoff value was chosen considering the highest sensitivity, reasonably high specificity, and positive and negative predictive values. *AUC* was interpreted as good if *AUC* = 0.8–1, moderate if *AUC* = 0.7–0.8, fair if *AUC* = 0.6–0.7, and poor if *AUC* = 0.5–0.6. An area under the curve analysis of scoring systems using the MedCalc (trial *version* 22.030) program was used. Univariable and multivariable analyses (MVAs) were performed with Cox proportional hazards models to evaluate the association of sarcopenia with OS and PFS using the stepwise backward Wald method. MVA models controlled for gender, laterality, Fuhrman grade, clinical T stage, and pathological T stage. Kaplan-Meier analysis was used to evaluate OS and PFS. Kaplan Meier and Cox proportional hazards models were obtained using R software (R Foundation for Statistical Computing, Vienna, Austria), survival, sura miner, and dplyr packages. A significance level of $p < 0.05$ was considered statistically significant.

RESULTS

ROC analysis using gender-based sensitivities and specificities revealed that the optimal cut-off values for PMI should be ≤ 5.1 cm^2/m^2 and ≤ 3.1 cm^2/m^2 in male and female patients, respectively, while the cut-off value for SMI should be ≤ 44 cm^2/m^2 and ≤ 30 cm^2/m^2 in male and female patients, respectively. The AUC value for PMI-based assessment was 0.935 in men and 0.948 in women. The SMI-based evaluation showed lower AUC values. Sensitivities and specificities according to the optimum cut-off values are given in Table 1 and Figure 1.

Table 1. Cut-off values of the applied indexes by gender

Index/ Score	Cut-off value	AUC (%95 CI)	Sensitivity	Specificity	PPV	NPV	Accuracy
PMI	≤ 5.1(cm^2/m^2)	0.790 (0.75-0.82)	97.3	58.44	16.1	99.6	0.614 (0.60-0.62)
Male	≤ 5.1(cm^2/m^2)	0.935 (0.90-0.96)	96.3	80.92	29.5	99.6	0.821 (0.80-0.83)
Female	≤ 3.1(cm^2/m^2)	0.948 (0.90-0.98)	100	76.80	25.6	100	0.785 (0.75-0.78)
SMI	≤ 44 (cm^2/m^2)	0.821 (0.78-0.85)	100	61.33	17.5	100	0.643 (0.63-0.64)
Male	≤ 44 (cm^2/m^2)	0.853 (0.81-0.89)	100	69.85	21.6	100	0.722 (0.70-0.72)
Female	≤ 30 (cm^2/m^2)	0.844 (0.77-0.90)	70	86.40	29.2	97.3	0.852 (0.81-0.88)

AUC: area under the curve, *CI:* confidence interval, *PPV:* positive predictive value, *NPV:* negative predictive value

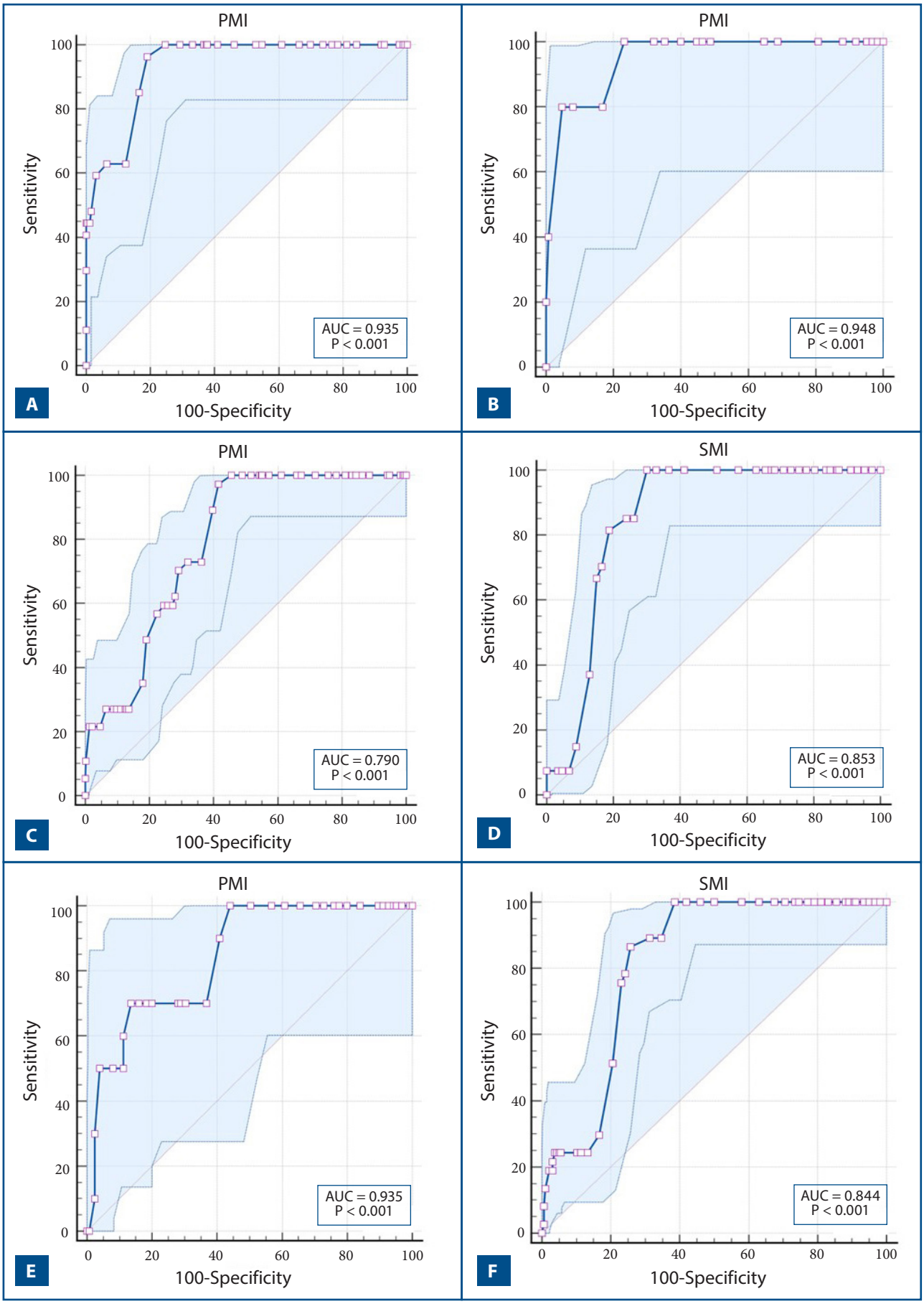

Figure 1. ROC Curve for PMI **A**-Male, **B**-Female, **C**-Total; ROC Curve for SMI **D**-Male, **E**-Female, **F**-Total

A total of 223 patients (45.7%) had sarcopenia when the PMI was used as the sarcopenia criterion, and 211 patients (43.3%) when the SMI was used. In the total cohort, the mean age of the patients was 58 years, and the gender was predominantly male (72.3%). The age of patients in the sarcopenia group was higher in both PMI- and SMI-based assessments (p<0.001). In gender distribution, the proportion of female patients was higher in patients with sarcopenia (p<0.001). ECOG performance score was higher in sarcopenic patients in PMI and SMI groups (PMI: p<0.001, SMI: p=0.035). Tumor sizes were statistically larger in sarcopenic patients, and the clinical and pathological T stages were more advanced in patients with sarcopenia (PMI: p=0.015, p=0.002; SMI: p=0.007, <0.001, respectively). Pathology findings did not show any difference between sarcopenia and histological type of tumor, but sarcopenic patients had a higher Fuhrmann Grade in both PMI and SMI groups (p<0.001). In addition, when patients were classified as lower stage (T1-2) and higher stage (T3-4), sarcopenic patients were found to have a higher T stage, and ≥T3 upstage was higher in sarcopenic patients (p<0.05). Higher recurrence and mortality rates were observed in patients with sarcopenia in PMI and SMI groups (p<0.001). No differences were observed in BMI, ASA score, laboratory parameters, laterality of the tumor, type of operation performed, and histological type of the tumor in patients with and without sarcopenia according to PMI and SMI criteria. Comparisons between sarcopenic and non-sarcopenic patients using PMI and SMI are shown in Table 2-3.

In multivariate analyses, female gender (OS: hazard ratio [HR] 2.33, 95% confidence interval [CI] 0.41-2.27, p<0.001; RFS: HR 1.31, %95 CI 0.43-2.32, p<0.001), Fuhrmann Grade 4 (OS: HR 1.85, 95% CI 0.45-3.60, p=0.002; RFS: HR 1.12, 95% CI 0.17-2.82, p=0.002), and sarcopenia according to PMI (OS: HR 1.86, %95 CI 0.57-3.48, p<0.001; RFS: HR 1.83, 95% CI 0.94-4.73, p<0.001) and SMI (OS: HR 1.79, %95 CI 0.71-2.92, p<0.001; RFS: HR 2.19, 95% CI 0.91-3.72, p<0.001) were independent predictors of worse OS and RFS. Also, recurrence, clinical T stage ≥ T3b and pathological T stage ≥T3b had a worse effect on OS and RFS (p<0.001) Multivariate analysis results are shown in Table 4.

In Kaplan-Meier analysis, OS in patients with and without sarcopenia was 74 vs 85 months (p<0.001), respectively. RFS were shorter in patients with sarcopenia (PMI: 76 vs 84, SMI: 74 vs 85 months, both p<0.001) (Figure 2-3). Furthermore, 5-year OS rates were 82% and 91% in patients with and without sarcopenia, respectively. 10-year OS rates were 72% and 86% in patients with and without sarcopenia. In terms of RFS, 5-year survival rates were 80% and 88% in patients with and without sarcopenia, while 10-year survival rates were 69% and 80% in patients with and without sarcopenia, respectively. OS, RFS, and survival rates are shown in Table 5.

Table 2. Comparison of demographic and laboratory data of sarcopenic and non-sarcopenic patients based on PMI and SMI as evaluation criteria

Characteristic	All patient (n=487)	PMI		p value	SMI		p value
		Nonsarcopenic (n=264)	Sarcopenic (n=223)		Nonsarcopenic (n=276)	Sarcopenic (n=211)	
Age (*years*) [x]	58.04±12.77	57.02±12.86	62.24±12.59	**<0.001**[*]	56.18±13.09	60.46±11.95	**<0.001**[*]
Age categorized (*years*)				0.286[+]			**<0.001**[+]
≤60	229 (47.0)	130 (49.2)	99 (44.4)		151 (54.7)[a]	78 (37.0)[b]	
>60	258 (53.0)	134 (50.8)	124 (55.6)		125 (45.3)[a]	133 (63.0)[b]	
Gender				**<0.001**[+]			**<0.001**[+]
Male	352 (72.3)	199 (75.3)[a]	153 (68.6)[b]		227 (82.2)[a]	125 (59.2)[b]	
Female	135 (27.7)	65 (24.7)[a]	70 (31.4)[b]		49 (17.8)[a]	86 (40.8)[b]	
BMI (kg/m^2) [x]	24.97±3.49	25.23±3.61	24.67±3.33		25.25±3.60	24.62±3.31	0.057[*]

BMI categorized (kg/m^2)				0.551[+]			0.101[+]
<25	208 (42.7)	116 (43.9)	92 (41.3)		109 (39.5)	99 (46.9)	
≥25	279 (57.3)	148 (56.1)	131 (58.7)		167 (60.5)	112 (53.1)	
Surgery type				0.051[+]			0.066[+]
Open RN	147 (30.2)	93 (35.2)	54 (24.2)		84 (30.4)	63 (29.9)	
Open PN	184 (37.8)	87 (33.0)	97 (43.5)		109 (39.5)	75 (35.5)	
Laparoscopic RN	69 (14.2)	38 (14.4)	31 (13.9)		45 (16.3)	24 (11.4)	
Laparoscopic PN	42 (8.6)	20 (7.6)	22 (9.9)		17 (6.2)	25 (11.8)	
Robotic RN	10 (2.1)	4 (1.5)	6 (2.7)		3 (1.1)	7 (3.3)	
Robotic PN	35 (7.2)	22 (8.3)	13 (5.8)		18 (6.5)	17 (8.1)	
Laterality				0.423[+]			0.786[+]
Right	232 (47.6)	137 (51.9)[a]	95 (42.6)[b]		130 (47.1)	102 (48.3)	
Left	255 (52.4)	127 (48.1)[a]	128 (57.4)[b]		146 (52.9)	109 (51.7)	
ECOG performance score				**<0.001**[+]			**0.035**[+]
0	345 (70.8)	215 (81.4)	130 (58.2)		206 (74.6)[a]	139 (65.9)[b]	
>1	142 (29.2)	49 (18.6)	93 (41.8)		70 (25.4)[a]	72 (34.1)[b]	
ASA				0.451[+]			0.174[+]
1	44 (9.0)	23 (8.7)	21 (9.4)		30 (10.9)	14 (6.6)	
2	327 (67.1)	176 (66.7)	151 (67.7)		181 (65.6)	146 (69.2)	
3	113 (23.2)	62 (23.5)	51 (22.9)		62 (22.5)	51 (24.2)	
4	3 (0.6)	3 (1.1)	0 (0.0)		3 (1.1)	0 (0.0)	
Neutrophil	5.22±2.11	5.23±1.91	5.21±2.33	0.542[*]	5.15±2.11	5.30±2.12	0.430[*]
Lymphocyte	2.98±12.15	3.48±2.07	3.14±17.83	0.305[*]	3.47±16.11	2.93±1.17	0.216[*]
Platelet	270.17±83.47	268.21±78.81	272.49±88.80	0.503[*]	262.45±75.36	280.27±92.23	0.148[*]
NLR	2.69±2.35	2.41±1.70	3.02±2.91	0.111[*]	2.65±2.60	2.74±1.98	0.079[*]
PLR	143.01±147.98	130.53±141.65	157.77±154.17	0.147[*]	145.32±187.49	139.98±68.07	0.395[*]
AST	21.29±10.27	21.10±10.54	21.52±9.96	0.960[*]	20.87±10.19	21.84±10.37	0.720[*]
ALT	22.29±16.75	22.11±18.16	22.49±14.94	0.828[*]	21.82±16.41	22.89±17.19	0.923[*]
AST/ALT	1.11±0.40	1.10±0.38	1.12±0.43	0.969[*]	1.10±0.39	1.13±0.43	0.657[*]

[x]Mean±SD [*] Mann Whitney *U* test, [+] Pearson Chi-Square test. *NLR* Neutrophil Lymphocyte ratio, *PLR* Platelet Lymphocyte ratio

Table 3. Comparison of radiologic, pathologic, and follow-up results of sarcopenic and non-sarcopenic patients using PMI and SMI as evaluation criteria

Characteristic	All patient (n=487)	PMI		p value	SMI		p value
		Nonsarcopenic (n=264)	Sarcopenic (n=223)		Nonsarcopenic (n=276)	Sarcopenic (n=211)	
Clinical T-stage				**0.015**[+]			**0.007**[+]
T1a	241 (49.5)	128 (48.4)	113 (50.6)		137 (49.6)	104 (49.3)	
T1b	127 (26.1)	80 (30.3)	47 (21.1)		77 (27.9)	50 (23.7)	
T2a	59 (12.1)	30 (11.3)	29 (13)		39 (14.1)	20 (9.5)	
T2b	43 (8.8)	20 (7.5)	33 (14.7)		20 (7.2)	23 (10.9)	
T3a	13 (2.7)	6 (2.2)	7 (3.1)		3 (1.1)	10 (4.7)	
T3b	4 (0.8)	0 (0.0)	4 (1.8)		0 (0.0)	4 (1.9)	
Pathological T-stage				**0.002**[+]			**<0.001**[+]
T1a	225 (46.2)	113 (42.8)	112 (50.2)		131 (47.5)	94 (44.5)	
T1b	114 (23.4)	77 (29.2)	37 (16.6)		75 (27.2)	30 (14.2)	
T2a	42 (8.6)	27 (10.2)	15 (6.7)		34 (12.3)	12 (5.7)	
T2b	25 (5.1)	15 (5.7)	10 (4.5)		14 (5.1)	16 (7.5)	
T3a	72 (14.8)	29 (11.0)	43 (19.3)		21 (7.6)	51 (24.2)	
T3b	5 (1.0)	1 (0.4)	4 (1.8)		1 (0.4)	4 (1.9)	
T4	4 (0.8)	2 (0.8)	2 (0.9)		0 (0.0)	4 (1.9)	
Tumor size	54.29±29.38	52.51±27.13	64.40±31.77	**<0.001**[+]	50.55±25.39	59.17±33.32	**0.017**[*]
Histological type							
Clear cell	395 (81.1)	220 (83.3)	175 (78.5)		219 (79.3)	176 (83.4)	
Papillary	48 (9.9)	26 (9.8)	22 (9.9)	0.155[+]	29 (10.5)	19 (9.0)	0.663[+]
Chromophobe	24 (4.9)	12 (4.5)	12 (5.4)		16 (5.8)	8 (3.8)	
Others	20 (4.1)	6 (2.3)	14 (6.3)		12 (4.3)	8 (3.8)	
Fuhrman grade							
I	27 (5.8)	15 (5.9)	12 (5.7) [a]108		21 (8.0)	6 (3.0)	
II	252 (54.3)	144 (56.9)	(51.2)	**<0.001**[+]	159 (60.9)	93 (45.8)	**<0.001**[+]
III	97 (20.9)	63 (24.9)	34 (16.1)		54 (20.7)	43 (21.2)	
IV	88 (19.0)	31 (12.3)	57 (27.0)		27 (10.3)	61 (30.0)	
Positive Surgical Margin	37 (9.7)	20 (7.6)	17 (7.7)	0.825[+]	18 (10.9)	19 (9.1)	0.772[+]
T Stage				**0.022**[+]			**<0.001**[+]
T 1-2	403 (82.8)	228 (86.4)	175 (78.5)		248 (89.9)	155 (73.5)	
T 3-4	84 (17.2)	36 (13.6)	48 (21.5)		28 (10.1)	56 (26.5)	
≥T3 upstage	77 (15.8)	39 (14.8)	58 (26.0)	**<0.001**[+]	31 (11.2)	46 (21.8)	**0.002**[+]
Recurrence				**<0.001**[+]			**<0.001**[+]
No	421 (86.4)	244 (92.4)	177 (79.3)		262 (94.9)	159 (75.4)	
Yes	66 (13.6)	20 (7.6)	46 (20.7)		14 (5.1)	52 (24.6)	
Mortality				**<0.001**[+]			**<0.001**[+]
No	450 (92.4)	263 (99.6)	187 (83.9)		274 (99.2)	176 (83.4)	
Yes	37 (7.6)	1 (0.4)	36 (16.1)		2 (0.7)	35 (16.6)	
Recurrence time (*months*)[x]	26.12±7.80	28.73±7.40	23.94±7.54	**0.012**[++]	29.42±4.96	25.23±8.21	**0.022**[++]
Follow-up period (*months*)[x]	113.8±40.10	117.3±44.9	109.9±42.5	**0.411**	112.8±41	115.6±38.3	**0.319**

[x] *Mean±SD, n* (%) [*] Mann Whitney *U* test, [+] Pearson Chi-Square test, [++] Independent samples *t* test.

Table 4. Multivariable Analysis of Sarcopenia for Overall Survival and Recurrence-Free Survival After Surgery

	Overall Survival		Recurrence Free Survival	
	HR (%95 CI)	**p value**	**HR (%95 CI)**	**p value**
Gender				
Male	1 (reference)		1 (reference)	**<0.001**
Female	1.33 (0.41-2.27)	**<0.001**	1.31 (0.43-2.32)	
Fuhrman grade				
IV	1.85 (0.45-.60)	**0.002**	1.12 (0.17-3.82)	**0.002**
Clinical T-stage				
T3b	1.45 (0.70-2.74)	**<0.001**	1.6 (0.81-3.15)	**<0.001**
T4	1.46 (0.54-2.02)	**<0.001**	1.68 (0.81-3.24)	**<0.001**
Pathological T-stage				
T3b	0.03 (0.01-0.12)	**<0.001**	0.03 (0.01-0.12)	**<0.001**
T4	0.07 (0.02-0.23)	**<0.001**	0.08 (0.02-0.23)	**<0.001**
Sarcopenia, PMI	1.86 (0.57-3.48)	**<0.001**	1.83 (0.94-4.73)	**<0.001**
Sarcopenia, SMI	1.79 (0.71-2.92)	**<0.001**	2.19 (0.91-3.72)	**<0.001**
Recurrence	2.18 (0.70-4.24)	**<0.001**	2.20 (0.6-4.41)	**<0.001**

Table 5. 5 and 10-year Overall and Recurrence Free survival rates, standard errors, and 95% confidence intervals

	Groups	**Survival Rate (*SE*)**	**(95%*CI*)**
OS	**5-year survival**		
	Nonsarcopenic	0.912 (0.012)	0.937-0.984
	Sarcopenic	0.829 (0.025)	0.797-0.895
	10-years survival		
	Nonsarcopenic	0.865 (0.019)	0.789-0.964
	Sarcopenic	0.721 (0.028)	0.658-0.817
RFS	**5-year survival**		
	Nonsarcopenic	0.888 (0.012)	0.814-0.953
	Sarcopenic	0.809 (0.026)	0.690-0.891
	10-years survival		
	Nonsarcopenic	0.801 (0.020)	0.703-0.912
	Sarcopenic	0.691 (0.031)	0.613-0.834

SE: Standard Error, CI: Confidence Interval

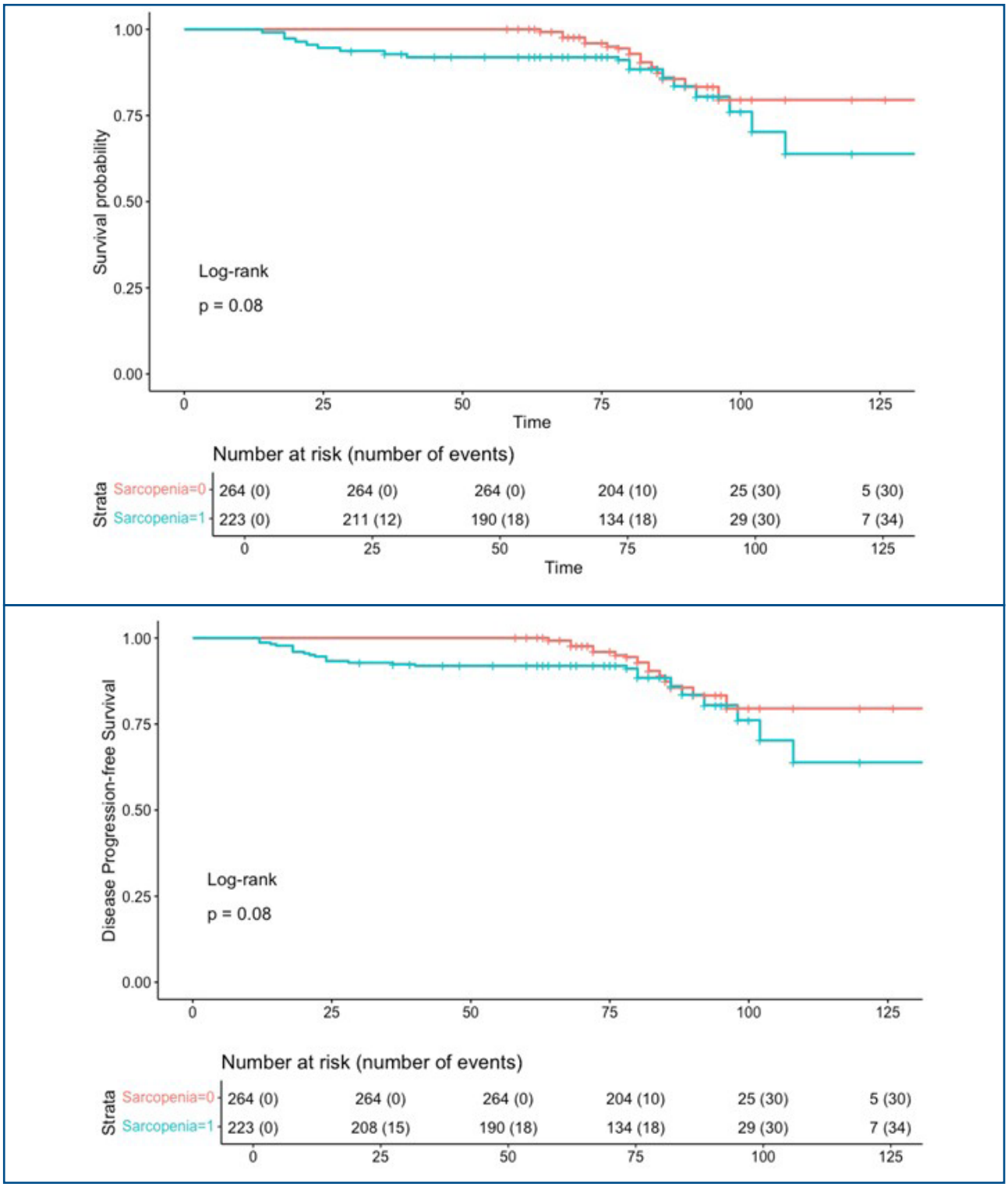

Figure 2. Kaplan-Meier analyses showing OS (A) and RFS (B) in patients with and without sarcopenia in PMI-based assessment

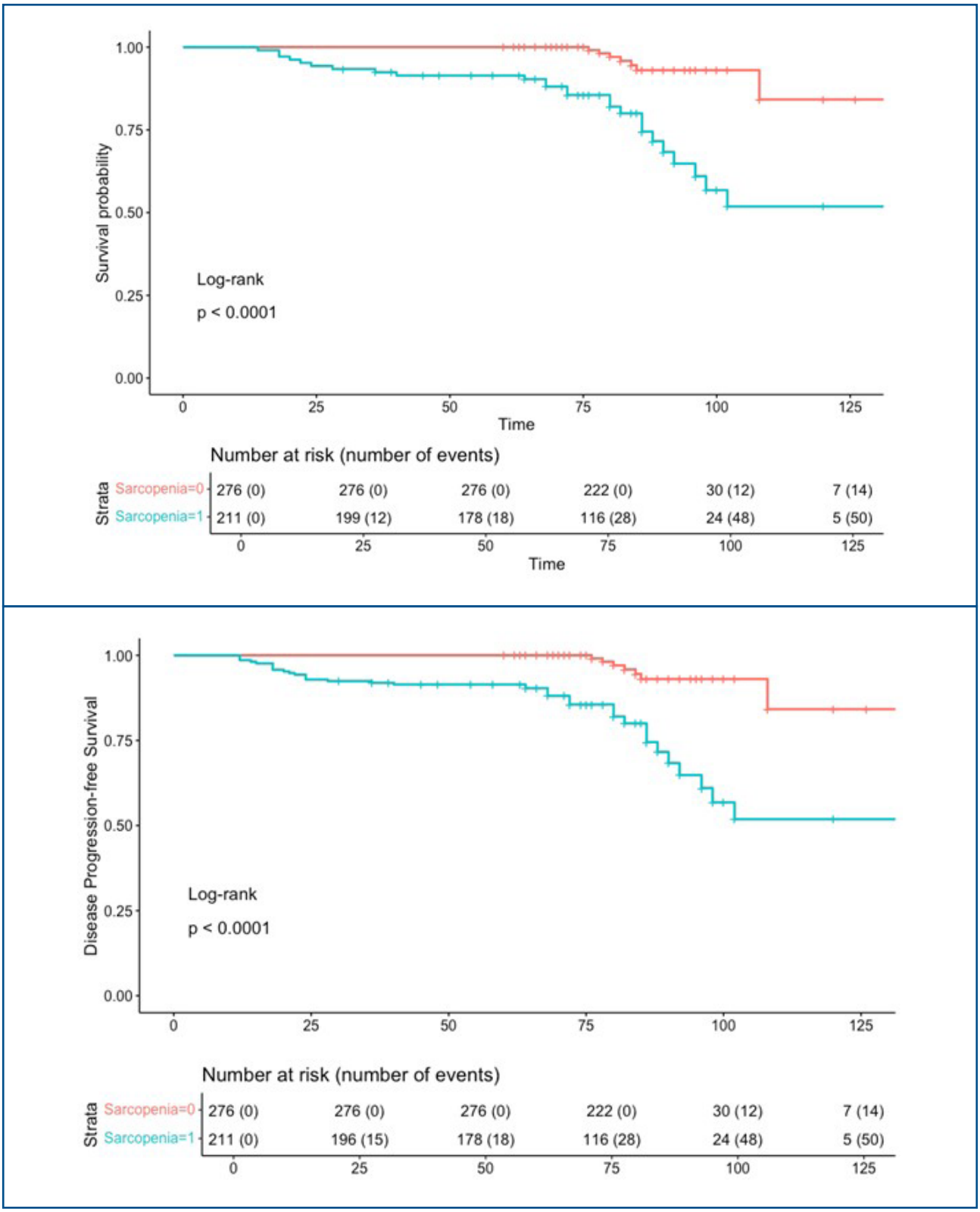

Figure 3. Kaplan-Meier analyses showing OS (A) and RFS (B) in patients with and without sarcopenia in SMI-based assessment

DISCUSSION

This study evaluates the association of preoperative PMI and SMI used to evaluate sarcopenia with recurrence and mortality in localized RCC patients undergoing PN and RN. We showed that patients with lower PMI and SMI had shorter OS and RFS. The results showed that sarcopenia is an independent risk factor for recurrence and mortality in RCC patients.

Sarcopenia, which is characterized by loss of skeletal muscle mass and function, has emerged as an important prognostic factor in oncology, including RCC patients (7). Sarcopenia is increasingly recognized as a predictor of adverse outcomes in cancer patients (8). PMI and SMI are specific measurements used to evaluate sarcopenia. Although some values have been determined for these measurements in the literature, we determined cut-off values for PMI and SMI by ROC analysis, as sarcopenia status is affected by patient age, BMI, and height. In the evaluation of sarcopenia in terms of PMI, the lowest values in the literature are 3.2 cm^2/m^2 for men and 2.6 cm^2/m^2 for females, while the highest values are 8.4 cm^2/m^2 for men and 8.04 cm^2/m^2 for females (3,9). In terms of SMI, the lowest values were 40 cm^2/m^2 for men and 30 cm^2/m^2 for females, while the highest values were 55 cm^2/m^2 for men and 41 cm^2/m^2 for females (10-11). Other studies have different values for PMI and SMI, and no standardization has been obtained yet (12-22). In our study, the cut-off value for PMI was 5.1 cm^2/m^2in males and 3.1 cm^2/m^2in females, and the cut-off value for SMI was ≤ 44 cm^2/m^2 in males and ≤ 30 cm^2/m^2 in females. In our study, 45.7% of the patients were sarcopenic according to PMI and 43.3% according to SMI.

Sarcopenic patients have been found to have higher T stages for RCC, but some studies did not find significant results (5,17,18). In addition, Fuhrman grades, which indicate more aggressive and poorly differentiated tumors, may be associated with an increased incidence of sarcopenia in patients. Mokina et al. found lower PMI values in patients with higher T stages (17). Mao et al. found a relationship between sarcopenia and higher T stage in terms of PMI, but not between SMI and T stage (5). Noguchi et al. reported that there was no relationship between PMI and T stage (18). Our study found higher T stages and higher Fuhrmann grades in patients with lower PMI and SMI. More accurate information about the prognosis can be given to patients by evaluating the T stage and sarcopenia status of the patients in the preoperative period.

The relationship between PMI and SMI and recurrence and mortality in patients with localized renal cancer is of significant clinical interest (5,7,15,16,18-22). Studies have shown increased cancer recurrence rates and decreased survival rates in renal cancer patients with low SMI, but studies on PMI are limited (5,7,15,16,18-22). In a study by Noguchi et al. with 316 male patients, they found shorter RFS in patients with low PMI but did not detect any difference in terms of OS (18). Psutka et al. reported that sarcopenia was independently associated with OS after RN regarding the prognosis of RCC localized with SMI (7). However, it was not found to be associated with RFS. Lee et al. found that low SMI was an independent risk factor for postoperative all-cause and cancer-specific mortality in patients who underwent RN between 2004 and 2014 in a series of 632 patients (15). Higgins et al. found worse OS, cancer-specific survival, and RFS in patients with low SMI and found that sarcopenia was associated with an increased likelihood of recurrence and death (16). A meta-analysis showed that patients with sarcopenia had worse OS (HR = 1.76; 95% CI, 1.35-2.31; $P < 0.001$) (19). Some studies have not found a significant relationship between sarcopenia and survival in patients with RCC, but remarkably, patients with RCC are metastatic in studies on survival (20-22). Our study investigated OS and RFS in patients with and without sarcopenia based on PMI and SMI. Patients with lower PMI and SMI had shorter OS and RFS.

This study used high-quality cancer data to provide a better understanding of the impact of PMI and SMI on recurrence and prognosis in localized RCC patients. However, limitations of the study include its retrospective design, as it was conducted in a single center, and the small number of patients included in the oncological survival analysis. This increases the risk of selection bias in our study, and therefore, we cannot comment on whether the results apply to all postoperative RCC patients.

CONCLUSION

In conclusion, PMI and SMI are valuable measures to assess sarcopenia in kidney cancer patients, but they must be standardized. Our diagnostic ROC curves provide the literature with new cut-off values for diagnosing cancer sarcopenia with PMI and SMI. In localized RCC patients, sarcopenia was associated with earlier recurrence, shorter OS, and RFS. In addition, our study showed that patients with sarcopenia have a worse prognosis with preoperative staging.

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Research involving human participants: All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

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Ethics Approval: The study was approved by The University of Health Sciences, Izmir Tepecik Training and Research Hospital Ethical Committee, Izmir, Türkiye (Decision No: 2024/07-14 Date: 19.08.2024).

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Original Article
Özgün Araştırma

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Does Timing of Retrograde Intrarenal Surgery Following Extracorporeal Shock Wave Lithotripsy Failure Influence the Outcomes?

Vücut Dışı Şok Dalga Litotripsi Başarısızlığı Sonrası Retrograd İntrarenal Cerrahinin Zamanlaması Sonuçları Etkiler mi?

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ABSTRACT

Objective: The objective of this study is to determine the impact of the timing of retrograde intrarenal surgery (RIRS) following extracorporeal shock wave lithotripsy (SWL) on renal stone treatment outcomes.

Material and Methods: This retrospective study included 138 patients who underwent RIRS for renal stones after at least two failed SWL sessions between 2020 and 2024. Patients were divided into three groups based on the time interval between SWL and RIRS: 7-14 days (group 1), 15-22 days (group 2), and 23-30 days (group 3). Demographic data, stone characteristics, operative time, stone-free rate, and complication rates were compared.

Results: Stone-free rates were similar across the three groups (group 1: 85.4%, group 2: 84.8%, group 3: 86.3%, p=0.978). There were no statistically significant differences between the groups in terms of median operative time (p=0.249), median length of hospital stays (p=0.865), perioperative complications (p=0.884), or postoperative complications (p=0.962).

Conclusions: The timing of RIRS after failed SWL does not appear to impact treatment outcomes for renal stones significantly, and these findings suggest flexibility in scheduling RIRS after SWL failure.

Keywords: endourology, extracorporeal shock wave lithotripsy, retrograde intrarenal surgery, timing, urolithiasis

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ÖZET

Amaç: Bu çalışmanın amacı, ekstrakorporeal şok dalga litotripsi (SWL) sonrası retrograd intrarenal cerrahinin (RIRS) zamanlamasının böbrek taşı tedavi sonuçlarına etkisini belirlemektir.

Gereç ve Yöntemler: Bu retrospektif çalışmaya, 2020 ile 2024 yılları arasında en az iki başarısız SWL seansından sonra böbrek taşları için RIRS uygulanan 138 hasta dahil edildi. Hastalar SWL ile RIRS arasındaki zaman aralığına göre üç gruba ayrıldı: 7-14 gün (Grup 1), 15-22 gün (Grup 2) ve 23-30 gün (Grup 3). Demografik veriler, taş özellikleri, operasyon süresi, taşsızlık oranı ve komplikasyon oranları karşılaştırıldı.

Bulgular: Taşsızlık oranları üç grupta da benzerdi (Grup 1: %85,4, Grup 2: %84,8, Grup 3: %86,3, p=0,978). Gruplar arasında medyan ameliyat süresi (p=0,249), medyan hastanede kalış süresi (p=0,865), perioperatif komplikasyonlar (p=0,884) veya postoperatif komplikasyonlar (p=0,962) açısından istatistiksel anlamlı bir fark yoktu.

Sonuç: Başarısız SWL'den sonra RIRS zamanlamasının böbrek taşları için tedavi sonuçlarını önemli ölçüde etkilemediği görülmektedir. Bu bulgular SWL başarısızlığından sonra RIRS planlamada esnek olunabileceğini göstermektedir.

Anahtar Kelimeler: endoüroloji, ekstrakorporeal şok dalga litotripsi, retrograd intrarenal cerrahi, ürolitiyazis, zamanlama

INTRODUCTION

Nephrolithiasis is a widespread health concern, exhibiting varying prevalence rates across continents and representing a significant proportion of urological clinic visits. Observed rates range up to 13% in North America, 9% in Europe, and 5% in Asia, suggesting potential influences of genetic, dietary, or environmental factors (1). Several treatment options are frequently suggested for kidney stones, including extracorporeal shockwave lithotripsy (SWL), retrograde intrarenal surgery (RIRS), and percutaneous nephrolithotomy (PNL). The selection of the most appropriate approach depends on various patient-specific factors. SWL, a minimally invasive approach, offers the advantage of avoiding general anesthesia and demonstrates acceptable success rates (2). Current clinical guidelines recommend both RIRS and SWL as initial treatment modalities for kidney stones measuring less than 2 cm in diameter. While SWL is also considered a primary treatment option, its efficacy can be influenced by various factors, including stone composition, patient body mass index, and renal anatomical variations (3). In cases of SWL failure, other treatment options are recommended to the patients, and RIRS comes to the forefront because it is more minimally invasive (3,4). While several studies have explored various aspects of kidney stone management, the impact of prior failed SWL on RIRS outcomes, the existing literature lacks data regarding the optimal timing of RIRS following unsuccessful SWL for renal stones (5-9). The purpose of this study was to assess the effect of the timing of RIRS operation on success and complications after failed SWL for renal stone.

MATERIALS AND METHODS

Study Design and Patient Selection

A retrospective analysis was conducted on 528 patients who underwent SWL for the treatment of kidney stones at our clinic between 2020 and 2024. Among these, 327 patients (61.9%) achieved stone-free status or had residual fragments ≤2 mm following SWL. A subsequent evaluation excluded patients based on predefined criteria: age younger than 18 years, renal anatomical anomalies, solitary kidney, multiple stones, prior ipsilateral renal surgery, ureteral narrowing preventing access sheath advancement, or refusal of additional interventions, and who were recommended for follow-up without further intervention. This process identified 138 patients who underwent RIRS after SWL failure and were included in the study (Figure 1). Ethical approval for this study was obtained from the local ethics committee.

Ethics Committee of Istanbul Medeniyet University Faculty of Medicine approved (Clinical trial number: 2025-GOSEK-0027, Date: 2025/01/22) the commencement of the presented study.

SWL Procedure

SWL procedure, performed using the Lithostar Modularis Lithotripter (Siemens AG Healthcare, Munich, Germany). The procedure commenced with a shock wave frequency of 60 per minute and an energy flow density of 0.1 mJ/

mm^2. These settings were adjusted based on the patient's tolerance, with the frequency potentially increasing to 90 shocks per minute and the energy flow density reaching 3.0 mJ/mm^2. A total of 3000 shock waves were delivered during the single session. SWL failure was defined as the lack of any change in stone status after a minimum of two SWL treatments for a kidney stone.

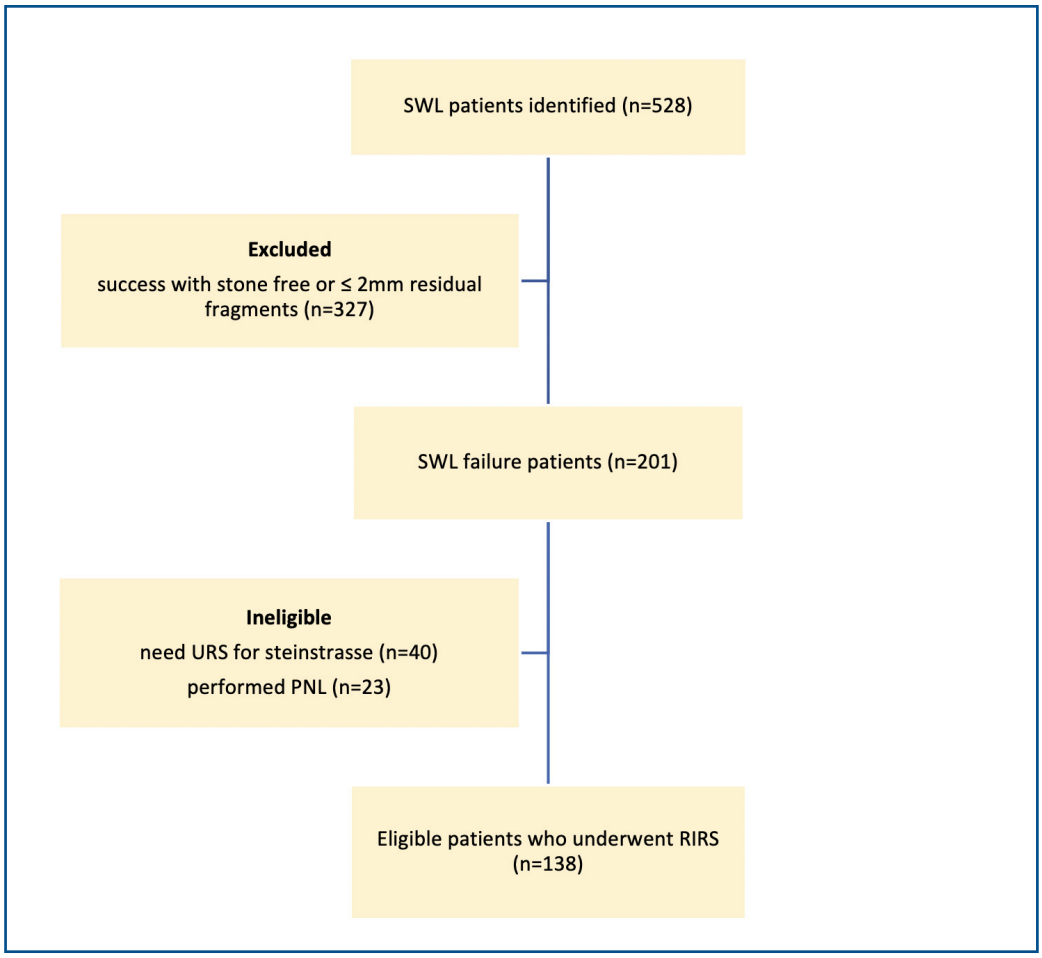

Figure 1. Study flowchart

RIRS Protocol and Group Stratification

Patients undergoing RIRS were stratified into three groups based on the interval between SWL and RIRS: group 1 (7–14 days post-SWL), group 2 (15–22 days post-SWL), and group 3 (23–30 days post-SWL). Preoperative evaluations included urine cultures to ensure negative results, and antimicrobial therapy was administered based on antibiogram findings in cases of positive cultures. All patients received preoperative antibiotic prophylaxis with second-generation cephalosporins.

The RIRS procedure was performed under general anesthesia with the patient positioned in the lithotomy position. A semi-rigid ureteroscope (URS) was initially used to passively dilate the ureter and assess for concurrent ureteral stones or strictures. A guidewire was advanced into the pelvicalyceal system, followed by placement of a ureteral access sheath (UAS). A flexible ureteroscope (F-URS) was then advanced through the UAS, and stone fragmentation was performed using a Holmium: YAG laser with a 272 µm fiber. The stone dusting technique was employed to fragment stones into fine particles. After lithotripsy, the pelvicalyceal system was visually inspected for residual fragments, and fluoroscopy was used to confirm the absence of larger fragments. The ureter was carefully examined for residual fragments and any significant damage upon withdrawal of the flexible ureteroscope and access sheath. All patients received a double-J stent postoperatively.

Follow-up Procedure

Patients were evaluated at 1 month postoperatively with non-contrast low-dose computed tomography. Stone-free status, defined as the absence of residual stones or the presence of residual fragments measuring ≤2 mm, was used as the criterion for success.

Statistical Analysis

Statistical analyses were conducted using SPSS version 27.0 (IBM Corp., Armonk, NY). The normality of continuous variables was assessed using the Kolmogorov-Smirnov test. Comparisons between two independent groups were performed using the Mann-Whitney U test for non-normally distributed data and the Student's t-test for normally distributed data. For comparisons of three or more independent groups, the Kruskal-Wallis test was applied for non-normally distributed data. At the same time, one-way analysis of variance (ANOVA) was used for normally distributed data. Pearson's chi-squared test was used for the analysis of categorical variables.

RESULTS

The study population comprised 41 patients in group 1, 46 in group 2, and 51 in group 3. Baseline demographic and stone characteristics were similar across the three groups. Statistical analysis revealed no significant differences between the groups concerning age (p=0.754), sex (p=0.806), body mass index (p=0.559), comorbidity (p=0.256), stone location (p=0.648), side of the stone (p=0.523), stone size (p=0.930), or Hounsfield Unit level (p=0.225) (Table 1). There were no significant differences between the groups in either median operation time (group 1: 45 minutes, range 33-67; group 2: 50 minutes, range 35-68; group 3: 50 minutes, range 35-70; p=0.249) or median length of hospital stay, which was consistently one day for all groups (p=0.865) (Table 1).

Table 1. Comparison of demographic data and surgical outcomes between the groups

	Group 1 (n=41)	Group 2 (n=46)	Group 3 (n=51)	p value
Age (years), mean ± SEM	44 ± 2.2	44.8 ± 2.1	42.7 ± 1.7	0.754[a]
Gender, n (%)				
Female	17 (41.5)	16 (34.8)	20 (39.2)	0.806[b]
Male	24 (58.5)	30 (65.2)	31 (60.8)	
BMI, median (IQR)	27.1 (24.3-29.7)	26.8 (24.4-29.9)	26.1 (24-29.4)	0.559[c]
CCI, median (IQR)	0 (0-1)	0 (0-2)	0 (0-1)	0.256[c]
Stone Location, n (%)				
Lower Calyx	12 (29.3)	13 (28.3)	11 (21.6)	0.648[b]
Non-Lower Calyx	29 (70.7)	33 (71.7)	40 (78.4)	
Stone Side, n (%)				
Right	20 (48.8)	26 (56.5)	23 (45.1)	0.523[b]
Left	21 (51.2)	20 (43.5)	28 (54.9)	
Stone Size (mm), median (IQR)	12 (8.5-13.5)	10 (8-14)	11 (8-14)	0.935[c]
HU, mean ± SEM	897.9 ± 32.8	838.6 ± 22.6	902.6 ± 30.9	0.225[a]
Operation Time (min), median (IQR)	45 (40-54)	50 (41.5-56.2)	50 (40-60)	0.249[c]
Hospitalization Time (days), median (IQR)	1 (1-1)	1 (1-1)	1 (1-1)	0.865[c]

SEM: standard error of the mean, BMI: body mass index, IQR: interquartile range (25th to 75th percentile), CCI: charlson comorbidity index, HU: hounsfield unit.

[a] One way ANOVA test

[b] Pearson's Chi-squared test

[c] Kruskal-Wallis test

Stone-free rates were comparable across the groups, with 85.4% in group 1, 84.8% in group 2, and 86.3% in group 3 (p=0.978). There were no statistically significant differences in perioperative or postoperative complication rates among the three groups. No severe perioperative complications like ureteral avulsion or perforation occurred. Minor perioperative complications as mucosal injury and hematuria were occurred at similar rates (group 1: 2.4%, group 2: 4.3%, group 3: 3.9%; p=0.884), as did postoperative urinary tract infections with fever (group 1: 7.3%, group 2: 6.5%, group 3: 5.9%; p=0.962) and major complications like Clavien-Dindo 3 or above were not seen (Table 2).

Table 2. Comparison of complication rates and stone-free status of the patients between the groups

	Group 1 (n=41)	Group 2 (n=46)	Group 3 (n=51)	p value
Perioperative Complication, n (%) (Hematuria, Mucosal injury)	1 (2.4)	2 (4.3)	2 (3.9)	0.884[a]
Postoperative Complication, n (%) (Urinary tract infection)	3 (7.3)	3 (6.5)	3 (5.9)	0.962[a]
Stone Clearance, n (%)	35 (85.4)	39 (84.8)	44 (86.3)	0.978[a]

[a] Pearson's Chi-squared test

DISCUSSION

This study aims to fill a significant gap in the current literature by investigating the optimal timing for RIRS procedures following failed SWL. To the best of our knowledge, this is the first study to specifically examine the impact of the time interval between failed SWL and subsequent RIRS on clinical outcomes. Previous studies have primarily focused on comparing RIRS outcomes in patients with and without a history of prior SWL, without specifically addressing the timing of RIRS after SWL failure.

Several studies have not demonstrated a statistically significant difference in stone-free rates between patients undergoing RIRS with and without prior SWL (6-10). In line with these findings, a systematic review and meta-analysis by Wang et al. reported no significant differences in stone-free rates, operative time, and complication rates between RIRS following failed SWL and primary RIRS (11). Our current findings corroborate these observations, as we did not observe any significant impact of the time interval between SWL and RIRS on stone-free rates, operative time, length of hospital stay, or complication rates. The comparable stone-free rates (85.4%, 84.8%, and 86.3% in groups 1, 2, and 3, respectively) indicate that the timing of RIRS does not influence the likelihood of achieving complete stone clearance. The similar operative times and length of hospital stay across the groups further support this conclusion, suggesting that the interval between procedures does not impact the technical difficulty or recovery period associated with RIRS. The low and comparable perioperative and postoperative complication rates across the three groups are also noteworthy. The absence of severe complications, such as ureteral avulsion or significant mucosal injury, underscores the safety of RIRS in this setting, regardless of the timing after SWL. The most common postoperative complication, urinary tract infection with fever, is a known risk factor associated with both SWL and RIRS and was managed effectively with antibiotic protocols. These results collectively suggest that the timing of RIRS procedures following unsuccessful SWL does not adversely affect treatment efficacy or patient safety. This finding is clinically relevant, as it provides flexibility in scheduling RIRS procedures after SWL failure, allowing for logistical considerations and patient preferences to be considered.

McAteer et al. have shown that tissue and vascular damage are observed after SWL, which has been practiced in clinical practice for many years (12). Our initial hypothesis for this study was that the timing of RIRS following failed SWL might influence clinical outcomes, potentially due to factors such as mucosal and vascular injury caused by prior SWL. However, our findings did not support this hypothesis. These results suggest that any mucosal or vascular

damage sustained during SWL either resolves within 7 days or does not significantly impact the subsequent RIRS procedure.

A study by Holland et al. compared RIRS for renal and proximal ureteral stones between patients who underwent RIRS as initial treatment and those who underwent RIRS after failed SWL. The study found a significantly higher stone-free rate in the primary RIRS group compared to the salvage RIRS group (80% vs. 67%). Although not statistically significant, the salvage RIRS group had longer hospital stays and higher complication rates. This study concluded that the low success rate of RIRS after SWL was not due to SWL-related effects, but that factors such as inferior calyx stone and infundibular anatomy, which affect the success of SWL, also affect the success of RIRS (5).

It is important to note that some studies have suggested a potential benefit to delaying URS after SWL failure. Irer et al. investigated the impact of timing on URS outcomes for proximal ureteral stones. Their findings indicated a significantly increased risk of complications in patients undergoing URS within 16.5 days of SWL compared to those with a longer interval between procedures (13). This suggests that a waiting period may be beneficial in the healing process of the affected ureteral wall after SWL, but in our study, we have shown that this is not the case for kidney stones.

This study has several limitations. First, the retrospective design inherently carries a risk of selection bias. Second, although the sample size was adequate for the present analysis, a larger cohort would increase statistical power and enhance the generalizability of the results. Additionally, the involvement of multiple surgeons in the RIRS procedures at a tertiary hospital may introduce variability in outcomes, which is acknowledged as a study limitation. Nevertheless, this study is the first to specifically evaluate the impact of timing between failed SWL and subsequent RIRS on surgical outcomes. Its strengths include a homogeneous patient cohort, clearly defined time intervals, and standardized surgical protocols, which enhance the reliability and clinical relevance of the findings.

CONCLUSIONS

This study demonstrates that the timing of RIRS after failed SWL for renal stones does not significantly impact stone-free rates, operative time, length of hospital stays, or perioperative and postoperative complication rates. These findings suggest that clinicians have flexibility in scheduling RIRS following unsuccessful SWL, allowing for individualized patient management based on logistical considerations, patient preference, and resource availability.

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Original Article
Özgün Araştırma

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The Effects of Holmium Laser Enucleation of the Prostate (HoLEP) on Urodynamic Parameters and Bladder Function: A Retrospective Analysis

Holmiyum Lazer Prostat Enükleasyonunun (HoLEP) Ürodinamik Parametreler ve Mesane Fonksiyonu Üzerindeki Etkisi: Retrospektif Bir Analiz

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ABSTRACT

Objective: This study evaluates the impact of Holmium Laser Enucleation of the Prostate (HoLEP) on urodynamic parameters and bladder function in patients with benign prostatic hyperplasia (BPH).

Material And Methods: A retrospective analysis was conducted on 44 patients with urodynamically confirmed BPH who underwent HoLEP in a tertiary care center. Preoperative and 6-month postoperative assessments included the International Prostate Symptom Score (IPSS), uroflowmetry, post-void residual (PVR) volume, and urodynamic studies measuring detrusor pressure, maximum flow rate (Qmax), bladder outlet obstruction index (BOOI), and detrusor overactivity (DO). Statistical comparisons were conducted using paired t-tests, Wilcoxon signed-rank tests, and McNemar's test.

Results: Significant improvements were observed post-HoLEP, including a reduction in IPSS (22.0 ± 7.0 to 6.1 ± 5.0, $p<0.001$), daytime frequency (7.4 ± 1.5 to 5.8 ± 1.2, $p=0.01$), nocturia (3.2 ± 0.8 to 1.1 ± 0.5, $p<0.001$), and PVR (175.0 ± 50.0 to 45.4 ± 15.0 mL, $p<0.001$). Qmax increased from 6.8 ± 2.0 to 19.7 ± 4.5 mL/s ($p<0.001$), maximum bladder capacity from 180.0 ± 45.0 to 375.0 ± 75.0 mL ($p<0.001$), and maximum cystometric capacity from 280.0 ± 56.0 to 415.0 ± 83.0 mL ($p<0.001$). BOOI decreased from 75.9 ± 15.0 to-8.5 ± 5.0 ($p<0.001$). Poor bladder compliance and DO prevalence decreased (13.6% to 6.8%, $p=0.30$; 25.0% to 11.3%, $p=0.10$), though not statistically significant.

Conclusion: HoLEP significantly improves urodynamic parameters and bladder function in BPH patients, particularly in those with complex urodynamic profiles. These findings support HoLEP as an effective treatment for relieving bladder outlet obstruction and improving lower urinary tract symptoms, with potential benefits for detrusor overactivity and bladder compliance.

Keywords: benign prostatic hyperplasia (BPH), holmium laser enucleation of the prostate (HoLEP), lower urinary tract symptoms, urodynamic parameters

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ÖZET

Amaç: Bu çalışma, Holmiyum Lazer Prostat Enükleasyonunun (HoLEP) benign prostat hiperplazisi (BPH) hastalarında ürodinamik parametreler ve mesane fonksiyonu üzerindeki etkisini değerlendirmeyi amaçlamaktadır.

Gereç ve Yöntemler: Üçüncü basamak bir sağlık merkezinde HoLEP uygulanan, ürodinamik olarak doğrulanmış BPH tanısı konmuş 44 hastanın retrospektif analizi yapıldı. Ameliyat öncesi ve 6 ay sonrası değerlendirmeler, Uluslararası Prostat Semptom Skoru (IPSS), üroflowmetri, idrar sonrası rezidüel hacim (PVR) ve detrüsör basıncı, maksimum akış hızı (Qmax), mesane çıkış obstrüksiyon indeksi (BOOI) ve detrüsör aşırı aktivitesini (DO) ölçen ürodinamik çalışmaları içermekteydi. İstatistiksel karşılaştırmalar eşleştirilmiş t-testleri, Wilcoxon işaretli sıralar testi ve McNemar testi ile yapıldı.

Bulgular: HoLEP sonrası IPSS (22,0 ± 7,0'den 6,1 ± 5,0'e, p<0,001), pollaküri (7,4 ± 1,5'ten 5,8 ± 1,2'ye, p=0,01), nokturi (3,2 ± 0,8'den 1,1 ± 0,5'e, p<0,001) ve PVR (175,0 ± 50,0'den 45,4 ± 15,0 mL'ye, p<0,001) anlamlı ölçüde azaldı. Qmax 6,8 ± 2,0'den 19,7 ± 4,5 mL/s'ye (p<0,001), maksimum mesane kapasitesi 180,0 ± 45,0'den 375,0 ± 75,0 mL'ye (p<0,001) ve maksimum sistometrik kapasite 280,0 ± 56,0'dan 415,0 ± 83,0 mL'ye (p<0,001) yükseldi. BOOI 75,9 ± 15,0'den -8,5 ± 5,0'e düştü (p<0,001). Zayıf mesane kompliyansı ve DO prevalansı azaldı (sırasıyla %13,6'dan %6,8'e, p=0,30; %25,0'den %11,3'e, p=0,10), ancak bu değişiklikler istatistiksel olarak anlamlı değildi.

Sonuç: HoLEP, özellikle karmaşık ürodinamik profillere sahip BPH hastalarında ürodinamik parametreleri ve mesane fonksiyonunu anlamlı ölçüde iyileştirir. Bu bulgular, HoLEP'in mesane çıkış obstrüksiyonunu gidermede ve alt üriner sistem semptomlarını iyileştirmede etkili bir tedavi olduğunu desteklerken, detrüsör aşırı aktivitesi ve mesane kompliyansı için potansiyel faydalar sunar.

Anahtar Kelimeler: alt üriner sistem semptomları, BPH, HoLEP, ürodinamik parametre

INTRODUCTION

Benign prostatic hyperplasia (BPH) is one of the most common urological conditions affecting aging men, with a prevalence that increases significantly with age. Epidemiological studies indicate that approximately 50% of men over the age of 50 and up to 80% of men over 80 experience histological evidence of BPH, with a substantial proportion developing bothersome lower urinary tract symptoms (LUTS) (1). These symptoms, broadly categorized into obstructive (e.g., weak urinary stream, hesitancy, and incomplete bladder emptying) and storage-related symptoms (e.g., urgency, frequency, and nocturia), significantly impair quality of life and impose a considerable burden on healthcare systems worldwide (2).

The pathophysiology of BPH involves progressive enlargement of the prostate, leading to bladder outlet obstruction (BOO). Prolonged BOO induces structural and functional changes in the bladder, including detrusor hypertrophy, reduced bladder compliance, and detrusor overactivity or underactivity (3). These alterations may mimic symptoms of other bladder dysfunctions, complicating differential diagnosis and raising concerns about detrusor contractility. To address these diagnostic challenges and to predict postoperative outcomes, urodynamic studies have become a valuable tool in certain clinical scenarios (4). These studies provide objective measures of bladder function, including detrusor pressure, bladder compliance, and the presence of BOO, thereby guiding surgical decision-making and offering insights into the potential reversibility of bladder dysfunction following intervention.

Surgical management of BPH, such as Holmium Laser Enucleation of the Prostate (HoLEP), has been shown to significantly alleviate LUTS by relieving BOO (5). Beyond improving obstructive symptoms, emerging evidence suggests that HoLEP may also ameliorate storage symptoms, potentially by reversing some of the structural and functional bladder changes induced by chronic obstruction (6). However, despite these clinical observations, the objective impact of HoLEP on urodynamic parameters remains a subject of ongoing debate among clinicians. While subjective symptom improvement is well-documented, there is a paucity of studies that comprehensively evaluate the postoperative urodynamic changes to provide objective evidence of the procedure's efficacy in restoring bladder function.

In this retrospective study, we aim to evaluate the effect of HoLEP on urodynamic parameters by analyzing

preoperative and postoperative urodynamic studies in patients with BPH. By assessing objective measures of bladder function, we seek to elucidate the impact of HoLEP on both obstructive and storage-related urodynamic outcomes, thereby contributing to a better understanding of its therapeutic efficacy and guiding clinical decision-making in the management of BPH.

MATERIAL AND METHODS

Study Design and Ethical Approval

This study was designed as a retrospective analysis of patients who underwent HoLEP at our institution. After obtaining approval from the Institutional Review Board (IRB) of Başakşehir Çam and Sakura City Hospital under number KAEK/08.11.2023.560, we completed a retrospective review of our prospectively maintained database of men who underwent HoLEP and had preoperative urodynamic testing at our institution. All procedures were conducted in accordance with the ethical standards outlined in the Helsinki Declaration.

Patient Selection

Patients with urodynamically confirmed BPH, based on clinical evaluations and diagnostic tests performed at our urology clinic, and who were deemed eligible for surgical intervention, were included in the study. Patients who underwent preoperative urodynamic studies included those who had the study completed prior to consultation with the primary surgeon, expressed interest in urodynamics to better understand their bladder function and potential postoperative outcomes, had a history of prior bladder outlet surgery, or were considering alternative bladder outlet procedures where urodynamic results could influence the choice of surgery. Exclusion criteria included a history of urethral stricture, previous prostate surgery (except where urodynamic studies were indicated for prior bladder outlet surgery), or incomplete postoperative data that prevented comprehensive analysis.

Preoperative and Postoperative Assessments

All patients underwent a standardized preoperative evaluation, which included completion of the International Prostate Symptom Score (IPSS) questionnaire, frequency-volume charts (Daytime Frequency maximum bladder capacity, nocturia), uroflowmetry, and measurement of post-void residual (PVR) urine volume via ultrasonography (USG). Prostate volume was assessed using transrectal ultrasonography (TRUS). Urodynamic studies were performed using the (MMS, Solar Blue, Netherlands) to evaluate bladder function, including pressure-flow studies to assess detrusor pressure at maximum flow (Pdet) and maximum flow rate (Qmax), in accordance with the International Continence Society (ICS) standards (4).

The Bladder Outlet Obstruction Index (BOOI) was calculated using the formula: Pdet - 2(Qmax). Detrusor overactivity (DO) was defined as spontaneous or provoked involuntary detrusor contractions observed during the bladder filling phase of the urodynamic study (4,7).

Postoperative assessments were conducted at the 6-month follow-up. Patients were re-evaluated using the same diagnostic tools, including IPSS, frequency-volume charts , uroflowmetry, PVR measurement via USG, and urodynamic studies to compare preoperative and postoperative urodynamic parameters.

Surgical Procedure

All HoLEP procedures (150 Watt, Jena MultiPulse HoPLUS, Germany) were performed by two experienced urologists. The surgical technique was selected based on the prostate's anatomical configuration, employing either the trilobar or en-bloc method (8). Following the procedure, a 20 Fr Foley catheter was inserted, and patients were monitored with gentle irrigation for the first 24 hours. The catheter was routinely removed on the third postoperative day.

Data Collection and Analysis

Data were collected from electronic medical records, including preoperative and postoperative clinical assessments, urodynamic parameters, and surgical outcomes. The primary objective was to compare preoperative and postoperative urodynamic parameters, including BOOI and the presence of DO, to evaluate the impact of HoLEP on bladder function.

Statistical Analysis

Data were analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics for continuous variables, including age, body mass index (BMI), prostate-specific antigen (PSA), prostate volume, operation duration, enucleation weight, hospital stay duration, catheterization duration, IPSS, daytime frequency, nocturia, maximum capacity, Qmax, PVR, first desire, maximum cystometric capacity (MCC), and BOOI, were reported as means ± standard deviations (SD). Categorical variables, including diabetes mellitus (DM) rate, biopsy history rate, retention history rate, poor bladder compliance, and DO, were expressed as frequencies and percentages.

Normality of continuous variables was assessed using the Shapiro-Wilk test. For normally distributed variables, differences between preoperative and postoperative measurements were evaluated using paired t-tests. For non-normally distributed variables, the Wilcoxon signed-rank test was applied. Comparisons of categorical variables (poor bladder compliance and DO) were performed using McNemar's test. A p-value of less than 0.05 was considered indicative of statistical significance. All tests were two-tailed.

RESULTS

This study evaluated the outcomes of HoLEP in a cohort of 44 patients with BPH. Demographic and clinical characteristics of the cohort are presented in Table 1. The mean age was 65.0 ± 6.5 years, with a mean BMI of 28.4 ± 4.3 kg/m^2. DM was observed in 31% of patients (n=14), while 56.8% (n=25) had a history of prostate biopsy, and 54% (n=24) reported a history of urinary retention. The mean PSA level was 6.1 ± 1.2 ng/mL, and the mean prostate volume was 84.4 ± 16.9 cc. Operative and postoperative characteristics included a mean operation duration of 115.0 ± 17.3 minutes, an enucleation weight of 35.4 ± 7.1 grams, a hospital stay duration of 2.4 ± 0.5 days, and a catheterization duration of 4.2 ± 0.8 days.

Table 2 summarizes the comparison of preoperative and postoperative clinical parameters following HoLEP, along with their statistical significance. Significant improvements were observed across multiple parameters post-surgery. The IPSS decreased from 22.0 ± 7.0 preoperatively to 6.1 ± 5.0 postoperatively (p<0.001). Daytime frequency reduced from 7.4 ± 1.5 to 5.8 ± 1.2 times per day (p=0.01), and nocturia improved from 3.2 ± 0.8 to 1.1 ± 0.5 episodes per night (p<0.001). Maximum bladder capacity increased significantly from 180.0 ± 45.0 mL to 375.0 ± 75.0 mL (p<0.001). The Qmax improved from 6.8 ± 2.0 mL/s to 19.7 ± 4.5 mL/s (p<0.001), and PVR decreased from 175.0 ± 50.0 mL to 45.4 ± 15.0 mL (p<0.001). First desire to void increased from 150.4 ± 30.0 mL to 210.8 ± 42.0 mL (p=0.002). The MCC increased from 280.0 ± 56.0 mL to 415.0 ± 83.0 mL (p<0.001). The BOOI showed a marked reduction from 75.9 ± 15.0 to -8.5 ± 5.0 (p<0.001). The prevalence of poor bladder compliance decreased from 13.6% (n=6) to 6.8% (n=3), though this change was not statistically significant (p=0.30). Similarly, DO prevalence reduced from 25.0% (n=11) to 11.3% (n=5), but the difference was not statistically significant (p=0.10).

Table 1. Clinical and Operative Characteristics of 44 Patients

Parameters	Value/Mean ± SD
Age (years)	65.0 ± 6.5
BMI (kg/m^2)	28.4 ± 4.3
Diabetes Mellitus (DM) Rate	31% (n=14)
Biopsy History Rate	56.8% (n=25)
Retention History Rate	54% (n=24)
PSA (ng/mL)	6.1 ± 1.2
Prostate Volume (cc)	84.4 ± 16.9
Operation Duration (min)	115.0 ± 17.3
Enucleation Weight (g)	35.4 ± 7.1
Hospital Stay Duration (days)	2.4 ± 0.5
Catheterization Duration (days)	4.2 ± 0.8

BMI: Body Mass Index, DM: Diabetes Mellitus, PSA: Prostate-Specific Antigen

Table 2. Comparison of Preoperative and Postoperative Parameters in 44 Patients

Parameters	Preoperative Mean ± SD or Rate	Postoperative Mean ± SD or Rate	p-value
Frequency-Volume Chart		6.1 ± 5.0	0.001
Daytime Frequency	7.4 ± 1.5	5.8 ± 1.2	0.01
Nocturia	3.2 ± 0.8	1.1 ± 0.5	0.001
Maximum Bladder Capacity (mL)	180.0 ± 45.0	375.0 ± 75.0	<0.001
Uroflowmetry			
Qmax (mL/s)	6.8 ± 2.0	19.7 ± 4.5	<0.001
PVR (mL)	175.0 ± 50.0	45.4 ± 15.0	<0.001
Urodynamics Study			
First Desire (mL)	150.4 ± 30.0	210.8 ± 42.0	0.002
Compliance (Poor %)	13.6% (n=6)	6.8% (n=3)	0.30
MCC (mL)	280.0 ± 56.0	415.0 ± 83.0	<0.001
Detrusor Overactivity	25.0% (n=11)	11.3% (n=5)	0.10
BOOI	75.9 ± 15.0	-8.5 ± 5.0	<0.001

IPSS: International Prostate Symptom Score, Qmax: Maximum Flow Rate, PVR: Post-Void Residual Urine, MCC: Maximum Cystometric Capacity ,BOOI: Bladder Outlet Obstruction Index.

Note: $p < 0.05$ indicates statistical significance.

DISCUSSION

This study reaffirms the efficacy of HoLEP as a highly effective treatment for BPH, demonstrating significant improvements in both subjective and objective clinical parameters. The detailed evaluation of pre- and postoperative urodynamic parameters, including BOOI, maximum bladder capacity, and MCC, sets this study apart and provides critical insights into HoLEP's impact on bladder function, supporting its role as a first-line surgical option for BPH. Despite our cohort of 44 patients, our study is among the few in the literature to incorporate both pre- and postoperative urodynamic assessments, a methodological distinction that underscores its originality and enhances the understanding of the procedure's therapeutic benefits, particularly in complex patient populations where urodynamics can optimize surgical planning (5,6).

Significant improvements were observed across multiple parameters, including a reduction in IPSS, daytime frequency, nocturia and PVR. Additionally, While the Qmax value increased at a remarkable level ($p<0.001$), a significant increase was observed in the maximum badder capacity from the flow-volume chart and in the MCC from urodynamic studies. ($p<0.001$). The BOOI decreased markedly, confirming HoLEP's ability to relieve BOO. These robust outcomes, driven by the precise enucleation of obstructing prostate tissue, align with prior studies reporting postoperative IPSS scores of 4–8 and Qmax values exceeding 18 mL/s (9). The objective improvements in urodynamic parameters provide compelling evidence for HoLEP's utility in restoring bladder function, particularly in patients with suspected bladder dysfunction.

A notable finding is the reduction in the prevalence of poor bladder compliance from 13.6% (n=6) to 6.8% (n=3), although this change was not statistically significant ($p=0.30$). Despite the modest improvement rate, the observed change suggests that structural bladder changes secondary to BPH-related chronic BOO may be partially reversible following HoLEP. Poor bladder compliance, often resulting from prolonged obstruction, is associated with persistent LUTS and reduced quality of life (10). The partial improvement in these patients highlights HoLEP's potential to mitigate some of the bladder remodeling caused by chronic obstruction, offering hope for improved outcomes in this challenging subgroup. This finding underscores the importance of considering HoLEP for patients with complex urodynamic profiles, as it may address structural bladder changes that contribute to persistent LUTS.

The prevalence of DO decreased from 25.0% (n=11) to 11.3% (n=5), though this reduction was not statistically significant (p=0.10). The relatively high baseline prevalence of DO, likely due to the inclusion of patients undergoing preoperative urodynamic evaluation, exceeds rates typically reported in HoLEP studies (11,12). DO is a hallmark of overactive bladder (OAB) syndrome, characterized by urgency, frequency, and nocturia, which significantly impact patient quality of life (13). The observed reduction, while not statistically significant, indicates that a clinically meaningful number of patients experienced improvement in OAB-related symptoms post-HoLEP. This suggests that HoLEP may alleviate DO in some patients, potentially by relieving BOO and improving bladder compliance, even in those with preoperative urodynamic abnormalities. These findings are particularly relevant for urologists managing BPH patients with OAB symptoms, as they highlight HoLEP's potential to address both obstructive and irritative symptoms, enhancing patient quality of life.

The high proportion of patients with a history of urinary retention (54%, n=24) further distinguishes our cohort. Urinary retention, often an indication for preoperative urodynamic assessment, is associated with worse baseline bladder function and a higher likelihood of urodynamic abnormalities, such as DO or poor compliance. The significant improvements observed across most parameters in this subgroup demonstrate HoLEP's efficacy in a more challenging patient population compared to typical HoLEP cohorts, where urinary retention rates are often lower (14,15). This reinforces HoLEP's versatility and effectiveness in managing BPH-related LUTS, even in patients with a history of urinary retention. The inclusion of preoperative urodynamic assessments in our study enhances the precision of patient selection and outcome evaluation, providing valuable data for clinicians managing complex BPH cases where urinary retention or urodynamic abnormalities are present.

The operative and postoperative characteristics, including a mean operation duration of 115 ± 17.3 minutes, hospital stay of 2.4 ± 0.5 days, and catheterization duration of 4.2 ± 0.8 days, align with established HoLEP protocols (16). The mean prostate volume of 84.4 ± 16.9 cc supports HoLEP's applicability across a range of prostate sizes, consistent with its reported efficacy in both small and large prostates (17). The high prevalence of comorbidities, such as DM (31%) and urinary retention (54%), reflects the complexity of our patient population. Despite these risk factors, which are known to impair bladder function and complicate recovery (15,18), the robust improvements observed across most parameters underscore HoLEP's effectiveness in real-world clinical scenarios. These outcomes support the use of HoLEP in diverse patient populations, including those with comorbidities or complex urodynamic profiles, where precise surgical intervention can yield significant functional improvements.

This study has several limitations. The sample size of 44 patients may limit the generalizability of findings, particularly for non-significant changes in DO and bladder compliance. The lack of statistical significance in these parameters may be due to insufficient power, underscoring the need for larger cohorts. Additionally, the absence of long-term follow-up data restricts insights into the durability of HoLEP's benefits, particularly regarding the reversibility of structural bladder changes and OAB symptoms. The lack of a control group undergoing alternative treatments, such as transurethral resection of the prostate or medical therapy, precludes comparative analyses. Despite these limitations, the inclusion of preoperative urodynamic assessments and the focus on objective parameters strengthen the study's contribution to the literature. Future studies should incorporate larger sample sizes, extended follow-up periods, and comparative arms to validate these findings and explore the long-term impact of HoLEP on DO and bladder compliance.

CONCLUSION

This study reinforces HoLEP as a highly effective treatment for BPH, with significant improvements in LUTS, urodynamic parameters, and quality of life. The detailed assessment of pre- and postoperative urodynamic parameters, including BOOI, maximum bladder capacity, and MCC, provides objective evidence of HoLEP's impact on bladder function, distinguishing this study from much of the existing literature. The partial improvement in poor bladder compliance and DO, particularly in a cohort with a high prevalence of urinary retention and urodynamic abnormalities, suggests that HoLEP may mitigate BPH-related structural bladder changes and OAB symptoms, even in complex cases. Our findings suggest HoLEP's versatility and support its role as a robust treatment option for BPH patients, including those

with challenging clinical profiles. Further research with larger cohorts, longer follow-up, and comparative designs is needed to confirm these outcomes and elucidate HoLEP's long-term effects on bladder function and OAB symptoms.

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Original Article
Özgün Araştırma

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Comparison of Spinal and General Anesthesia Outcomes in Geriatric Patients Undergoing Retrograde Intrarenal Surgery

Retrograd İntrarenal Cerrahi Yapılan Geriatrik Hastalarda Spinal ve Genel Anestezi Sonuçlarının Karşılaştırılması

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ABSTRACT

Objective: This study aims to investigate the feasibility of spinal anesthesia (SA) in retrograde intrarenal surgery (RIRS) among patients aged over 65 years, and to compare the effectiveness of spinal and general anesthesia (GA) techniques on postoperative pain.

Material and Methods: A retrospective analysis was conducted on 281 patients who underwent RIRS. Patients were divided into two groups: those who received SA (Group 1) and those who received GA (Group 2). Perioperative and postoperative outcomes of RIRS were compared between the groups. Additionally, postoperative pain levels in both the early and late periods were assessed using the Visual Analog Scale (VAS).

Results: Group 1, which received SA, consisted of 166 patients, while Group 2, which received GA, included 115 patients. There was no statistically significant difference between the two groups in the demographic data and stone characteristics. The complication rates, classified according to the modified Clavien-Dindo system, were comparable between the two anesthesia techniques. The mean early postoperative VAS score was 2.26 ± 0.99 in Group 1 and 3.58 ± 1.13 in Group 2, with the difference being statistically significant ($p < 0.001$). However, there was no statistically significant difference in late postoperative VAS scores between the groups ($p = 0.362$). Postoperative analgesic requirement was observed in 10.24% of patients in Group 1, compared to 27.82% in Group 2, and this difference was statistically significant ($p < 0.001$).

Conclusion: SA may be a viable alternative to GA in geriatric patients undergoing RIRS, as it provides favorable outcomes in postoperative pain control and may protect patients from certain potential morbidities associated with GA.

Keywords: general anesthesia, post operative pain, regional anesthesia, spinal anesthesia

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ÖZET

Amaç: Bu çalışma 65 yaş üstü hastalarda spinal anestezinin (SA) retrograd intrarenal cerrahi' de (RIRS) uygulanabilirliğini araştırmayı ve ayrıca spinal ve genel anestezi (GA) tekniklerinin postoperatif ağrı üzerine etkinliğini karşılaştırmayı amaçlamaktadır.

Gereç ve Yöntemler: RIRS uygulanan 281 hastanın retrospektif incelemesi yapıldı. Hastalar SA uygulanan (Grup 1) ve GA uygulananlar (Grup 2) olmak üzere 2 gruba ayrıldı. Grupların perioperatif ve postoperatif RIRS sonuçları ve komplikasyon oranları karşılaştırıldı. Ayrıca Vizüel Analog Scale (VAS) kullanılarak postoperatif erken ve geç dönem ağrı düzeyleri karşılaştırıldı.

Bulgular: SA uygulanan Grup 1 166 hastadan, GA uygulanan Grup 2 115 hastadan oluşuyordu. Grupların demografik verileri ve taş özellikleri benzer olarak bulundu. Her 2 anestezi tekniğinde modifiye Clavien-Dindo komplikasyon oranları benzerdi. Gruplar arasında operasyon süresi ($p = 0,344$) ve hastanede yatış süresi ($p = 0,876$) açısından fark gözlenmedi. Grup 1' de erken dönem ortalama VAS skoru 2,26 ± 0,99 iken Grup 2' de 3,58 ± 1,13 olarak bulundu ve aradaki fark istatistiksel olarak anlamlıydı ($p < 0,001$). Geç dönem VAS skorları arasında istatistiksel anlamlı fark gözlenmedi ($p = 0,362$). Grup 1' deki hastaların %10,24' ünde postoperatif analjezi ihtiyacı olurken, Grup 2' deki hastaların %27,82 'sinin postoperatif analjezi ihtiyacı olmuştur ve aradaki fark istatistiksel olarak anlamlıydı ($p < 0,001$).

Sonuç: Spinal anestezi postoperatif ağrı kontrolünde olumlu sonuçlar vermesi ve hastaları genel anestezinin olası bazı morbidetelerinden koruması nedeniyle RIRS yapılacak geriatrik hastalarda genel anesteziye alternatif bir teknik olabilir.

Anahtar Kelimeler: genel anestezi, postoperatif ağrı, rejyonel anestezi, spinal anestezi

INTRODUCTION

The global prevalence of kidney stones ranges from 1% to 15%, with a recurrence rate of approximately 50% within 10 years of diagnosis (1,2). While most prevalent between ages 30–55, kidney stone incidence can reach 10–20% in those over 65 (3,4). Considering that the incidence of comorbidities also increases in individuals over the age of 65, the management of kidney stone treatment and associated complications becomes increasingly important.

The European Association of Urology (EAU) urolithiasis guideline recommends retrograde intrarenal surgery (RIRS) and shock wave lithotripsy (ESWL) for the treatment of kidney stones smaller than 2 cm (5). Advancements in flexible devices, laser lithotripters, and optical systems have progressively increased the use of RIRS in the surgical treatment of kidney stones. RIRS, a minimally invasive procedure with high stone-free and low complication rates, is traditionally performed under general anesthesia (GA). However, its use under regional anesthesia is increasingly common (6).

As life expectancy continues to rise, the demand for both medical and surgical treatment services for elderly patients is progressively increasing. Chronological age is not the sole factor determining patients' frailty, and it cannot be expected to provide objective information about their overall health status on its own. Additionally, the overall health status across age groups varies from country to country. However, in many academic studies, the population aged 65 and above is considered elderly, as per the classification of the World Health Organization (WHO) (7,8). Urinary system stone disease is a significant problem in patients over 65 years of age. This means that urologists encounter many stone patients with one or more chronic diseases in their daily practice. In this context, in addition to stone disease, complications that may arise from treatment in patients with higher frailty further challenge both the urologist and the patient.

RIRS is widely used in urolithiasis treatment and is considered safe and effective, with major complications being rare (9). While some studies assess RIRS outcomes in the elderly, data on how anesthesia methods affect its safety and efficacy in this group remain limited. Although RIRS, which has traditionally been performed under GA for many years, has recently been increasingly performed under regional anesthesia, there is insufficient data in the literature regarding the elderly population. Regional anesthesia is preferred over GA in many different surgeries due to safety and comfort considerations for both the anesthesiologist and the patient. This study aims to investigate the impact of anesthesia methods on the efficacy and safety of surgical procedures in the elderly population.

MATERIAL AND METHODS

We retrospectively analyzed data from 290 patients aged 65 years and older who underwent RIRS treatment for proximal ureteral or renal stones between January 2019 and January 2024. Approval was obtained from the Karabük University Clinical Research Ethics Committee (01.04.2024/1718) prior to the start of the study. Patients under the age of 65, those with congenital urinary anomalies, and individuals with non-sterile urine cultures were excluded from the study. The patients' ages, genders, body mass indices (BMI), American Society of Anesthesiologists (ASA) scores, Charlson Comorbidity Index (CCI), presence of congenital urinary anomalies, and preoperative JJ stent status were recorded. All patients were evaluated with preoperative non-contrast computed tomography (CT). Data related to the stone, including its size (maximum length of the stone, total of maximum lengths for multiple stones), number, side (right/left), location (proximal ureter, renal pelvis, upper/middle/lower calyx, and multiple calyceal), and density (Hounsfield unit), were recorded. In the postoperative period, the anesthesia method (general/spinal anesthesia), operation duration, fluoroscopy time, complications according to the Modified Clavien-Dindo Complication Classification (MCDCC), stone-free rates (SFR) (stones smaller than 2 mm were considered clinically insignificant), and hospitalization duration were recorded.

Spinal anesthesia was administered in the lateral decubitus position at the L3-L4 interspace. Before central blockade, all patients underwent skin infiltration with 3 ml of 2% lidocaine at the intervention site. Following skin infiltration, 3.5 ml (17.5 mg) of 0.5% hyperbaric bupivacaine was administered at the L3-L4 interspace using a 25-gauge Quincke spinal needle.

All surgeries were performed in the standard lithotomy position by three urologists experienced in RIRS (with a minimum of 100 cases). As a routine, diagnostic ureterorenoscopy was performed by advancing a semi-rigid ureterorenoscope to the renal pelvis in all procedures. A guidewire was left in the kidney, and a ureteral access sheath (Flexor 9.5/11.5 Fr, Cook Medical, Bloomington, IL, USA) was placed over it into the ureter. If the access sheath could not be placed into the ureter due to ureteral orifice stenosis or ureteral stricture, a JJ stent was inserted into the ureter for passive dilation, and the procedure was postponed for 2-3 weeks. A non-digital flexible ureterorenoscope (Flex X2™, Karl Storz, Tutlingen, Germany) was used in all cases. Irrigation rate was kept below 25 ml/min. When image quality deteriorated, irrigation pressure was manually increased from the irrigation pump. Lower pole stones that were difficult to reach were intervened on by moving them to the pelvis or midpole with a basket catheter. The operative time was defined as the duration from the urethral meatal entry of the ureterorenoscope to the placement of the urethral catheter. A JJ stent was placed in all cases, and if no further surgery or ESWL was indicated, the JJ stent was removed 1-2 weeks later. Three surgeons opted for a fluoroscopy-free protocol in their surgeries whenever possible. Postoperative pain was assessed using the Visual Analog Scale (VAS) 30 minutes after the end of the operation in the recovery room or in the patient room in the ward. On postoperative day 1, the VAS score was reassessed (late VAS score). Patients requiring analgesia were recorded, and nonsteroidal anti-inflammatory drugs (NSAIDs) (deksketoprofen trometamol 50 mg-2 ml intravenous)) were administered for pain management. Metoclopramide hydrochloride 10 mg/2 ml was administered intravenously as an antiemetic.

Postoperative day 1 imaging was performed using kidney-ureter-bladder radiography for opaque stones and ultrasound for non-opaque stones. Follow-up of the patients was conducted with a non-contrast CT scan three months postoperatively.

The patients were divided into two groups: those who underwent surgery under spinal anesthesia (SA) (Group 1) and those who received GA (Group 2). The data of the groups were compared to investigate the impact of anesthesia type on the effectiveness and safety of RIRS.

Visual Analog Scale (VAS)

The VAS is a 10 cm long scale drawn either horizontally or vertically, ranging from "No pain" at one end to "Unbearable pain" at the other. The patient is asked to mark a point on the scale that corresponds to the intensity of their pain, which intersects with the scale above.

Modified Clavien-Dindo Complication Classification (7)

The Clavien-Dindo classification system was established for the identification and grading of postoperative adverse events.

1. Normal postoperative changes that do not require pharmacological treatment, surgery, endoscopic, or radiological intervention. Medications such as diuretics, antipyretics, analgesics, antiemetics, and electrolytes are acceptable. Wound infection opened and treated at the bedside.

2. Conditions treated with medications other than those permitted for use in Grade 1 complications.

3. Conditions treated with surgical, endoscopic, or radiological interventions.

3a. Conditions not requiring general anesthesia.

3b. Procedures requiring general anesthesia.

4. Life-threatening conditions requiring treatment in the intensive care unit.

4a. Single organ dysfunction (including dialysis).

4b. Multiple organ dysfunction.

5. Patient death.

Statistical Analysis

Statistical analysis was performed using the Statistical Package for the Social Sciences (SPSS) version 23.0 (IBM Corp., Chicago, Illinois, USA) software programme. The normal distribution of the data was examined using the Shapiro-Wilk test. Normally distributed and non-normally distributed numerical variables were presented as mean and standard deviation (SD) values or maximum, median, and minimum values, respectively. The differences between the groups for numerical variables were tested using the Student's t-test for data following a normal distribution, and the Mann-Whitney U test for data not following a normal distribution. The Pearson chi-square test was employed to compare the categorical variables. A p-value < 0.05 was considered significant.

RESULTS

The data of 290 patients who underwent RIRS were analyzed. Five patients were excluded from the study because early and late VAS results were not available, and four patients did not come for the 3rd month follow-up. The mean age of the patients was 71.63±4.85. 161 (57.29%) of the patients were male and 120 (42.71%) were female. Of the 281 patients included in the study, 166 (59.07%) were operated under SA (Group 1) and 115 (40.93%) were operated under GA (Group 2). No statistically significant difference was found between the groups regarding age, gender, BMI, CCI scores, urinary anomaly, and ASA scores. Demographic data of the patients are summarized in Table 1.

When stone-related data were analyzed, no statistically significant difference was found between the groups. Comparison of perioperative and postoperative data showed no significant differences between the groups in surgery time, fluoroscopy time, or hospitalization duration. Postoperative 1st day and 3rd month SFR of all patients were found to be 86.12% and 87.18%, respectively. When the SFR on postoperative day 1 and at 3 months were compared, no significant difference was found between the groups (p=0.129 and p=0.095, respectively).

In our study, the total complication rate was found to be 8.89% (25 patients). The number of patients with MCDCC grade 1 or 2 complications in Group 1 was 15 (9.03%), while in Group 2 it was 8 (6.95%) (p=0.366). In Group 1, hematuria was observed in 6 patients, postoperative fever in 4 patients, headache in 3 patients, and nausea in 2 patients. In Group 2, renal colic was observed in 3 patients, fever in 2 patients, hematuria in 2 patients, and vomiting in 1 patient. No MCDCC grade 3 or 4 complications were observed in Group 1, while in Group 2, 1 patient experienced a MCDCC grade 3 complication (steinstrasse) and one patient required intensive care unit admission due to urosepsis. The total complication rate in Group 2 was found to be 8.69%. No statistically significant difference was observed between the groups in terms of complications. Complication relationship data are summarized in Table 2 and 3.

A statistically significant difference between the groups was found only in the postoperative early-period VAS score and analgesic usage. The mean early VAS score was 2.26±0.99 in Group 1 and 3.58±1.13 in Group 2 (p<0.001). Late-term VAS scores of the groups were statistically similar. When postoperative analgesic requirements were analyzed, 10.24% of patients in Group 1 required postoperative analgesics, while 27.82% of patients in Group 2 required analgesics, and this difference was statistically significant (p<0.001). On the first postoperative day, one patient in Group 1 had a headache, while no patient in Group 2 had a headache.

Table 1. Demographic, clinical and preoperative data.

	Group 1 n:166	Group 2 n:115	p value
Gender			
Female/Male	70(42.16%)/96(57.84%)	50(43.47%)/65(56.53)	0.828[a]
Age (years) (mean ± SD)	71.93 ± 5.27	71.20 ± 4.17	0.516[b]
BMI (kg/m^2) (mean ± SD)	27.41 ± 4.55	28.18 ± 4.38	0.17[b]
CCI (mean ± SD)	5.11 ± 0.46	4.98 ± 0.39	0.488[b]
ASA Score 1/2/3/4 N	2/36/117/11	2/34/68/11	0.339[a]
Urinary anomaly No/Yes N(%)	139(83.73%)/27(16.27%)	105(91.30%)/10(8.70%)	0.066[a]
Preoperative JJ stent No/Yes N(%)	116(69.87%)/50(30.13%)	78(67.82%)/37(32.18%)	0.715[a]
Side (right/left) N(%)	66(39.75%)/100(60.25%)	52(45.21%)/63(54.79%)	0.363[a]
Location N(%)			
Pelvis	32 (19.27%)	23(20%)	
Upper calyx	41(24.69%)	32(27.82%)	
Middle calyx	29(17.46%)	22(19.13%)	0.538[a]
Lower calyx	20(12.04%)	12(10.43%)	
Ureter	39(23.49%)	22(19.13%)	
Multiple calyx	5(3.01%)	4(3.47%)	
Stone size (mm), median (Q1-Q3)	11 (10-15)	13 (8-22)	0.082[a]
Density (HU), median (Q1-Q3)	809.5(691-956)	798(616-985)	0.819[a]

BMI: Body Mass Index. CCI: Charlson Comorbidity Index. ASA: American Society of Anesthesiologist HU: Hounsfield Unit

[a]Mann- Whitney U Test

[b]Student's t-test

Table 2. Complication of RIRS classified according to MCDCC

Grade	Complications	Group 1 (n:15)	Group 2 (n:10)
Grade 1-2			
	Hematuria	6	2
	Fever	4	2
	Headache	3	
	Nausea	2	
	Renal colic		3
	Vomiting		1
Grade 3-4			
	Steinstrasse		1
	Urosepsis		1

Table 3. Peroperative and postoperative data

	Group 1(n:166)	Group 2 (n:115)	p value
Operation time (min) mean±SD (min-max)	35.55±15.59(5-90)	38.62±21.32(5-120)	0.344[a]
[x]Fluoroscopy time (sec) median (Q1-Q3)	0 (0-12)	0 (0-22)	0.310[a]
Hospitalization time (day) median(Q1-Q3)	1(1-1)	1(1-1)	0.876[a]
Postoperative 1. day stone- free N (%)	145 (87.34%)	97(84.34%)	0.129[a]
Postoperative 3 months stone- free N (%)	147(88.55)	98(85.21)	0.095[a]
MCDCC 1-2 complication N(%)	15 (9.03%)	8 (6.95%)	0.366[a]
MCDCC 3 complication N(%)	0	1 (0.86%)	0.230[a]
MCDCC 4 complication N(%)	0	1 (0.86%)	0.230[a]
Early VAS score (mean± SD)	2.26±0.99	3.58±1.13	<0.001[1,b]
Late VAS score (mean± SD)	1.50±0.85	1.47±0.61	0.362[b]
Postoperative analgesic use N(%)	17 (10.24%)	32 (27.82%)	<0.001[1,a]

[1]Significant at p<0.05. MCDCC: Modified Clavien-Dindo Complication Classification. VAS: Visual Analog Scale

[x]0 second: fluoroscopy-free protocol

[a]Mann- Whitney U Test

[b]Student's t-test

DISCUSSION

Nowadays, life expectancy and average age are steadily increasing (10). Consequently, the number of patients receiving treatment for urolithiasis in the geriatric population is also rising (11). This patient group, with high frailty, faces not only comorbid conditions but also the morbidity associated with anesthesia (12). While comorbidities are the main factor contributing to frailty, the prevalence of chronic diseases also increases with age. In the ICD-11 version, the WHO has defined 'advanced age' not as a part of the normal life cycle, but as a pathological process (7). By 2050, over 20% of the global population will be aged 60 or older, with life expectancy in developed countries surpassing 80 years (13).

Along with the increased incidence of stones in the geriatric population, the number of complications related to stones and their treatment is also rising (3,4,7). Therefore, it would be prudent for urologists to take various measures to reduce morbidity in the surgical treatment of urolithiasis in the geriatric population. RIRS has long been used as a minimally invasive procedure for the surgical treatment of kidney and proximal ureter stones. Although traditionally performed under GA, recent applications under regional anesthesia are becoming increasingly common (14). Advancements have been made not only in RIRS technology but also in anesthesia techniques. Although there are limited studies in the literature regarding the efficacy and safety of RIRS under GA and SA in the general population, to the best of our knowledge, no studies have been conducted on anesthesia methods in geriatric patients. There is no consensus regarding the ideal anesthesia method for elderly patients undergoing RIRS. In the present study, we evaluated the outcomes of RIRS performed under GA and SA in the geriatric patient group.

In our study, the SFR was 86.12% in a single procedure, consistent with RIRS outcomes in the general population (15-17). The anesthesia method does not affect the SFR of the procedure, and the SFR for both anesthesia techniques is consistent with those in the literature. In one of the rare studies in the literature examining RIRS outcomes in elderly patients, Berardinelli et al. reported that patient age did not affect the operation, fluoroscopy, or hospital stay duration (18). In the present study, perioperative outcomes such as operation and fluoroscopy time, as well as length of hospital stay, were not influenced by the type of anesthesia. However, there are studies in the literature reporting that SA shortens the duration of surgery compared to GA (14). Moreover, several studies have reported that, in medical specialties other than urology, the use of SA is associated with shorter hospital stays and reduced

intensive care unit durations compared to GA (19). Although average costs vary by country, evidence suggests no significant cost difference between GA and SA (14). However, reports of longer intensive care unit stays with GA indicate a potential for increased costs.

In the urology literature, major complications related to RIRS have been reported as rare. According to the MCDCC, complication rates ranging from 7% to 14% have been reported in the elderly population (7,18,20). The overall complication rate in this study was 8.89%, with similar rates observed in both groups. Anesthesia type had no impact, and the results were consistent with the literature.

In our study, procedures performed under SA were found to be associated with lower VAS scores compared to those performed under GA. Although VAS scores were similar between the two anesthesia techniques on postoperative day 1, more effective analgesia was achieved in the early postoperative period on the day of surgery in the SA group compared to the GA group. Moreover, the postoperative analgesic requirement was lower in the SA group compared to the GA group. This can be considered an objective indicator of improved patient comfort in the early postoperative period. In addition, patients are also protected from the potential side effects of NSAIDs and narcotic analgesics. Numerous studies have demonstrated that NSAIDs may cause gastrointestinal, cardiovascular, renal, hepatic, cerebral, and pulmonary adverse effects (21). Although these side effects are not commonly observed, they are clinically significant, and limiting the use of these medications may help prevent potentially serious complications. However, patients undergoing SA have a higher risk of developing postoperative headaches due to dural perforation compared to those receiving GA (22). In the present study, postoperative headache was observed in 3 patients in the SA group, whereas no patients in the GA group reported such a complaint. The occurrence of a headache may trigger the need for NSAID administration. To avoid this disadvantage of spinal anesthesia, Çakıcı et al. have suggested that combined spinal-epidural anesthesia, another regional anesthesia technique, could be a preferable alternative (22). Numerous studies in the literature have reported that spinal anesthesia is superior to general anesthesia in terms of postoperative pain control (14,18,19,22). Effective postoperative pain management is particularly important in patients with chronic kidney disease, as it helps to minimize exposure to the nephrotoxic effects of NSAIDs.

Anesthesia techniques exhibit distinct advantages and disadvantages; thus, the selection of the appropriate technique should be determined on an individual case basis. Providing the patient with detailed information about the techniques and understanding their expectations can facilitate the decision-making process, allowing for a collaborative choice of anesthesia method. It is recommended that the benefits and risks of anesthesia techniques be discussed with the patient, allowing them the opportunity to make an informed choice (23). For a patient experiencing surgical stress, GA may be preferred to forget the intraoperative period, while SA would be the natural choice for those with anxiety about general anesthesia. Additionally, in patients with bleeding disorders, general anesthesia may be preferred due to the risk of spinal cord compression following spinal hematoma caused by spinal hemorrhage (22). Aside from patient preference and contraindications, anesthesia techniques should be reviewed based on the patient's overall health status. The incidence of chronic diseases increases in geriatric patients. For example, patients with chronic obstructive pulmonary disease are at risk for pulmonary infections. In these patients, spinal anesthesia may be preferred over general anesthesia, as it allows for physiological respiration and does not require the use of an endotracheal tube or laryngeal mask (22,23). In our study, no postoperative pulmonary infections were observed. The anesthesiologist's choice of regional anesthesia for high-risk patients may have contributed to the absence of complications. A meta-analysis demonstrated an association between GA and increased incidence of postoperative pneumonia, deep vein thrombosis, and surgical site infections (24). Although increased risks of cardiac, cerebrovascular, and renal events were noted, wide confidence intervals limited statistical robustness. The same meta-analysis found reduced intraoperative bleeding with neuraxial blockade, possibly due to lower intraoperative arterial blood pressure.

In the context of RIRS procedures, the prevailing preference for GA has been attributed to respiratory-induced diaphragmatic excursions, which may lead to renal mobility and subsequently compromise surgical access to the stone (25,26). Furthermore, such renal movement may result in unintended laser contact with the urothelial mucosa,

increasing the risk of mucosal injury. The ability to control respiratory rate and tidal volume with mechanical ventilation is an advantage of GA. However, in elderly patients, the cessation of respiration may not be as tolerable as in younger individuals. Prolonged apnea may lead to hypercapnia, trigger cardiovascular events, and cause hyperkalemia (27). In the present study, the operation duration, SFR, and complication rates were found to be similar for both anesthesia techniques. Similarly, studies comparing anesthesia techniques in the literature also report comparable SFR and complication rates between the two methods, with no significant difference in operation duration, even in patients undergoing GA (14,25).

Our study had some limitations. First, the retrospective nature of our study was a key limitation. The absence of stone analysis was the second limitation; however, the Hounsfield units of the groups were similar, which may suggest that the stone structures were comparable. Despite these limitations, our study is one of the few to investigate anesthesia technique selection in geriatric patients undergoing RIRS, and it may serve as a foundation for future randomized controlled trials.

CONCLUSION

The RIRS procedure performed under SA and GA shows similarities in terms of SFR, complications, operation time, and length of hospital stay. SA may be preferred as it not only provides effective pain control in the early postoperative period, but also offers the potential for a more comfortable surgical experience, especially in the geriatric patient group with multiple comorbidities, likely resulting in lower morbidity and mortality. Considering its advantages, SA could serve as an alternative technique to GA in geriatric patients undergoing RIRS, and with the increasing number of randomized controlled trials, it may become the preferred anesthetic method.

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Original Article
Özgün Araştırma

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Comparison of the Flush-out Technique and the Basket for Retrieving Stone Fragments in Distal Ureteral Stones After Ureterolithotripsy: A Prospective Randomized Study

Üreterolitotripsi Sonrası Distal Üreter Taşlarında Taş Fragmanlarının Çıkarılması İçin Flush-out Tekniği ve Basketin Karşılaştırılması: Prospektif Randomize Çalışma

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ABSTRACT

Objective: This prospective randomized study evaluated the efficacy and safety of the flush-out technique in comparison with conventional basket retrieval for the clearance of stone fragments during semi-rigid ureteroscopy in patients with distal ureteral stones.

Materials and Methods: Eighty-four patients diagnosed with distal ureteral stones were randomly assigned to two equal groups. Group 1 underwent stone retrieval using a nitinol basket. In contrast, group 2 was treated with the flush-out technique, which entails passive fragment expulsion facilitated by irrigation pressure and strategic withdrawal of the ureteroscope. Demographic data, stone characteristics, operative outcomes, and complication rates were recorded.

Results: Demographic data and stone characteristics were comparable between the two groups. The Group 2 exhibited a significantly reduced median operation time (30 vs. 45 minutes, p=0.020) and stone retrieval time (1 vs. 10 minutes, p=0.001) in comparison to the Group 1. The stone-free rates on postoperative day one were similar between the groups (97.6% vs. 100%, p=1.000). Intraoperative and postoperative complication rates were analogous, with no significant differences observed in the distribution of the Satava and Clavien-Dindo classifications.

Conclusion: The flush-out technique is a safe and efficacious alternative to basket retrieval for managing distal ureteral stones, yielding comparable clinical outcomes while reducing both operative and stone retrieval times. Its simplicity and cost-effectiveness may facilitate broader adoption in routine urological practice, particularly in high-volume and resource-constrained settings.

Keywords: lithotripsy, laser, surgical instruments, ureteral calculi, ureteroscopy

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ÖZET

Amaç: Bu prospektif, randomize çalışmada, distal üreter taşı olan hastalarda semi-rigid üreteroskopi sırasında taş fragmanlarının çıkarılması için basket ve flush-out tekniği karşılaştırılmıştır.

Gereç ve Yöntemler: Distal üreter taşı olan 84 hasta eşit olarak iki gruba ayrıldı. Grup 1'e nitinol basket kullanılarak taş çıkarma işlemi uygulanırken, Grup 2'ye irrigasyon basıncıyla üreteroskopun geri çekilmesi yoluyla pasif olarak taş fragmanlarının çıkarılmasını içeren flush-out tekniği uygulandı. Demografik veriler, taş özellikleri, operasyon sonuçları ve komplikasyon oranları kaydedildi.

Bulgular: Demografik veriler ve taş özellikleri iki grup arasında benzerdi. Grup 2, Grup 1'e kıyasla anlamlı derecede daha kısa median operasyon süresi (30'a karşı 45 dakika, p=0,020) ve taş çıkarma süresi (1'e karşı 10 dakika, p=0,001) gösterdi. Ameliyat sonrası birinci gündeki taşsızlık oranları gruplar arasında benzerdi (%97,6'ya karşı %100, p=1,000). Ameliyat sırasında ve sonrasındaki komplikasyon oranları benzerdi ve Satava, Clavien-Dindo sınıflandırmalarının dağılımında anlamlı bir fark yoktu.

Sonuç: Flush-out tekniği, distal üreter taşları için basket yöntemine güvenli ve etkili bir alternatif olup, daha kısa ameliyat süresi ve taş çıkarma süreleri ile karşılaştırılabilir klinik sonuçlar sunmaktadır. Basitliği ve uygun maliyeti, özellikle yüksek hacimli ve sınırlı kaynaklara sahip kliniklerde günlük üroloji pratiğinde daha yaygın bir şekilde uygulanmasını destekleyebilir.

Anahtar Kelimeler: cerrahi aletler, lazer litotripsi, üreteral taşlar, üreteroskopi

INTRODUCTION

Distal ureteral stones constitute a prevalent category of urolithiasis cases that are typically addressed using ureteroscopic (URS) intervention. The combination of semi-rigid ureteroscopy with holmium: yttrium–aluminum–garnet (YAG) laser lithotripsy has emerged as the standard method for fragmentation of distal ureteral stones, offering high efficacy and safety with minimal invasiveness (1,2). Following laser fragmentation, management of residual fragments remains a crucial step in achieving optimal stone-free outcomes.

Traditionally, stone fragments are extracted using ureteroscopic stone retrieval devices such as nitinol baskets. Although effective, basket retrieval presents several potential disadvantages, including prolonged procedural time, elevated equipment costs, and the risk of device malfunction or complications related to entrapment (3,4). These limitations have led to the investigation of alternative fragment clearance techniques that are both efficient and cost-effective.

The flush out technique, previously documented in percutaneous nephrolithotomy (PNL) and retrograde intrarenal surgery (RIRS), employs irrigation pressure in conjunction with advantageous patient positioning to facilitate the passive migration of stone fragments into the bladder, thereby obviating the need for active retrieval (5,6). Nonetheless, its application in the context of distal ureteral stones during URS has not been sufficiently investigated in the existing literature.

The objective of this study was to evaluate the flush-out technique in comparison with conventional basket retrieval in terms of stone-free rates, operative duration, and complication rates in patients undergoing semi-rigid URS for distal ureteral stones. We hypothesized that the flush-out technique would provide comparable stone-free and complication rates to basket retrieval while reducing operative time and cost.

MATERIALS AND METHODS

This prospective, randomized study was conducted by the principles outlined in the Declaration of Helsinki by the World Medical Association, titled "Ethical Principles for Medical Research Involving Human Subjects." The study protocol was approved by the institutional ethics committee (approval number: 2021-287). Assuming an alpha level of 0.05 and a statistical power of 80%, the required minimum total sample size was calculated to be 84 patients, with 42 patients allocated to each group.

Patients who underwent semi-rigid URS for distal ureteral stones between April 2022 and January 2023 were included in this study. The inclusion criteria specified patients with distal ureteral stones who were deemed suitable for semi-rigid URS. The distal ureter was defined as the segment of the ureter below the sacroiliac joint. The exclusion criteria included a history of previous urological stone surgery or extracorporeal shockwave lithotripsy (ESWL), preoperative indwelling double-J stent or nephrostomy tube, age < 18 years, or anatomical abnormalities. Randomization into two groups was performed using computer-generated random number sequences.

All patients underwent standard preoperative assessments. Demographic data, including age, gender, and body mass index (BMI), as well as stone-specific parameters such as size and location, were documented. The presence of ureteral stones was confirmed using non-contrast-enhanced computed tomography (NCCT). Stone size was determined by measuring its longest diameter. Preoperative laboratory evaluation included a complete blood count and serum creatinine levels. Prior to the procedure, patients with positive urine cultures received targeted antibiotic therapy based on antimicrobial susceptibility.

All URS procedures were conducted under spinal or general anesthesia. A 6/7.5 Fr semi-rigid ureteroscope (Richard Wolf, Knittlingen, Germany) was introduced into the bladder following the insertion of a feeding catheter and placement of a safety guidewire (Boston Scientific, Marlborough, Massachusetts, USA) into the ureter. Stone fragmentation was accomplished using a Holmium: YAG laser (Sphinx, Katlenburg-Lindau, Germany). In Group 1 (basket group), stone fragments were actively retrieved using a 1.9 Fr nitinol stone basket (Boston Scientific, Marlborough, Massachusetts, USA). In Group 2 (flush-out group), fragments were expelled passively using the flush-out technique. After complete fragmentation, the ureteroscope was advanced proximal to the stone location, and continuous irrigation was applied while the scope was slowly withdrawn. The ureteroscope was advanced proximal to the stone location, and continuous irrigation was applied while the scope was slowly withdrawn. This maneuver created a unidirectional flow that facilitated the movement of the fragments into the bladder. Maintaining a low intravesical pressure during this process is essential to facilitate fragment expulsion.

The postoperative placement of the double-J stent was determined at the discretion of the surgeon. Intraoperative complications were categorized using the Satava classification system (7). All patients underwent kidney, ureter, and bladder (KUB) radiography on the first postoperative day. Patients who achieved complete stone clearance were designated as stone-free, whereas those who did not achieve this status received additional treatment as clinically indicated. Postoperative complications were assessed and graded according to the Clavien–Dindo classification system (8).

Statistical analyses were performed utilizing SPSS version 27.0 (IBM Corp., Armonk, NY, USA). Continuous variables are presented as mean ± standard deviation or median (interquartile range (IQR)), depending on the distribution determined by the Shapiro–Wilk test. Comparisons were made using either the Student's t-test or the Mann–Whitney U test, as appropriate. Categorical variables were assessed using the chi-square test or Fisher's exact test. Statistical significance was established at $p < 0.05$.

RESULTS

A total of 84 patients participated in the study, with an equal allocation of 42 patients to each group. No statistically significant differences were observed between the two groups regarding baseline characteristics. The median age was 44 years in the basket group and 35 years in the flush-out group ($p = 0.172$). Gender distribution, BMI, stone size, number of stones, stone side, and the presence of impacted stones were also comparable between the groups ($p > 0.05$ for all) (Table 1).

In terms of perioperative and postoperative outcomes, the mean duration of operation was significantly shorter in the flush-out group compared to the basket group (45 vs. 30 minutes, $p = 0.020$). Additionally, the mean time for stone retrieval was markedly reduced in the flush-out group (1 vs. 10 minutes, $p = 0.001$).

Table 1. Demographic data and stone characteristics according to groups

Number of patients	Group 1 (basket)	Group 2 (flush-out)	*p*
	42	42	
Gender			0.512
Male	18 (42.9%)	22 (52.4%)	
Female	24 (57.1%)	20 (47.6%)	
Age* (year)	44 (32-49)	35 (31-47)	0.172
Body mass index* (kg/m²)	27.6 (26.1-29.7)	27 (23.6-30.2)	0.867
Stone size* (mm)	13 (6-14)	8 (7.0-10.8)	0.439
Number of stones			0.405
Soliter	36 (85.7%)	32 (76.2%)	
Multiple	6 (14.3%)	10 (23.8%)	
Stone side			0.827
Right	24 (57.1%)	22 (52.4%)	
Left	18 (42.9%)	20 (47.6%)	
Impacted stone	10 (23.8%)	10 (23.8%)	1.000

*: median (interquartile range)

Intraoperative complications were observed in five patients (11.9%) in the basket group and six patients (14.3%) in the flush-out group (p = 1.000). According to the Satava classification, the majority of complications in both groups were classified as grade 1, including mucosal tears and mild bleeding. In the basket group, a device malfunction occurred in one patient. 3%) in the flush-out group (p = 1.000). According to the Satava classification, most complications in both groups were grade 1, including mucosal tears and mild bleeding. In the basket group, a device malfunction occurred in one patient. In the flush-out group, one patient experienced a grade 2b complication, specifically a mucosal injury necessitating re-URS, while no such complications were noted in the basket group (p = 0.602). No severe complications, such as ureteral avulsion, were reported in any case.

The stone-free rate on the first postoperative day was 100% in the basket group and 97.6% in the flush-out group, with no statistically significant difference between the groups (p = 1.000). Postoperative complications were similarly distributed, occurring in three patients (7.1%) in the basket group and two patients (4.8%) in the flush-out group (p = 1.000). According to the Clavien–Dindo classification, all complications were minor (grade 1: hematuria, renal colic, or grade 2: urinary tract infection (UTI)), with no significant difference in distribution between the two groups (p = 0.841) (Table 2).

Table 2. Peroperative and postoperative outcomes according to groups

	Group 1 (basket)	Group 2 (flush-out)	p
Number of patients	42	42	
Operation time (min)*	45 (15-50)	30 (15-38)	0.020
Stone retrieval time (min)*	10 (5-13)	1 (1-4)	0.001
Peroperative complications	5 (11.9%)	6 (14.3%)	1.000
SATAVA classification			0.602
Grade 1	5 (11.9%)	5 (11.9%)	
Grade 2a	0	0	

Grade 2b	0	1 (2.4%)	
Stone-free rate	42 (100.0%)	41 (97.6%)	1.000
Postoperative complications	3 (7.1%)	2 (4.8%)	1.000
Clavien - Dindo classification			0.841
Grade 1	2 (4.8%)	1 (2.4%)	
Grade 2	1 (2.4%)	1 (2.4%)	

*: median (interquartile range)

DISCUSSION

Effective clearance of stone fragments is a crucial aspect of URS because residual fragments can result in recurrent symptoms, infection, or necessitate additional procedures. Traditionally, stone retrieval devices such as nitinol baskets and graspers have been employed for fragment removal, particularly in the distal ureter. These devices facilitate active extraction under direct visualization; however, they are associated with extended operation times and increased costs. Furthermore, their use may be constrained by anatomical limitations or risk of ureteral trauma (9,10).

The flush-out technique, which uses irrigation pressure to mobilize stone fragments into the bladder passively, has been primarily described in the context of PNL and RIRS (5,6). In these contexts, it has been demonstrated to reduce instrument manipulation and operation time. We have previously presented preliminary findings on the adaptation of this method for distal ureteral stones, suggesting that this approach may be both effective and efficient in the context of semi-rigid URS (11). To our knowledge, very few studies have specifically addressed this setting, underscoring the novelty of our investigation.

One potential concern associated with the flush-out technique is the transient increase in intrarenal pressure during active irrigation, which could theoretically increase the risk of complications such as mucosal injury, intraoperative bleeding, pyelovenous backflow, and postoperative infection (12). However, in our study, the incidence rates of mucosal injury, intraoperative bleeding, and postoperative UTI were comparable between the flush-out and basket groups. Postoperative UTIs are recognized as a complication of endourological procedures. Several prognostic factors have been associated with an increased risk, including patients with a higher Charlson comorbidity index, older age, female gender, prolonged duration of pre-procedural indwelling ureteric stents, neurogenic bladder, and BMI (13).

Ureteral avulsion is a rare, yet significant complication associated with URS procedures. This condition typically arises from the application of excessive force or the improper utilization of surgical instruments. The identified risk factors for ureteral avulsion include the presence of symptomatic stones for a duration exceeding three months, stones with a diameter greater than 5 mm, hydronephrosis of the proximal ureter, and impacted stones (14). Notably, no instances of ureteral avulsion were observed in our study.

An additional consideration is the suitability of the flush-out technique for surgeons with limited experience. Due to its straightforward nature, this technique does not necessitate advanced endourological expertise beyond fundamental ureteroscopic skills. Nevertheless, we advise that novice surgeons first attain proficiency in standard semi-rigid URS prior to adopting this method, as meticulous control of irrigation and scope manipulation is crucial to mitigate pressure-related risks and ensure safety.

While the basket device is effective, it is not without limitations, including potential malfunction, increased cost, and extended manipulation time (15). In our study, both the operation and stone retrieval durations were notably reduced in the flush-out group. In one instance, a basket malfunction required a change of devices, further prolonging the procedure. In addition to these practical benefits, the flush-out technique offers a significant economic advantage by obviating the need for disposable retrieval devices. This cost-effectiveness is particularly advantageous for high-volume centers and resource-constrained healthcare systems, where minimizing reliance on costly disposables can

substantially reduce overall treatment costs without compromising safety or efficacy.

This study has several limitations. The relatively small sample size may have limited the generalizability of our findings. The absence of stone composition analysis could result in variations in the data, such as fragmentation behavior and operation time. A cost analysis comparing the two methods was not conducted. Additionally, the lack of long-term follow-up data limits our ability to assess stone recurrence and late complications. Furthermore, although the clinical outcomes were monitored, intrarenal pressure was not measured directly. Given the theoretical concerns regarding pressure-related complications, future research should aim to quantify intrarenal pressures during the flush-out technique using pressure-monitoring systems.

CONCLUSION

The flush-out technique is a safe and effective alternative to conventional nitinol baskets for retrieving stone fragments in patients undergoing semi-rigid ureteroscopic lithotripsy for distal ureteral stones. While achieving comparable stone-free and complication rates, the flush-out method significantly reduced both the total operation and stone retrieval times. These findings suggest that the flush-out technique may offer procedural efficiency and economic advantages, particularly in high-volume and resource-limited settings. Further studies with larger cohorts and direct measurement of intrarenal pressure are warranted to validate these outcomes and to explore long-term efficacy and safety.

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Data Availability: The data that support the findings of this study are not openly available due to reasons of sensitivity and are available from the corresponding author upon reasonable request.

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Ethics Committee Report: Başakşehir Çam and Sakura City Hospital Clinical Research Ethics Committee Date: December 29, 2021 Decision No: 287.

Authors' Contribution:

MS: Conception and design, Data analysis, Drafting the manuscript
EA: Data acquisition, Data analysis
HÖ: Data analysis, Manuscript editing
ETK: Statistical analysis
MŞ: Data analysis, Manuscript editing
HLC: Manuscript editing

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Original Article
Özgün Araştırma

Endourol Bull. 2025;17(3):164-169. doi: 10.54233/endourolbull-1748348

Clinical Outcomes of Rezum Treatment in High-Risk Elderly Patients with Long-Term Urinary Catheters: A Retrospective Study

Uzun Süreli Üriner Sonda Kullanan Yüksek Riskli Yaşlı Hastalarda Rezum Tedavisinin Klinik Sonuçları: Retrospektif Bir Çalışma

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ABSTRACT

Objective: This study aimed to evaluate the efficacy and safety of Rezum water vapor therapy in elderly male patients with long-term urinary catheterization and high anesthetic risk, as indicated by American Society of Anesthesiologists (ASA) scores of 3–4.

Material and Methods: We retrospectively analyzed 15 elderly male patients with ASA scores of 3–4 who had been using indwelling urinary catheters and underwent Rezum therapy between January and December 2023. Outcomes assessed at 1 and 6 months post-treatment included the International Prostate Symptom Score (IPSS), quality of life (QoL), prostate volume (PV), and post-void residual urine (PVR) volume. Time to catheter removal was also recorded.

Results: The study cohort consisted of 15 elderly male patients with a mean age of 83.2 years (73-90 years old). Catheter removal was attempted at an average of 21 ± 4.5 days post-procedure. While 13 patients tolerated catheter removal successfully, two patients developed acute urinary retention and required re-catheterization. In these patients, the catheter was maintained for at least an additional 14 days. By the third postoperative month, all patients had achieved catheter independence.

At 1 month post-treatment, the mean IPSS was 20.07 ± 1.62, improving to 18.13 ± 1.51 at 6 months. QoL scores increased from a baseline of 1.60 ± 0.51 to 3.33 ± 0.49 at 1 month and further to 3.67 ± 0.49 at 6 months PVR decreased from 136.7 ± 53.7 mL at 1 month to 92.0 ± 33.4 mL at 6 months. PV reduced from 91.07 ± 18.7 mL to 65.27 ± 13.4 mL. No Clavien-Dindo grade ≥2 complications were observed.

Conclusions: Rezum therapy appears to be a safe and effective minimally invasive alternative for high-risk elderly male patients with indwelling catheters who are not suitable candidates for conventional surgical interventions.

Keywords: ASA score, benign prostatic hyperplasia, elderly patients, high surgical risk, minimally invasive therapy, urinary catheter, Rezum

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ÖZET

Amaç: Bu çalışmanın amacı, Amerikan Anesteziyologlar Derneği (ASA) skorları 3–4 olan uzun süreli üriner kateter kullanımı ve yüksek anestezi riski bulunan yaşlı erkek hastalarda Rezum su buharı tedavisinin etkinliğini ve güvenliğini değerlendirmektir.

Gereç ve Yöntemler: Ocak–Aralık 2023 tarihleri arasında Rezum tedavisi uygulanan, ASA skoru 3–4 olan ve kalıcı üriner kateter kullanan 15 yaşlı erkek hasta retrospektif olarak analiz edildi. Tedavi sonrası 1. ve 6. aylarda Uluslararası Prostat Semptom Skoru (IPSS), yaşam kalitesi (QoL), prostat hacmi (PV) ve işeme sonrası artık idrar hacmi (PVR) değerlendirildi. Sondanın çekilme süresi de kaydedildi.

Bulgular: Ortalama yaşı 83,2 yıl olan 15 yaşlı erkek hasta çalışmaya dahil edildi. Sonda çıkarma işlemi ortalama 21 ± 4,5 gün sonra denendi. On üç hasta sondasız idrar yapmayı başardı, ancak iki hastada akut üriner retansiyon gelişti ve tekrar sondalanmaları gerekti. Bu hastalarda sonda en az 14 gün daha tutuldu. Üçüncü ayın sonunda tüm hastalar sonda bağımsızlığına ulaşmıştı.

Tedavi sonrası 1. ayda ortalama IPSS skoru 20,07 ± 1,62 iken, 6. ayda 18,13 ± 1,51'e düştü. QoL skorları 1. ayda 3,33 ± 0,49'dan 6. ayda 3,67 ± 0,49'a yükseldi. PVR, başlangıçta 136,7 ± 53,7 mL iken 6. ayda 92,0 ± 33,4 mL'ye düştü. Prostat hacmi ise 91,07 ± 18,7 mL'den 65,27 ± 13,4 mL'ye geriledi. Clavien-Dindo ≥2 düzeyinde hiçbir komplikasyon gözlenmedi.

Sonuç: Rezum tedavisi, konvansiyonel cerrahi müdahalelere uygun olmayan kalıcı sondalı yüksek riskli yaşlı erkek hastalar için güvenli ve etkili bir minimal invaziv tedavi seçeneği olarak görünmektedir.

Anahtar Kelimeler: ASA skoru, benign prostat hiperplazisi, minimal invaziv tedavi, Rezum, üriner kateter

INTRODUCTION

Benign prostatic hyperplasia (BPH) is a highly prevalent urological condition among older men. It remains a leading cause of lower urinary tract symptoms (LUTS), often resulting in a substantial decline in quality of life (1). Conventional surgical treatments, such as transurethral resection of the prostate (TURP), are generally effective but may carry elevated perioperative risks in older individuals, particularly those with significant comorbidities and high anesthetic risk, as defined by an American Society of Anesthesiologists (ASA) score of 3 or 4 (2).

In response to these challenges, there has been a growing interest in minimally invasive therapies that offer symptom relief with reduced morbidity. One such option is Rezum therapy, which delivers convective water vapor thermal energy to ablate hyperplastic prostatic tissue, thereby relieving bladder outlet obstruction (3). The safety and efficacy of Rezum have been well documented in the general population, demonstrating improvements in symptom scores, urinary flow, and quality of life.

However, data on the use of Rezum in frail, elderly patients with long-term urinary catheterization and elevated surgical risk are limited. This patient population is frequently excluded from clinical trials, despite their growing presence in real-world urology practice (4).

The present study aims to evaluate the clinical outcomes, procedural tolerability, and safety of Rezum therapy in high-risk elderly male patients with indwelling urinary catheters. By focusing on this underrepresented population, we aim to provide practical evidence that may support safer, effective management strategies for complex BPH cases.

MATERIALS AND METHODS

This retrospective study included 15 elderly male patients with indwelling urinary catheters and ASA physical status scores of 3 or 4, who underwent Rezum water vapor therapy between January and December 2023. All patients were treated at a single tertiary care center.

Demographic and clinical data were collected, including age, ASA score, duration of catheter use, and comorbidities. Baseline preoperative assessments included the International Prostate Symptom Score (IPSS), quality of life (QoL) score, prostate volume (PV), and postvoid residual urine volume (PVR).

Rezum therapy was performed under local anesthesia or intravenous sedation. The choice between in these method was determined by patient comorbidities, tolorance levels and anesthesiologist assesment to ensure maximum safety and comfort during the procedure. The procedure involved the transurethral delivery of convective water vapor to hyperplastic prostatic tissue using standard manufacturer protocols. The total number of vapor injections was recorded for each patient.

Postoperative catheter removal time (in days) was documented. Follow-up evaluations were conducted at 1 and 6 months after the procedure, with repeated assessments of IPSS, QoL, PV, and PVR.

Statistical analyses were descriptive. Continuous variables were expressed as means ± standard deviation (SD) and ranges. Changes in clinical parameters from baseline to follow-up were summarized using mean values. Due to the small sample size and retrospective design, no inferential statistical testing was conducted.

This study was conducted in accordance with the Declaration of Helsinki. Ethical approval was obtained from the institutional review board of Hisar Hospital Intercontinental (21.07.2025/:25-39). Written informed consent was obtained from all participants or their legal guardians from all participants or their legal representatives.

RESULTS

The study cohort consisted of 15 elderly male patients with a mean age of 83.2 years (73-90 years old). Catheter removal was attempted at an average of 21 ± 4.5 days post-procedure. Thirteen patients were able to void spontaneously after catheter removal, whereas two patients experienced acute urinary retention. These patients required re-catheterization, and their catheters were maintained for at least an additional 14 days. Nevertheless, by the third postoperative month, all patients had successfully discontinued catheter use.

At 1 month post-treatment, the mean IPSS improved from a baseline of 20.07 ± 1.62 to 18.13 ± 1.51 at 6 months, indicating a sustained reduction in LUTS. QoL scores increased from a baseline of 1.60 ± 0.51 to 3.33 ± 0.49 at 1 month and further to 3.67 ± 0.49 at 6 months, reflecting meaningful improvement in patient-reported outcomes.

Postvoid residual urine volume decreased from a mean of 136.7 ± 53.7 mL at baseline to 92.0 ± 33.4 mL at 6 months, indicating improved bladder emptying. PV also showed a significant reduction, from 91.07 ± 18.7 mL at baseline to 65.27 ± 13.4 mL at 6 months.

A summary of clinical outcomes is presented in Table 1, highlighting the changes in IPSS, QoL, PVR, and PV from baseline through follow-up. Figure 1 illustrates the trends in clinical improvement over time. These findings support the clinical benefit of Rezum therapy in reducing LUTS and enhancing urinary function in high-risk older men with catheter dependence.

Table 1. Changes in clinical parameters over time following Rezum therapy.

Parameter	Baseline	1 Month	6 Months
IPSS		20.07	18.13
QoL	1.6	3.33	3.67
PVR (ml)		136.7	92.0
Prostate Volume (ml)	91.07		65.27

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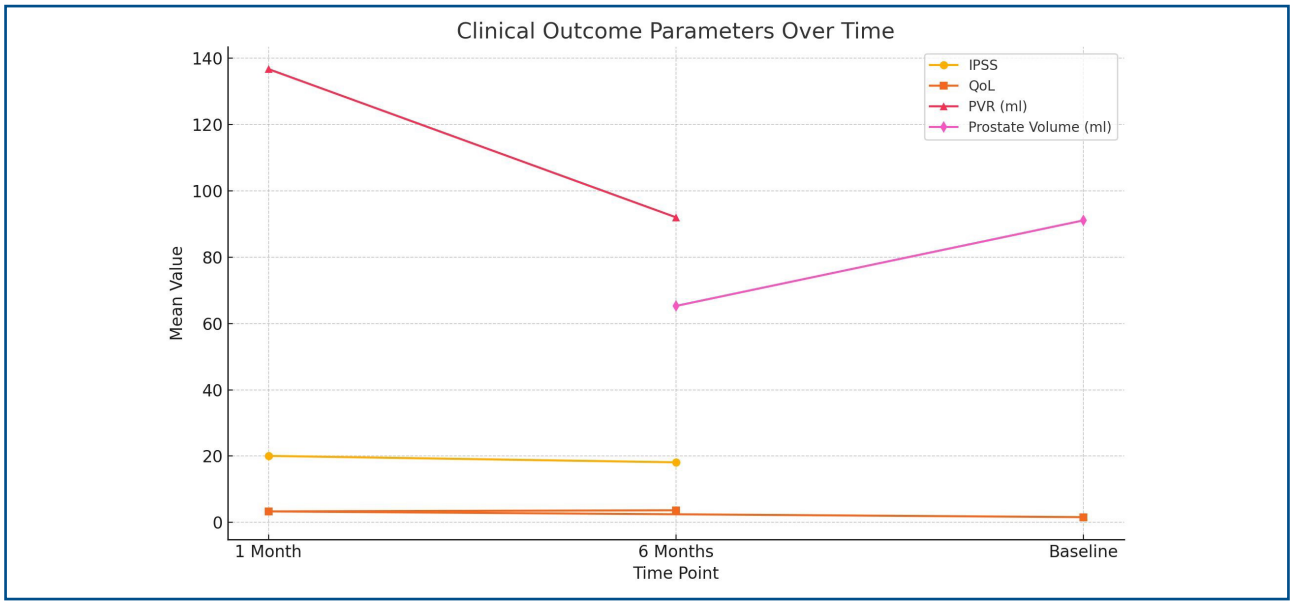

Figure 1. Trends in International Prostate Symptom Score (IPSS), quality of life (QoL), post-void residual urine volume (PVR) and prostate volume (PV) at baseline, 1 month and 6 months after Rezum therapy

DISCUSSION

This study addresses a significant gap in the literature by evaluating the clinical outcomes of Rezum therapy in a particularly vulnerable population: elderly, catheter-dependent patients with high surgical risk. The findings of this study indicate that Rezum therapy substantially improved lower urinary tract symptoms and quality of life in this high-risk group. Reductions in IPSS, QoL improvement, and decreases in prostate volume and post-void residual urine underscore the clinical efficacy of this minimally invasive procedure. The catheter-free rates observed in our study are consistent with those in the previous literature. Wong et al. reported a 100% catheter-free rate post-Rezum in 10 patients with urinary retention (5). Similarly, McVary et al. found that 70.3% of catheter-dependent patients resumed spontaneous voiding following the procedure (6). Elterman et al. confirmed these outcomes, with 15 of 16 patients achieving catheter independence (7). Bassily et al. and Eredics et al. also reported high success rates in patients with multimorbidity [8-10]. Collectively, these findings demonstrate that Rezum therapy can restore spontaneous urination in patients previously dependent on catheters. The reduction in prostate volume and post-void residual urine in our cohort further supports the physiological benefits of thermal ablation using water vapor. Previous reports have highlighted similar outcomes for prostate size and PVR metrics (11–13). Our results contribute to this body of evidence by confirming its effectiveness in the elderly and frail populations. Anesthetic management plays a crucial role in the tolerability and feasibility of RT.. In our study, both sedation and intravenous sedation were used to enhance patient comfort. These findings were corroborated by Bal et al., who demonstrated high procedural success and patient preference for both oral sedation with local anesthesia (OSLA) and deep intravenous sedation (DIS) and also emphasized the acceptability of minimal sedation in a recent prospective study. This adaptability renders Rezum suitable for office-based and resource-limited settings (9).

A crucial component of our study was the continuation of antiplatelet and anticoagulant medication. None of the patients discontinued aspirin, clopidogrel, or warfarin, and no significant hemorrhagic complications were observed. Eredics et al. similarly reported no increased perioperative risk among patients who remained on chronic anticoagulation (10). This suggests that Rezum may offer a significant safety advantage over TURP or other resective procedures that typically necessitate cessation of such therapies. While the current literature provides a foundation for the efficacy and safety of Rezum, there remains a need for comparative, long-term data. Future studies should investigate not only symptom improvement and catheter independence but also cost-effectiveness, quality of life scores, and functional outcomes in comparison with TURP, HoLEP, and emerging minimally invasive techniques (14–16).

Furthermore, sub-analysis by comorbidity profile (e.g., cardiovascular disease, neurogenic bladder) could enhance patient selection and preprocedural planning (17–20). In conclusion, the safety profile, tolerability, and effectiveness of RT support its role as a first-line minimally invasive therapy in the elderly, high-risk patients with BPH, and chronic catheter use. The ability to avoid general anesthesia, maintain antithrombotic therapy, and perform the procedure in an outpatient setting makes it a valuable addition to the urologist's armamentarium. The limitations of this study include its retrospective design, small sample size, and lack of a control group. Future prospective studies with larger cohorts and longer follow-up periods are recommended to validate these findings further and define the long-term efficacy and safety of Rezum in high-risk patient populations.

Limitations and Future Directions

This study has several limitations that must be considered when interpreting the results. The retrospective design constrains the ability to establish causality, and the small sample size may diminish the statistical power and generalizability of the findings. Furthermore, the absence of a control group limits its ability to be compared with other treatment modalities. The follow-up period was restricted to six months; thus, long-term outcomes concerning symptom recurrence, necessity for re-intervention, or sustained catheter independence remain unknown. Future research should prioritize prospective multicenter trials with larger patient populations and extended follow-up duration. Randomized controlled studies comparing Rezum therapy with traditional surgical treatments or alternative minimally invasive options in high-risk elderly patients would provide more robust evidence for clinical decision-making. Additionally, future comparative studies with TUR-P, HoLEP or other minimally invasive methods should be considered to strengthen evidence in this high-risk population.

CONCLUSION

Rezum therapy is an effective and safe treatment option for elderly male patients with a high surgical risk and long-term catheter dependency, offering significant improvements in lower urinary tract symptoms, quality of life, and bladder function. It serves as a viable alternative to traditional surgical treatments, particularly for patients who are unsuitable candidates for more invasive procedures.

Data Availability Statement: Data supporting the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest: The authors declare no conflicts of interest regarding the publication of this article.

Informed Consent: Written informed consent was obtained from all participants or their legal representatives.

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Ethical Approval: This study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from the Institutional Ethics Review Board of Hisar Hospital Intercontinental (21.07.2025/25-39).

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Original Article
Özgün Araştırma

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Assessment of Laparoscopic Radical Nephrectomy Videos on YouTube Using LAP-VEGaS Criteria: A Cross-Sectional Analysis

YouTube'daki Laparoskopik Radikal Nefrektomi Videolarının LAP-VEGaS Kriterleri Kullanılarak Değerlendirilmesi: Kesitsel Bir Analiz

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ABSTRACT

Objective: YouTube has become an increasingly important platform for surgical education; however, the quality of laparoscopic surgery videos is variable. The LAParoscopic Surgery Video Educational Guidelines (LAP-VEGaS) provides a standardized framework for assessing surgical video quality.

Material and Methods: A systematic search was conducted on YouTube using relevant search terms. English-narrated laparoscopic radical nephrectomy videos were included. Each video was evaluated using the 9-item core LAP-VEGaS checklist.

Results: Twenty-one videos were included. The mean LAP-VEGaS score was 9.14 ± 3.72 (range 3–16). Videos originated from 11 different countries, with India contributing 38.1% (n=8). No significant correlation was found between popularity metrics and educational quality ($p>0.05$).

Conclusion: Laparoscopic radical nephrectomy videos on YouTube demonstrate a moderate level of educational quality. The lack of association between popularity and educational value highlights the necessity of quality assessment tools in surgical education.

Keywords: laparoscopic surgery, LAP-VEGaS, nephrectomy, video quality assessment, YouTube

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ÖZET

Amaç: YouTube cerrahi eğitimde giderek artan önemde bir platform haline gelmiştir, ancak laparoskopik cerrahi videolarının kalitesi değişkendir. LAParoscopic surgery Video Educational GuidelineS (LAP-VEGaS) cerrahi video kalitesini değerlendirmek için standart bir çerçeve sağlar.

Gereç ve Yöntem: YouTube'da ilgili arama terimleri kullanılarak sistematik arama yapıldı. İngilizce açıklamalı laparoskopik radikal nefrektomi videoları dahil edildi. Her video 9 maddelik LAP-VEGaS temel kontrol listesi kullanılarak değerlendirildi.

Bulgular: Yirmi bir video dahil edildi. Ortalama LAP-VEGaS skoru 9.14±3.72 (aralık 3-16) idi. Videolar 11 farklı ülke kaynaklıydı, Hindistan %38.1 (n=8) katkı sağladı. Popülerlik metrikleri ile eğitimsel kalite arasında anlamlı korelasyon bulunmadı (p>0.05).

Sonuç: YouTube'daki laparoskopik radikal nefrektomi videoları orta düzeyde eğitimsel kalite göstermektedir. Popülerlik ve eğitimsel değer arasındaki bağlantısızlık, cerrahi eğitimde kalite değerlendirme araçlarının gerekliliğini vurgulamaktadır.

Anahtar Kelimeler: laparoskopik cerrahi, LAP- VEGaS, nefrektomi, video kalite değerlendirmesi, YouTube

INTRODUCTION

Laparoscopic radical nephrectomy has become the gold standard surgical approach for the treatment of renal masses, offering reduced morbidity and improved recovery compared to open surgery (1). The acquisition of laparoscopic skills traditionally relies on the master-apprentice model, but increasing surgical volumes and reduced training opportunities have necessitated alternative educational approaches (2).

YouTube has emerged as a significant platform for surgical education, with millions of users accessing medical content daily (3). The platform's accessibility and comprehensive video library have made it an attractive resource for surgical trainees and practicing surgeons seeking to enhance their skills (4). However, the quality of surgical videos on social media platforms remains highly variable, raising concerns about the educational value and potential impact on surgical practice (5).

The LAParoscopic Surgery Video Educational Guidelines (LAP-VEGaS) were developed to provide a standardized framework for assessing the quality of laparoscopic surgery videos (6). This validated assessment tool evaluates videos across nine essential criteria, including author information, case presentation, technical setup, procedural demonstration, anatomical landmarks, outcomes, educational aids, language, and technical quality.

Previous studies have examined the quality of surgical videos across various specialties, consistently demonstrating variable educational standards (7,8). However, specific evaluation of laparoscopic radical nephrectomy videos using validated assessment tools remains limited, despite the procedure's complexity and educational importance.

MATERIAL AND METHODS

This cross-sectional observational study was granted exemption from institutional review board approval due to the analysis of publicly available content. The study was conducted in accordance with the principles outlined in the Declaration of Helsinki for research involving human subjects, though no direct human participation was involved. To replicate a trainee's internet search in real-world scenarios, a systematic search was performed on March 1, 2023, using a cache-cleared browser to ensure unbiased results. Four search terms were employed: "laparoscopic radical nephrectomy," "nephrectomy," "laparoscopic nephrectomy," and "radical nephrectomy." The first 40 results from each search term were evaluated for eligibility, totaling 160 potential videos.

Videos were included if they: (1) featured laparoscopic radical nephrectomy procedures, (2) contained English commentary or subtitles, and (3) were uploaded within the last 10 years to ensure contemporary relevance. Videos were excluded if they: (1) were not in English, (2) were older than 10 years, (3) did not demonstrate actual surgical procedures, (4) were duplicate uploads, or (5) contained incomplete or fragmented procedures. Videos shorter than 5

minutes were also excluded because they were considered insufficient to represent a complete laparoscopic radical nephrectomy procedure.

For each included video, the following data were extracted: video title, ranking position in search results, number of views, upload country, upload date, video duration (minutes), number of comments, and number of likes. Geographic origin was determined based on the uploader's stated location or institutional affiliation.

Each video was independently assessed using the LAP-VEGaS essential checklist, consisting of nine key criteria: (1) Authors and Institution Information, (2) Case Presentation, (3) Technical Setup, (4) Procedural Steps, (5) Anatomical Demonstration,

(6) Outcomes, (7) Educational Aids, (8) Language, and (9) Technical Quality. Each criterion was scored as: 0 (not presented), 1 (partially presented), or 2 (extensively presented), yielding a total possible score of 18 points.
Descriptive statistics were calculated for continuous variables (mean ± standard deviation) and categorical variables (frequencies and percentages). Spearman correlation analysis was performed to examine relationships between video characteristics, engagement metrics, and LAP-VEGaS scores. Statistical significance was set at $p < 0.05$.

RESULTS

A total of 160 videos were initially assessed based on the LAP-VEGaS criteria. Of these, 45 videos were excluded due to insufficient duration, 38 for poor quality, 43 were identified as duplicates, and 13 were excluded because they were not in English. Following these exclusion criteria, 21 videos remained for final analysis. The videos originated from 11 different countries, with India contributing the highest proportion at 38.1% (n=8), followed by Ukraine at 9.5% (n=2). Other contributing countries included the United States, Turkey, Germany, and the United Kingdom, each representing a single contribution.

The mean video duration was 34.27±21.50 minutes (range: 6.4–83 minutes). Video upload dates ranged from 2013 to 2023, with 71.4% of videos uploaded within the last 5 years. The total number of views ranged from 2,785–65,300, with a mean of 15,532 ± 17,816 views per video.

The mean total LAP-VEGaS score was 9.14±3.72 (range: 3-16), with 52.4% of videos achieving scores ≥9, indicating moderate educational quality according to established thresholds. Characteristics of reviewed surgical videos on Laparoscopic Radical Nephrectomy on YouTube are shown in Table 1. The LAP-VEGaS assessment revealed variable compliance across the nine criteria, as shown in Table 2.

Video Characteristics and Geographic Distribution are shown in Table 3. Video engagement metrics showed considerable variation. The mean number of likes was 104.52 ± 133.85 (range: 12–565), and the mean number of comments was 9.62 ± 18.86 (range: 0–70). Spearman correlation analysis showed no significant association between popularity metrics and educational quality: Views vs. LAP-VEGaS ($\rho = -0.183$, 95% CI [−0.57, 0.27], $p = 0.427$), Likes vs. LAP-VEGaS ($\rho = -0.084$, 95% CI [−0.50, 0.36], $p = 0.716$), Comments vs. LAP-VEGaS ($\rho = -0.049$, 95% CI [−0.47, 0.39], $p = 0.834$), indicating that popular videos do not necessarily provide superior educational quality.

Table 1. Characteristics of reviewed surgical videos on Laparoscopic Radical Nephrectomy on YouTube

Video Rank	Video Title	Number of Views	Country	Upload Date	Length of Video (min)	Number of Comments	Number of Likes
1	Laparoscopic Radical Nephrectomy - Step by Step, AINU	65300	India	23.10.2018	19.6	34	565
2	Laparoscopic right nephrectomy takes about half an hour	57568	Ukraine	2.10.2014	32.6	70	215

3	Laparoscopic Nephrectomy	39438	India	19.01.2019	29.3	12	314
4	Laparoscopic nephrectomy less than 20 min	33021	Ukraine	21.01.2017	18.9	51	270
5	Antonio Alcaraz - Laparoscopic radical nephrectomy, left side	13280	Germany	12.09.2018	83	0	77
6	lap right nephrectomy	13192	Egypt	8.05.2013	29.3	12	49
7	CILR 2016 - Antonio Alcaraz - Advanced laparoscopic left radical nephrectomy	12191	Spain	13.06.2017	52.7	0	77
8	Laparoscopic Right Radical Nephrectomy | Surgical Videos	10040	India	20.09.2021	16.6	0	86
9	Left Laparoscopic Radical Nephrectomy | Safe Laparoscopy	9617	Greece	5.09.2021	21.2	3	99
10	Laparoscopic Left Radical Nephrectomy (Kidney Cancer Surgery) Renal Cell Carcinoma - Unedited Video	9193	India	29.06.2020	62	1	46
11	Left Laparoscopic Transperitoneal Nephrectomy	9095	Australia	23.12.2017	17.3	3	76
12	Nefrectomía Laparoscópica izquierda. Laparoscopic nephrectomy. Kidney tumor	8907	Costa Rica	31.08.2015	6.4		43
13	Technique of Laparoscopic Nephrectomy for Kidney Cancer	7716	India	23.04.2017	8.2	2	26
14	CILR 2015 - Renaud Bollens - Advanced laparoscopic radical nephrectomy	6960	Turkey	13.06.2017	52.5		39
15	Right laparoscopic nephrectomy	6276	Australia	28.11.2017	14.2	2	28
16	Laparoscopic Right Radical Nephrectomy for Kidney Cancer	5489	India	1.08.2021	23.8	9	50
17	CILR 2012 - Renaud Bollens - Advanced laparoscopic right radical nephrectomy	4786	Italy	13.06.2017	70	1	27
18	CILR 2011 - Renaud Bollens - Advanced right nephrectomy	4375	Germany	13.06.2017	62		27
19	Laparoscopic right nephrectomy	3625	South Africa	19.05.2020	40.6		42
20	Laparoscopic Nephrectomy - Dr. Nagendra Parvataneni	3327	India	7.10.2016	24.2	1	27
21	Laparoscopic Right Radical Nephrectomy	2785	India	28.11.2018	35.3	1	12

Table 2. LAP-VEGaS Criteria Compliance and Scoring

LAP-VEGaS Criterion	Videos Meeting Criterion n(%)	Partial Compliance n(%)	Not Presented n(%)	Mean Score±SD
1. Author/Institution Information	18 (85.7)	2 (9.5)	1 (4.8)	1.81±0.51
2. Case Presentation	13 (61.9)	5 (23.8)	3 (14.3)	1.48±0.75
3. Technical Setup	16 (76.2)	3 (14.3)	2 (9.5)	1.67±0.66
4. Procedural Steps	19 (90.5)	2 (9.5)	0 (0.0)	1.90±0.30
5. Anatomical Demonstration	17 (81.0)	3 (14.3)	1 (4.8)	1.76±0.54
6. Outcomes Presentation	14 (66.7)	4 (19.0)	3 (14.3)	1.52±0.75
7. Educational Aids	12 (57.1)	6 (28.6)	3 (14.3)	1.43±0.75
8. English Commentary	21 (100.0)	0 (0.0)	0 (0.0)	2.00±0.00
9. Technical Quality	20 (95.2)	1 (4.8)	0 (0.0)	1.95±0.22
Total LAP-VEGaS Score	**Range: 3-16**			**9.14±3.72**

Table 3. Video Characteristics and Geographic Distribution

Characteristic	Value
Total Videos Analyzed	21
Mean Duration (minutes)	34.27±21.50 (range: 6.4–83)
Mean Views	15,532±17,816 (range: 2,785–65,300)
Mean Likes	104.52±133.85 (range: 12–565)
Mean Comments	9.62±18.86 (range: 0–70)
Countries Represented	11
Top Contributing Country	India: 8 videos (38.1%)
Videos with LAP-VEGaS ≥9	11 videos (52.4%)

DISCUSSION

Our findings reveal that laparoscopic radical nephrectomy videos on YouTube demonstrate moderate educational quality, with a mean LAP-VEGaS score of 9.14±3.72. This finding is consistent with previous studies evaluating surgical videos across different specialties, which have consistently reported variable educational standards on social media platforms (9,10).

The LAP-VEGaS assessment revealed significant strengths and weaknesses in video quality. Most videos demonstrated excellent technical quality (95.2% compliance) and comprehensive procedural demonstration (90.5% compliance), indicating that basic surgical recording standards are generally met. However, areas such as formal case presentation (61.9% compliance) and educational aids (57.1% compliance) showed considerable room for improvement.

Our findings align with the recent study by Baturu et al., which examined laparoscopic radical nephrectomy videos using different quality assessment tools (11). While their study focused on comparing short versus long video formats using JAMA, DISCERN, and GQS criteria, our study provides the first comprehensive LAP-VEGaS-based evaluation of this surgical procedure. Notably, both studies identified a disconnect between video popularity and educational quality, reinforcing concerns about algorithm-driven content discovery in surgical education.

The findings also complement those of Kayar et al., who recently evaluated similar videos using LAP-VEGaS criteria but focused on comparing institutional versus personal uploads (12). Their study reported higher LAP-VEGaS scores for institutional videos (6.3±2.2) compared to personal uploads (4.0±2.1). While our study did not specifically categorize videos by upload source, our overall mean score of 9.14±3.72 suggests potential methodological differences or different video selection criteria between studies.

A unique finding of our study is the significant geographic concentration of content creation, with India contributing over one-third (38.1%) of the analyzed videos. This contrasts with the more distributed geographic representation reported in other surgical specialties and may reflect regional differences in laparoscopic nephrectomy adoption, academic output, or video sharing practices (13,14).

The representation of 11 different countries in our sample demonstrates the global nature of surgical knowledge sharing through YouTube, but also highlights potential disparities in educational resource development. The predominance of content from specific geographic regions may limit the diversity of surgical techniques and approaches presented to international audiences.

The lack of correlation between video popularity metrics and educational quality represents a critical finding for surgical education. This disconnect suggests that YouTube's algorithm-driven content discovery may not align with educational objectives, potentially directing learners toward entertaining but less educational content (15,16). This finding is consistent with studies in other medical specialties and reinforces the need for quality-based content curation in medical education platforms.

The use of LAP-VEGaS criteria provides several advantages over other quality assessment tools used in recent studies. Unlike the JAMA benchmarks or DISCERN questionnaire employed by Baturu et al., LAP-VEGaS was specifically developed and validated for laparoscopic surgery videos (11). This procedure-specific focus allows for more nuanced evaluation of surgical education content, particularly in areas such as procedural demonstration and anatomical landmark identification.

For surgical trainees and practicing surgeons using YouTube as an educational resource, our findings emphasize the importance of applying critical evaluation skills rather than relying on popularity metrics. The moderate overall quality scores suggest that while YouTube videos can provide valuable supplementary educational content, they should not replace formal surgical training programs or structured educational curricula (17,18).

Educational institutions and surgical societies should consider implementing LAP-VEGaS-based quality assurance processes for video content creation and dissemination. The development of curated video libraries with quality-assured content could address the current limitations in algorithm-driven content discovery (19,20).

Several limitations should be acknowledged. First, our analysis was restricted to YouTube and excluded other video-sharing platforms that may host high-quality surgical content. Second, the English-language requirement may have excluded high-quality videos in other languages, potentially affecting the geographic representation of our sample. Third, the moderate sample size (n=21) limits the generalizability of findings, although this reflects the relatively limited availability of high-quality laparoscopic radical nephrectomy videos meeting our inclusion criteria.

Additionally, the LAP-VEGaS assessment, while comprehensive, does not evaluate actual learning outcomes or the practical impact of video quality on surgical skill acquisition. Future studies should examine the relationship between video quality scores and measurable educational outcomes.

Future research should examine learning outcomes associated with high-quality versus low-quality surgical videos to establish the clinical relevance of quality assessment tools. Longitudinal studies tracking changes in video quality over time could inform understanding of how social media platforms evolve as educational resources (21,22).

Additionally, comparative studies examining the educational effectiveness of different quality assessment tools (LAP-VEGaS, JAMA, DISCERN, GQS) could help establish optimal evaluation frameworks for surgical video content. Investigation of learner preferences and the relationship between video characteristics and knowledge retention would further inform evidence-based surgical video production guidelines.

CONCLUSION

Laparoscopic radical nephrectomy videos on YouTube demonstrate moderate educational quality according to LAP-VEGaS criteria, with significant geographic variation in content creation and a notable disconnect between popularity and educational value. While these videos can serve as valuable supplementary educational resources, the variable quality highlights the need for critical evaluation skills among learners and quality assurance processes in surgical video production.

The findings support the importance of validated assessment tools like LAP-VEGaS in evaluating surgical educational content and emphasize the need for evidence-based approaches to surgical video creation and curation. As social media platforms continue to play an increasingly important role in surgical education, ensuring content quality and educational appropriateness remains a critical priority for the surgical community.

Conflict of Interest: The authors declare no conflicts of interest.

Informed Consent: This study is based on publicly available YouTube videos and does not involve human participant data. Therefore, informed consent was not required

Funding: This research received no external funding

Ethical Approval: This cross-sectional observational study was granted exemption from institutional review board approval due to the analysis of publicly available content. The study was conducted in accordance with the principles outlined in the Declaration of Helsinki for research involving human subjects, though no direct human participation was involved.

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Case Report
Olgu Sunumu

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Foreign Body Complication After Endourological Intervention: A Rare Case Report

Malekot Kateter Kırığına Bağlı Retroperitoneal Yabancı Cisim: Nadir Bir Olgu Sunumu

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ABSTRACT

Percutaneous nephrolithotomy (PNL) is a widely used minimally invasive surgical technique for the treatment of large and complex renal stones. Although nephrostomy catheters placed after the procedure play a crucial role in drainage and hemostasis, they may rarely lead to serious complications. Herein, we report a rare case of distal fragment retention of a Malecot nephrostomy catheter following PNL, which was successfully removed through open surgery.

Keywords: complication, foreign body, nephrostomy catheter, percutaneous nephrolithotomy

ÖZET

Perkütan nefrolitotomi (PNL), büyük ve komplike böbrek taşlarının tedavisinde yaygın olarak kullanılan minimal invaziv bir cerrahi yöntemdir. İşlem sonrası yerleştirilen nefrostomi kateterleri drenaj ve hemostaz açısından önemli olmakla birlikte, nadiren ciddi komplikasyonlara yol açabilir. Bu yazıda, PNL sonrası Malecot nefrostomi kateterinin distal parçasının fragmante olarak retroperitoneal alanda kaldığı ve açık cerrahi ile çıkarıldığı nadir bir olgu sunulmuştur.

Anahtar Kelimeler: komplikasyon, nefrostomi kateteri, perkütan nefrolitotomi, yabancı cisim

GİRİŞ

Üriner sistem taş hastalıklarında tedavi seçimi, taşın lokalizasyonu, boyutu ve hastanın klinik durumuna göre belirlenmektedir. Ekstrakorporeal şok dalga litotripsi (ESWL), üreteroskopi (sert ve fleksibl) ve perkütan nefrolitotomi (PNL) gibi minimal invaziv endoürolojik yöntemler, açık cerrahi uygulamaların yerini önemli ölçüde almıştır (1). Özellikle PNL, ESWL'ye dirençli, 2 cm'den büyük taşlarda ve komplike taş hastalıklarında başarı oranı yüksek bir tedavi seçeneğidir(2). Bununla birlikte, PNL sonrası ateş, kanama ve üriner ekstravazasyon gibi komplikasyonlar gelişebilmektedir (3). Bu yazıda, PNL sonrası malekot kateterinin fragmante olarak retroperitoneal alanda kalan distal parçasının cerrahi yöntemle çıkarıldığı bir olgu sunulmuştur.

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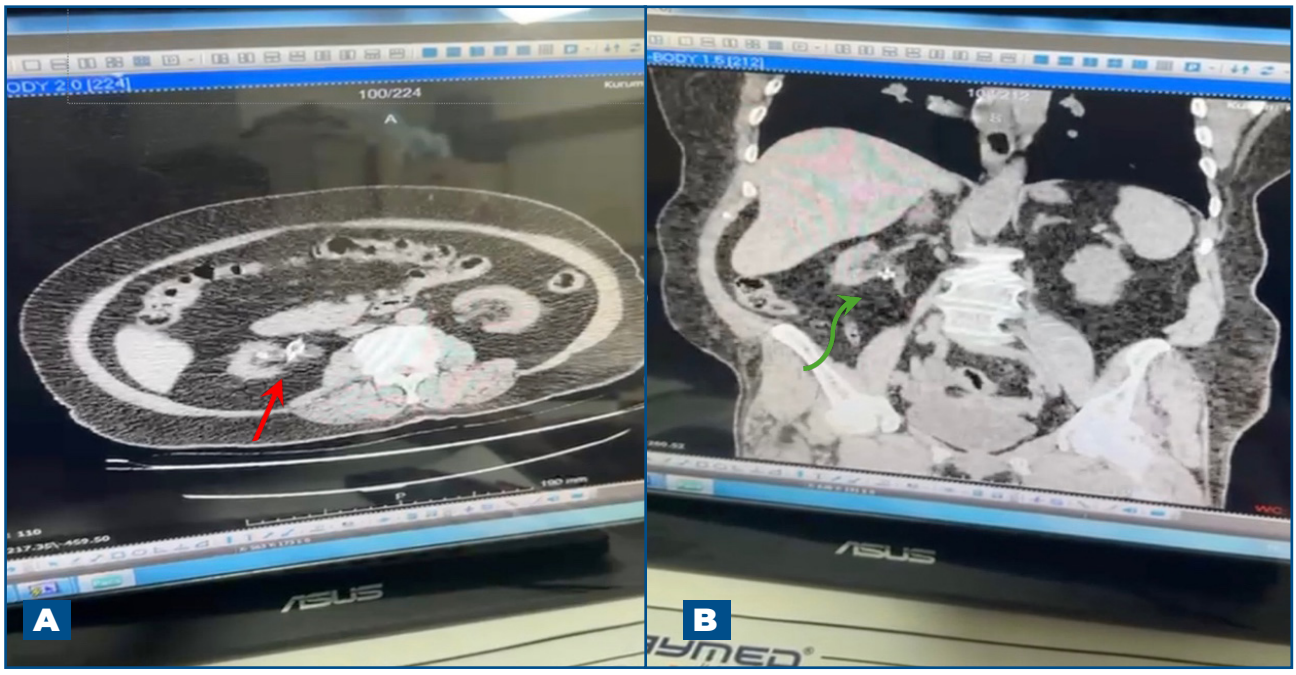
OLGU SUNUMU

51 yaşında kadın hasta, sağ renal pelvis taşı nedeniyle yapılan perkütan nefrolitotomi (PNL) sonrası takibe alındı. Postoperatif 3. günde Malecot nefrostomi kateteri çekilirken distal fleksibl kısmın koparak yerinde kalmış olabileceği düşünüldü. Postoperatif dönemde çekilen kontrastsız abdominal bilgisayarlı tomografi (BT)'de, 2,5 cm uzunluğundaki kateter fragmanının üreteropelvik bileşkeden (UPB) ayrılarak retroperitoneal (RP) alanda lokalize olduğu ve toplayıcı sistemle bağlantısının tamamen kaybolduğu izlendi (Şekil 1). Ayırıcı tanıda taş fragmanı, enjeksiyon materyali veya yabancı cisim kalıntısı düşünülmüş; ancak fleksibl üreterorenoskopi (F-URS) sırasında toplayıcı sistem içinde herhangi bir yabancı cisim saptanmaması tanının doğrulanmasına katkı sağlamıştır. F-URS sırasında pelvik sistem normal görünümdeydi; ancak kateterin retroperitoneal alanda yerleşmiş olması nedeniyle toplayıcı sistem içinde yabancı cisim saptanamadı. Bu bulgu, kateterin sistem dışına tamamen migre olduğunu ve bu nedenle endoskopik yaklaşımın yetersiz kaldığını göstermektedir.

Semptomlar minimal olmasına rağmen, yabancı cismin retroperitoneal yağ dokuda kalması durumunda apse oluşumu, inflamasyon ve ileride fibrotik değişiklik riski nedeniyle cerrahi girişim planlandı. Enfeksiyon gelişmeden müdahale edilmesi tercih edildi.

Cerrahi açık teknikle, sağ lomber bölgede yapılan insizyon üzerinden gerçekleştirildi. Lomber insizyon, retroperitoneal alana doğrudan erişim sağlaması sayesinde intraperitoneal organ hasarı riskini azaltırken, aynı zamanda üreterin seyrini daha net görmeyi mümkün kılmıştır. Bu sayede üretere zarar verilmeden diseksiyon yapılabildi. Kateter fragmanı, UPB'nin yaklaşık 1 cm distalinde, retroperitoneal yağ dokusu içinde sıkışmış halde bulundu ve dikkatli disseksiyonla çıkarıldı (Şekil 2). Kullanılan Malekot kateter 12 Fr çapında, silikon esaslı, çoklu kanal delikli ve uç kısmı fleksibl yapıdaydı. Bu esnek yapı, RP alanda kıvrılıp migrasyona neden olmuş olabilir.

Postoperatif dönemde çekilen direkt üriner sistem grafisinde kateter parçası saptanmadı. Hasta 48. saatte mobilize edildi ve postoperatif 4. günde komplikasyonsuz olarak taburcu edildi.



Şekil 1. Postoperatif kontrastsız abdominal BT görüntüleri:
A) Aksiyel kesitte, üreteropelvik bileşkeden (UPB) ayrılarak retroperitoneal alana migrate olmuş, yaklaşık 2.5 cm uzunluğundaki Malecot kateter fragmanı (kırmızı ok). Fragman, sağ üreterin posterolateralinde, psoas kası önünde lokalizedir.
B) Koronal rekonstrüksiyonda, kateter parçasının renal pelvisle olan anatomik ilişkisini tamamen kaybettiği izlenmektedir (yeşil ok)

Şekil 2. Cerrahi olarak çıkarılan Malecot kateter fragmanının makroskopik görünümü. Yaklaşık 2.5 cm uzunluğunda olup, ucu hafif bükülmüş ve kontaminasyon izleri içermektedir. Yanında ölçekleme amacıyla enjektör yerleştirilmiştir.

TARTIŞMA

Her cerrahi işlemde olduğu gibi PNL sonrasında da çeşitli komplikasyonlar gelişebilir. Komplikasyonların çoğu konservatif veya minimal invaziv yönetimle çözülmektedir (4). Perkütan nefrolitotomiye bağlı komplikasyonlar, intraoperatif ve postoperatif olarak sınıflandırılabilir. İntraoperatif dönemde en sık karşılaşılan komplikasyonlar; kanama, renal toplayıcı sistem yaralanmaları, visseral organ hasarı, pulmoner komplikasyonlar, tromboembolik olaylar, taş fragmanlarının ekstrarenal alana göçü ve nefrostomi tüpünün yanlış yerleştirilmesidir. Postoperatif komplikasyonlar ise enfeksiyon ve sepsis, geç dönem kanama, kalıcı üriner fistül oluşumu, infundibular stenoz gelişimi ve nadiren mortaliteyi içermektedir (5). Yabancı cisim malekot kateterinin çıkarılması esnasında retroperitoneal alanda fragmante olması ise oldukça nadir bildirilen bir komplikasyondur.

Perkütan nefrostomi drenajı, üst üriner sistem obstrüksiyonu, enfekte renal sistem varlığı, üriner diversiyon sağlanması ya da toplayıcı sisteme terapötik ajanların instilasyonu veya cerrahi girişim için erişim amacıyla sıklıkla tercih edilen etkili bir yöntemdir. Bu amaçla en yaygın kullanılan drenaj materyalleri pig-tail kateterler ve Malekot kateterlerdir. Kateterlerin dış yüzeyi genellikle pürüzsüz olup, çoğu olguda kolaylıkla çıkarılabilmektedir. Ancak zamanla kateterin üzerindeki deliklerde doku proliferasyonu gelişebilir ve bu durum kateterin çıkarılması sırasında teknik zorluklara yol açabilir (6). Bu durum, kateterin iç kısmında delikleri çaprazlayan bir doku köprüsünün oluşmasına neden olabilir. Zamanla bu doku in-growtu, kateterin çıkarılması sırasında teknik zorluklara ve nadiren kateter fragmantasyonuna yol açabilmektedir (7).

Literatürde uzun süre vücutta bırakılan ve enfeksiyona eğilimli hale gelen sıkışmış nefrostomi tüplerinin çıkarılması için açık cerrahi, laparoskopik, endoskopik ve perkütan yöntemler tanımlanmıştır (8); bizim olgumuzda ise endoskopik yöntemle yabancı cisim tespit edilemediği için açık cerrahi ile retroperitoneal alanda lokalize edilerek başarılı şekilde çıkarılmıştır.

Malekot kateterinin distal parçasının koparak retroperitoneal alanda kalması hem tanı hem de tedavi açısından özgün bir durumdur. Literatürde benzer olgularda, özellikle drenaj kateterlerinin veya cerrahi enstrüman parçalarının vücutta kalması sonrası, ciddi enfeksiyon ve sepsis gibi hayatı tehdit eden komplikasyonlar gelişebildiği bildirilmiştir

(9,10). Bizim olgumuzda, yabancı cisim klinik olarak sessiz seyretmiş olmasına rağmen, ilerleyen dönemde apse formasyonu veya çevre dokularda inflamasyon gelişme riski mevcuttu. Drenaj kateterinin çıkarılması sırasında aşırı güç kullanılmaması ve son derece dikkatli olunması gerekmektedir. Kateterin yer değiştirme veya kırılma olasılığını etkileyen birçok faktör bulunmaktadır; hastanın vücut kitle indeksi, cilt ile toplayıcı sistem arasındaki mesafe, mevcut hidronefroz derecesi ve kullanılan drenaj materyaline ait özellikler bu faktörler arasında sayılabilir. İdeal bir nefrostomi kateteri; toplayıcı sistem içinde stabil pozisyonunu koruyabilmeli, vücut içinde ve dışında bükülmelere direnç gösterebilmeli, idrar, kan, pıhtı ve taş parçalarının vücuttan etkin şekilde atılımını sağlamalı ve hastada minimum düzeyde rahatsızlık yaratmalıdır (11). Bu durum, endoürolojik işlemler sonrasında kullanılan kateter ve enstrümanların sağlamlığının kontrol edilmesinin ve prosedürlerin dikkatle yürütülmesinin önemini bir kez daha ortaya koymaktadır.

Yabancı cisimlerin çıkarılmasında endoürolojik yöntemler ilk tercih edilse de cismin lokalizasyonu veya migrasyonu nedeniyle açık cerrahi gerekli olabilir. Bizim vakamızda da retroperitoneal alanda toplayıcı sistem dışında kalan yabancı cismin endoskopik yöntemlerle çıkarılamaması üzerine lomber insizyon ile açık cerrahi tercih edilmiş ve başarılı bir şekilde çıkarılmıştır.

SONUÇ

Endoürolojik işlemler sonrasında nadir görülen yabancı cisim komplikasyonları, erken tanı ve doğru cerrahi strateji ile başarıyla yönetilebilir. Cerrahların, bu tür komplikasyonları önlemek amacıyla işlem öncesi ve sonrası kullanılan ekipmanları dikkatle kontrol etmeleri ve beklenmedik durumlara karşı hazırlıklı olmaları önem taşımaktadır.

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Author Guidelines
Yazarlara Bilgi

Dergi, yazarların yayın haklarını kısıtlama olmaksızın saklamasını sağlar.

Yazarların kimlik bilgileri ve e-posta adresleri hiçbir şekilde başka amaçlar için kullanılmamaktadır.

Gönderilen yazıların daha önce yayınlanmamış olması veya başka bir dergide değerlendirme aşamasında olmaması gerekmektedir.

Gönderilen yazılar herhangi bir kongrede takdim edilmiş ise bu durum gönderilen makalede dipnot olarak bildirilmelidir.

Derginin Yayın Kurulu, tüm itirazları Yayın Etik Komitesi (COPE) kuralları çerçevesinde ele alır. Bu gibi durumlarda, yazarlar temyiz ve şikayetleri ile ilgili olarak yayın kuruluyla doğrudan iletişime geçmelidir. Gerektiğinde, dahili olarak çözülemeyen sorunları çözmek için bir ombudsman atanabilir. Editör, tüm temyiz ve şikayetler için karar verme sürecindeki nihai otoritedir.

Derginin editoryal ve yayın süreçleri, International Council of Medical Journal Editors (ICMJE) yönergelerine göre şekillendirilmektedir.

Endoüroloji Bülteni yayıncılıkta şeffaflık ve en iyi uygulama ilkelerine uygundur (DOAJ).

Bir yazının yayın için kabul edilmesinde en önemli kriterler özgünlük, yüksek bilimsel kalite ve alıntı potansiyelinin varlığıdır. Dergide yayınlanmak üzere gönderilen yazılar, daha önce başka bir yerde yayınlanmamış ve yayınlanmak üzere gönderilmemiş olmalıdır. Bir kongrede tebliğ edilmiş ve özeti yayınlanmış çalışmalar organizasyonun adı, yeri ve tarihi belirtilmek şartı ile kabul edilebilir.

Deneysel, klinik, ilaç çalışmalarının ve bazı vaka raporlarının araştırma protokollerinin Etik Kurul tarafından uluslararası sözleşmelere uygun olarak onaylanması (Dünya Tıp Birliği Helsinki Deklarasyonu "İnsan Denekleri ile İlgili Tıbbi Araştırmalar İçin Etik İlkeler") gereklidir.

Etik kurul izni gerektiren tüm araştırmalar için etik kurul onayı alınmalı, bu onay makalede belirtilmeli ve belgelenmelidir.

Etik kurul izni gerektiren çalışmalarda izne ilişkin bilgiler (kurulun adı, tarih ve sayısı) yöntem bölümünde ve makalenin ilk/son sayfalarından birinde yer alabilir; Olgu sunumlarında aydınlatılmış onam/rıza formunun imzalanması ile ilgili bilgilere makalede yer verilmelidir.

- Üzerinde deneysel çalışma yapılan gönüllü kişilere ve hastalara uygulanan prosedürler ve sonuçları anlatıldıktan sonra onaylarının alındığını ifade eden bir açıklama yazının içinde bulunmalıdır.
- Hayvanlar üzerinde yapılan araştırmalarda acı ve rahatsızlık verilmemesi için yapılan uygulamalar ve alınan tedbirler açık olarak belirtilmelidir.
- Hasta onamı, etik kurulun adı, etik kurul toplantı tarihi ve onay numarası ile ilgili bilgiler makalenin "Gereç ve Yöntem" bölümünde de belirtilmelidir.
- Hastaların gizliliğini korumak, yazarların sorumluluğundadır. Hasta kimliğini ortaya çıkarabilecek fotoğraflar için, hasta ve/veya yasal temsilcileri tarafından imzalanan onayların alınması ve yazılı onay alındığının metin içerisinde belirtilmesi gereklidir.

Dergimize gönderilen tüm yazılar intihal tespit etme programı (iThenticate) ile değerlendirilmektedir. Benzerlik oranının %20 ve altı olması önerilmektedir.

Endoüroloji Bülteni, yayınlanan tüm içerik için ulusal ve uluslararası telif hakkına sahiptir. Bir gönderi yayınlanmak üzere reddedilirse, telif hakkı otomatik olarak yazarlara iade edilir.

Yazarlar dergide yayınlanan makaleler için herhangi bir telif hakkı veya maddi tazminat almazlar. Ayrıca, el yazması gönderimi, hakem değerlendirmesi veya yayın için herhangi bir ücret alınmaz.

Yayımlanan her makale için telif hakkı şartları yayın dosyalarında ve derginin web sitesinde açıkça belirtilmiştir. Endoüroloji Bülteni'ne gönderilen el yazmalarına " Yazar Başvuru ve Telif Hakları Formu" eşlik etmelidir.

Yazarlar, çalışmalarının mevcut telif haklarını ihlal etmediğinden emin olmaktan sorumludur. Şekiller, tablolar veya diğer materyaller gibi içerikler (basılı veya elektronik formatta) başka kaynaklardan ödünç alınırsa, yazarlar telif hakkı sahiplerinden

uygun izinleri almalıdır. Telif hakkı ihlallerinden kaynaklanan yasal, mali ve cezai sorumluluklar yalnızca yazarlara aittir.

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Telif Hakkı Sözleşmesi: Yazarlar, yazılarını göndermeden önce " Yazar Başvuru ve Telif Hakları Formu"nda belirtilen şartları incelemeli ve kabul etmelidir. Bu sözleşmenin imzalı bir kopyası gönderimle birlikte yüklenmelidir.

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Önceki Yayın: Yazarlar, yazının başka bir yerde yayınlanmadığını ve aynı anda başka bir dergide yayınlanmak üzere değerlendirilmediğini teyit eder.

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Preparation of Manuscript
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Dergiye gönderilen yazılar, öncelikle yazının dergi kurallarına uygun olarak hazırlanmasını ve sunulmasını sağlayacakları teknik değerlendirme sürecinden geçer. Derginin kurallarına uymayan yazılar, teknik düzeltme talepleri ile gönderen yazara iade edilir. Editör, ana metni değiştirmeden düzeltme yapabilir. Editör, yukarıda belirtilen şartlara uymayan makaleleri reddetme hakkını saklı tutar.
Yazarların aşağıdaki belgeleri göndermeleri gerekir:

- Yazar Katkı ve Telif Hakları Formu
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- Başlık Sayfası (Makale Başlığı, kısa başlık, yazarın adı, unvanı ve kurumu, sorumlu yazarın iletişim bilgileri, araştırmayı destekleyen kuruluş varsa kuruluşun adı)
- Ana belge (Tüm makalelerde, ana metinden önce de Özet bölümü yer almalıdır)
- Şekiller (JPEG formatı)
- Tablolar (en fazla 6 tablo)

Ana Belgenin Yayına Hazırlığı

Yazılar bilgisayar ile çift aralıklı olarak 12 punto büyüklüğünde ve Times New Roman karakteri ile yazılmalıdır. Her sayfanın bütün kenarlarında en az 2.5 cm boşluk bırakılmalıdır. Ana metin, yazarların adları ve kurulları hakkında hiçbir bilgi içermemelidir.
Yayın çeşitleri;

Araştırma Türü	Özet	Kelime Sayısı	Referans Sayısı	Tablo ve Figürler
Özgün Araştırma	250	4000	30	10
Derleme	250	5000	100	10
Olgu Sunumu	300	2000	20	10

Özgün makaleler yapılandırılmış bir Özet (abstract) (Giriş, Gereç ve yöntemler, Bulgular, Sonuçlar, Referanslar, Tartışma, gerekli ise Onam, Figürler; resim, grafik çizim, video, Tablolar) içermelidir.
Olgu sunumları için yapılandırılmış Özet gerekmez. Özet bölümü 300 sözcük ile sınırlandırılmalıdır. Özet de kaynaklar, tablolar ve atıflar kullanılamaz. Özün bittiği satırın altında sayısı 3-5 arasında olmak üzere anahtar kelimeler verilmelidir.
Türkiye dışındaki ülkelerden yazı gönderen yazarlar için Başlık, Özet, Anahtar Kelimeler ve yazıyla ilgili diğer bazı temel bölümlerin Türkçe olarak gönderilmesi zorunlu değildir. Bu bölümlerin çevirileri, yazarlar tarafından gönderilen özgün İngilizce metinler dikkate alınarak dergi editörlüğü tarafından yapılacaktır.
Makalede kullanılan tüm kısaltmalar, ilk kullanımda tanımlanmalıdır. Kısaltma, tanımı ardından parantez içinde verilmelidir.
Ana metinde bir ilaç, ürün, donanım veya yazılım programından bahsedildiğinde, ürünün adı, ürünün üreticisi, üretim şehri ve üreten şirketin ülkesi de dahil olmak üzere ürün bilgileri (ABD'de ise devlet dahil) parantez içinde verilmelidir.
Anahtar kelime seçimi için lütfen Index Medicus'un (MeSH) tıbbi konu başlıklarına bakınız: https://meshb.nlm.nih.gov/MeSHonDemand .
Tüm kaynaklara, tablolara ve şekillere ana metinde atıfta bulunulmalı ve kaynaklar, ana metinde geçen sıraya göre numaralandırılmalıdır. Kullanılan semboller, sembollerin standart kullanımlarına uygun olmalıdır.

1. Orijinal Araştırma Makaleleri

Amaç

Orijinal Araştırma Makaleleri, eleştirel okuyucular için güvenilirliği garanti altına almak için yeterli dokümantasyonla klinik veya temel araştırma sonuçlarını sunmalıdır. Bu makaleler alana yeni bakış açıları katmalı ve sağlam veriler ve sağlam metodoloji ile desteklenmelidir.

Gönderme Yönergeleri
Kelime Sınırı: Maksimum 4.000 kelime (kaynaklar, tablolar ve şekil başlıkları hariç).
Yapı: El yazmaları aşağıdaki şekilde yapılandırılmalıdır:
Başlık (hem Türkçe hem de İngilizce)
Özet (hem Türkçe hem İngilizce)
Anahtar Kelimeler (hem Türkçe hem İngilizce)
Giriş
Materyaller ve Yöntemler
Sonuçlar
Tartışma
Sonuçlar
Şekil ve Tablo Başlıkları (varsa)
Referanslar

İnceleme Süreci
Gönderilen tüm araştırma makaleleri, bilimsel değerlerini, özgünlüklerini ve derginin kapsamıyla alakalarını değerlendirmek için çift kör hakem incelemesinden geçecektir. İstatistiksel analizler ve metodoloji açıkça sunulmalı ve yeniden üretilebilir olmalıdır.

2. Olgu Sunumları
Amaç
Vaka Raporları, tanı zorlukları, tedavi yaklaşımları veya yeni gözlemler hakkında değerli içgörüler sağlayan benzersiz veya nadir klinik vakaları tanımlamalıdır. Bu raporlar iyi belgelenmeli ve tıbbi bilginin ilerlemesine katkıda bulunmalıdır.

Gönderme Yönergeleri
Kelime Sınırı: Maksimum 2.000 kelime (referanslar, tablolar ve şekil başlıkları hariç).
Yapı: El yazmaları aşağıdaki gibi yapılandırılmalıdır:
Başlık (hem Türkçe hem de İngilizce)
Özet (hem Türkçe hem de İngilizce)
Anahtar Kelimeler (hem Türkçe hem de İngilizce)
Giriş
Vaka Sunumu
Tartışma ve Sonuç
Şekil ve Tablo Başlıkları (varsa)
Referanslar

İnceleme Süreci
Vaka Raporları, önemli bir öğrenme fırsatı sunduklarından, uygun şekilde referanslandırıldıklarından ve klinik uygulamaya veya tıbbi araştırmaya katkıda bulunduklarından emin olmak için editöryal ve çift kör hakem değerlendirmesine tabidir.

3. Derleme Makaleleri
Amaç
Derleme Makaleleri, belirli bir konunun kapsamlı ve yapılandırılmış bir analizini sunar, mevcut literatürü özetler ve eleştirel olarak değerlendirir. Bu makaleler iyi organize edilmeli ve araştırma bulgularının güncel bir sentezini içermelidir.

Gönderme Yönergeleri
Kelime Sınırı: Maksimum 5.000 kelime (kaynaklar, tablolar ve şekil başlıkları hariç).
Yapı: El yazmaları aşağıdaki gibi yapılandırılmalıdır:
Başlık (hem Türkçe hem de İngilizce)
Özet (hem Türkçe hem İngilizce)
Anahtar Kelimeler (hem Türkçe hem İngilizce)
Ana Metin

Sonuç
Şekil ve Tablo Başlıkları (varsa)
Referanslar

Sistematik İncelemeler
Sistematik inceleme gönderen yazarlar, şeffaflığı ve metodolojik titizliği sağlamak için PRISMA yönergelerine uymalıdır. PRISMA kontrol listesine şu adresten ulaşılabilir: PRISMA Kontrol Listesi

İnceleme Süreci
İnceleme Makaleleri, analiz derinliği, alaka düzeyi ve bilimsel topluluğa katkısı açısından editör kurulu ve editöryal ve çift kör hakem değerlendirmesi tarafından değerlendirilecektir.

4. Editöre Mektuplar
Amaç
Editöre Mektuplar, okuyucuların daha önce yayınlanmış makalelere yanıt vererek, kısa bilimsel gözlemler sunarak veya derginin okuyucularının ilgisini çeken konulara değinerek akademik tartışmalara katılmalarını sağlar.

Gönderim Yönergeleri
Yapı: El yazmaları aşağıdaki şekilde yapılandırılmalıdır:
Başlık (hem Türkçe hem de İngilizce)
Anahtar Sözcükler (hem Türkçe hem İngilizce)
Ana Metin
Şekil ve Tablo Başlıkları (varsa)
Referanslar

İçerik: Mektuplar öz olmalı, söz konusu makalenin belirli yönlerine odaklanmalı ve akademik söyleme anlamlı bir şekilde katkıda bulunmalıdır. Bunlar şunları içerebilir:
Yayınlanmış bir makalenin metodolojileri, yorumları veya sonuçları hakkında eleştirel analiz veya yorum.
Konuyu daha iyi anlamayı sağlayan doğrulayıcı veya çelişkili verilerin sunumu.
Makalenin bulgularını daha geniş çalışma alanı içinde bağlamlandıran tartışmalar.
Uzunluk: Genellikle, mektuplar referanslar dahil 1.000 kelimeyi geçmemelidir.
Başlık: Orijinal makaleye atıfta bulunan bir başlıkla başlayın, örn. “[Yazar Adı(ları)] tarafından [Makale Başlığı] hakkında yorum.”
Yazar Bilgileri: Tüm katkıda bulunan yazarların tam adlarını, akademik bağlantılarını ve iletişim bilgilerini ekleyin.
Referanslar: Orijinal makaleyi ve diğer ilgili literatürü uygun şekilde atıfta bulunun.
Ton: Kişisel yorumlardan ziyade akademik eleştiriye odaklanarak saygılı ve profesyonel bir ton koruyun.

İnceleme Süreci
Gönderilen tüm mektuplar, açıklık, akademik değer ve etik standartlara uyumu sağlamak için editör ekibi tarafından incelenecektir. Mektuplar profesyonel bir üslupla yazılmalı ve anlamlı bir akademik söyleme katkıda bulunmalıdır.

5. Araştırma Notu
Amaç
Bir Araştırma Notu, tam uzunlukta bir makaleyi gerektirmeyen ancak yine de bilim camiası için değerli olan ön bulguların, yeni metodolojilerin veya önemli gözlemlerin kısa raporlarını yaymak için kullanılır.

Gönderme Yönergeleri
Uzunluk: Ana metin, referanslar, şekiller ve tablolar hariç 2.000 kelimeyi geçmemelidir.
İçerik: Araştırma Notları şunları içerebilir:
Potansiyel bir atılım veya yeni bir içgörü öneren ön veriler.
Yenilikçi tekniklerin veya metodolojilerin açıklamaları.
Daha fazla araştırmayı teşvik eden veya ortaya çıkan eğilimleri vurgulayan gözlemler.

Yapı
Notu, aşağıdaki gibi net başlıklarla düzenleyin:
Başlık (hem Türkçe hem de İngilizce)
Özet (hem Türkçe hem İngilizce)
Anahtar Kelimeler (hem Türkçe hem İngilizce)
Giriş: Çalışmanın bağlamını ve önemini kısaca ana hatlarıyla belirtin.
Yöntemler: Kullanılan yaklaşımı ve teknikleri özetleyin.
Sonuçlar: Temel bulguları özlü bir şekilde sunun.
Tartışma: Sonuçları ve potansiyel gelecekteki yönleri tartışın. Referanslar: Çalışmayı destekleyen temel alıntılarla sınırlayın.
Şekiller ve Tablolar: Yalnızca notun netliğini ve etkisini artırıyorsa ekleyin.

İnceleme Süreci
Araştırma Notları, bilimsel geçerliliği, özgünlüğü ve derginin kapsamıyla alakalı olmasını sağlamak için çift kör hakem incelemesinden geçecektir.

6. Kitap İncelemesi
Amaç: Kitap İncelemesi, alandaki son yayınların eleştirel bir değerlendirmesini sunarak okuyuculara kitabın içeriği, önemi ve devam eden akademik tartışmalarla alakalılığı hakkında fikir verir.

Gönderim Yönergeleri
İçerik: İncelemeler şunları içermelidir:
Uzunluk: Genellikle 1.500 ila 2.500 kelime arasındadır.
Kitabın ana temalarını ve argümanlarını özetleyin.
Çalışmanın güçlü ve zayıf yönlerini değerlendirin.
Kitabın alana katkısını ve güncel araştırma veya uygulamayla alakalılığını tartışın.
Kitabı mevcut literatüre yerleştirin ve benzersiz bakış açılarını veya yaklaşımları not edin.
Başlık: İncelemenin başında kitabın tam başlığını, yazar(lar), yayıncı, yayın yılı, sayfa sayısı ve ISBN'yi ekleyin.
Ton: Nesnel ve akademik bir ton koruyun, kanıtlarla desteklenen dengeli eleştiriler sunun.

İnceleme Süreci
Kitap İncelemeleri, editör ekibi tarafından açıklık, analiz derinliği ve derginin okuyucu kitlesiyle alakalılık açısından değerlendirilecektir.

Şekillerin ve Tabloların Yayına Hazırlığı
Şekiller, grafikler ve fotoğraflar, makale yükleme sistemi aracılığıyla ayrı dosyalar (JPEG formatında) halinde sunulmalıdır.
Dosyalar bir Word belgesine veya ana belgeye gömülmemelidir.
Şeklin alt birimleri olduğunda; alt birimler tek bir görüntü oluşturmak için birleştirilmemelidir. Her alt birim, başvuru sistemi aracılığıyla ayrı ayrı sunulmalıdır.
Şekil alt birimlerini belirtmek için görüntüler Arabik rakamlarla (1,2,3...) numaralandırılmalıdır.
Gönderilen her bir şeklin en düşük çözünürlüğü 300 DPI olmalıdır.
Şekillerin başlıkları ana belgenin sonunda listelenmelidir.
Bilgi veya resimler hastaların tanımlanmasına izin vermemelidir. Kullanılan herhangi bir fotoğraf için hastadan ve/veya yasal temsilcisinden yazılı bilgilendirilmiş onam alınmalıdır.

Tablolar ana belgeye gömülmeli veya ayrı dosyalar halinde sunulmalıdır. Tablo sayısı altı adet ile sınırlandırılmalıdır. Tüm tablolar, ana metinde kullanıldığı sırayla art arda numaralandırılmalıdır. Tablo başlıkları ve açıklamaları ana belgenin sonunda listelenmelidir.

Kaynaklar
Kaynaklar yazıda kullanılan kaynaklar cümlenin sonunda parantez içinde belirtilmelidir. Kaynaklar makalenin sonunda yer almalı ve makalede geçiş sırasına göre sıralanmalıdır. Kaynaklar yazarların soyadlarını ve adlarının baş harflerini, makalenin başlığını, derginin adını, basım yılını, sayısını, başlangıç ve bitiş sayfalarını belirtmelidir. Altı ve daha fazla yazarı olan makalelerde ilk

3 yazardan sonrası için ‘et al.’ veya ‘ve ark.’ ifadesi kullanılmalıdır. Kısaltmalar Index Medicus’ a uygun olmalıdır.
Kaynakların sonuna alıntı yapılan makalelerin doi linki eklenmelidir.

Örnekler

Makaleler için:

1. Tasci A, Tugcu V, Ozbay B, Mutlu B, Cicekler O. Stone formation in prostatic urethra after potassium-titanyl-phosphate laser ablation of the prostate for benign prostatic hyperplasia. J Endourol 2009;23:1879-81. https://doi.org/10.1089/end.2008.0596

Kitap için:

1.Günalp İ: Modern Üroloji. Ankara: Yargıçoğlu matbaası, 1975. Kitap bölümleri için: Anderson JL, Muhlestein JB. Extra corporeal ureteric stenting during laparoscopic pyeloplasty. Philadelphia: W.B. Saunders; 2003. p. 288-307

Web sitesi için;

Gaudin S. How moon landing changed technology history [Internet]. Computerworld UK. 2009 [cited 15 June 2014]. Available from: http://www.computerworlduk.com/in-depth/it-business/2387/how-moon-landing-changed-technology-history/

Bildiriler için;

Proceedings of the Symposium on Robotics, Mechatronics and Animatronics in the Creative and Entertainment Industries and Arts. SSAISB 2005 Convention. University of Hertfordshire, Hatfield, UK; 2005.

Tez için;

Ercan S. Venöz yetmezlikli hastalarda kalf kası egzersizlerinin venöz fonksiyona ve kas gücüne etkisi. Süleyman Demirel Üniversitesi Tıp Fakültesi Spor Hekimliği Anabilim Dalı Uzmanlık Tezi. Isparta: Süleyman Demirel Üniversitesi. 2016.

Geri Çekme veya Reddetme

Yazıyı Geri Çekme: Gönderilen yazının değerlendirme sürecinde gecikme olması vb. gibi gerekçelerle yazıyı geri çekmek ve başka bir yerde yayınlatmak isteyen yazarlar yazılı bir başvuru ile yazılarını dergiden geri çekebilirler.
Yazı Reddi: Yayınlanması kabul edilmeyen yazılar, gerekçesi ile geri gönderilir.

Kabul Sonrası

Makalenin kabul edilmesi durumunda, kabul mektubu iki hafta içinde sorumlu yazara gönderilir. Makalenin baskıdan önceki son hali yazarın son kontrolüne sunulur. Dergi sahibi ve yayın kurulu, kabul edilen makalenin derginin hangi sayısında basılacağına karar vermeye yetkilidir.
Yazarlar, makalelerini kişisel veya kurumsal web sitelerinde, uygun alıntı ve kütüphane kurallarına bağlı kalarak yayınlayabilirler.
Yazar değişikliği (isim, yazar ekleme) talebi, değerlendirme süreci tamamlanmadan önce tüm yazarlar tarafından imzalanmış bir mektupla Yayın Kurulu’na (yayıncı/dergi adresi) iletilmelidir.
Geri çekme ve düzeltmeler hakkında daha fazla bilgi için lütfen Geri Çekme ve Düzeltme Politikası sayfasını inceleyiniz.

PREPARATION OF MANUSCRIPT

Manuscripts can only be submitted through the journal's online manuscript submission and evaluation system, available at https://dergipark.org.tr/ Manuscripts submitted via any other medium will not be evaluated.

Manuscripts submitted to the journal will first go through a technical evaluation process where the editorial office staff will ensure that the manuscript has been prepared and submitted following the journal's guidelines. Submissions that do not conform to the journal's guidelines will be returned to the submitting author with technical correction requests. The editor reserves the right to reject manuscripts that do not comply with the aforementioned requirements. Corrections may be done without changing the main text.

Authors are required to submit the following:

- Copyright Agreement&Acknowledgement of Authorship Form
- Informed Consent Form
- ICMJE Disclosure of Interest Form
- Title Page (including Title of Manuscript, Running title, author (s) 's name, title, and institution, corresponding author's contact information, Name of the organization supporting the research)
- Main document (All articles should have an abstract before the main text).
- Figures (Jpeg format)
- Tables (max 6 tables)

Preparation of the Main Document

The articles should be written double-spaced in 12 pt, Times New Roman character and at least 2.5 cm from all edges of each page. The main text should not contain any information about the authors' names and affiliations.

Publication Types;

Type of Article	Abstract	Text (Word)	References	Table&Figures
Original Article	250	4000	30	10
Review Article	250	5000	100	10
Case Reports	300	2000	20	10

Original articles should have a structured abstract. (Aim, Material and Methods, Results, Conclusion). For case reports, the structured abstract is not used. Limit the abstract to 300 words. References, tables, and citations should not be used in an abstract. Authors must include relevant keywords (3-5) on the line following the end of the abstract. The Turkish title, abstracts, and Turkish keywords are not required for the international authors. The editorial office will provide these.

All acronyms and abbreviations used in the manuscript should be defined first, both in the abstract and in the main text. The abbreviation should be provided in parentheses following the definition.

When a drug, product, hardware, or software program is mentioned within the main text, product information, including the name of the product, the producer of the product, and city and the country of the company (including the state if in the USA), should be provided in parentheses.

All references, tables, and figures should be referred to within the main text, and they should be numbered consecutively in the order they are referred to within the main text. The symbols used must be nomenclature used standards.

1. Original Research Articles

Purpose

Original Research Articles should present the results of clinical or basic research with sufficient documentation to ensure credibility for critical readers. These articles must contribute novel insights to the field and be supported by robust data and sound methodology.

Submission Guidelines
Word Limit: Maximum 4,000 words (excluding references, tables, and figure captions).
Structure: Manuscripts must be structured as follows:
Title (in both Turkish and English)
Abstract (in both Turkish and English)
Keywords (in both Turkish and English)
Introduction
Materials and Methods
Results
Discussion
Conclusions
Figure and Table Captions (if applicable)
References
Review Process

All submitted research articles will undergo double-blind peer review to assess their scientific merit, originality, and relevance to the journal's scope. Statistical analyses and methodology must be clearly presented and reproducible.

2. Case Reports

Purpose

Case Reports should describe unique or rare clinical cases that provide valuable insights into diagnostic challenges, treatment approaches, or novel observations. These reports should be well-documented and contribute to the advancement of medical knowledge.

Submission Guidelines
Word Limit: Maximum 2,000 words (excluding references, tables, and figure captions).
Structure: Manuscripts must be structured as follows:
Title (in both Turkish and English)
Abstract (in both Turkish and English)
Keywords (in both Turkish and English)
Introduction
Case Presentation
Discussion and Conclusion
Figure and Table Captions (if applicable)
References

Review Process

Case Reports are subject to editorial and double-blind peer review to ensure they present a significant learning opportunity, are properly referenced, and contribute to clinical practice or medical research.

3. Review Articles

Purpose

Review Articles provide a comprehensive and structured analysis of a specific topic, summarizing and critically evaluating existing literature. These articles should be well-organized and include an up-to-date synthesis of research findings.

Submission Guidelines
Word Limit: Maximum 5,000 words (excluding references, tables, and figure captions).
Structure: Manuscripts must be structured as follows:
Title (in both Turkish and English)
Abstract (in both Turkish and English)
Keywords (in both Turkish and English)
Main Text

Conclusion
Figure and Table Captions (if applicable)
References

Systematic Reviews
Authors submitting systematic reviews must adhere to PRISMA guidelines to ensure transparency and methodological rigor. The PRISMA checklist can be accessed at: PRISMA Checklist

Review Process
Review Articles will be evaluated by the editorial board and editorial and double-blind peer review for their depth of analysis, relevance, and contribution to the scientific community.

4. Letters to the Editor

Purpose
Letters to the Editor allow readers to engage in academic discussions by responding to previously published articles, presenting brief scientific observations, or addressing issues of interest to the journal's readership.

Submission Guidelines
Structure: Manuscripts must be structured as follows:
Title (in both Turkish and English)
Keywords (in both Turkish and English)
Main Text
Figure and Table Captions (if applicable)
References

Content: Letters should be concise, focused on specific aspects of the article in question, and contribute meaningfully to the academic discourse. They may include:
Critical analysis or commentary on the methodologies, interpretations, or conclusions of a published article.
Presentation of corroborative or contradictory data that enhances the understanding of the topic.
Discussions that contextualize the article's findings within the broader field of study.

Length: Typically, letters should not exceed 1,000 words, including references.
Title: Begin with a title that references the original article, e.g., "Comment on [Article Title] by [Author Name(s)]."
Author Information: Include full names, academic affiliations, and contact details of all contributing authors.
References: Cite the original article and any other relevant literature appropriately.
Tone: Maintain a respectful and professional tone, focusing on academic critique rather than personal remarks.

Review Process:
All submitted letters will be reviewed by the editorial team to ensure clarity, academic merit, and adherence to ethical standards. Letters must be professional in tone and contribute to meaningful scholarly discourse.

5. Research Note

Purpose: A Research Note serves to disseminate brief reports of preliminary findings, novel methodologies, or significant observations that may not warrant a full-length article but are nonetheless valuable to the scientific community.
Submission Guidelines
Length: The main text should not exceed 2,000 words, excluding references, figures, and tables.
Content: Research Notes may include:
Preliminary data that suggest a potential breakthrough or novel insight.
Descriptions of innovative techniques or methodologies.
Observations that prompt further investigation or highlight emerging trends.

Structure
Organize the note with clear headings, such as:
Title (in both Turkish and English)
Abstract (in both Turkish and English)
Keywords (in both Turkish and English)
Introduction: Briefly outline the context and significance of the work.
Methods: Summarize the approach and techniques employed.
Results: Present key findings succinctly.
Discussion: Discuss the implications and potential future directions.
References: Limit to essential citations that support the work.
Figures and Tables: Include only if they enhance the clarity and impact of the note.

Review Process
Research Notes will undergo double-blind peer review to ensure scientific validity, originality, and relevance to the journal's scope.

6. Book Review

Purpose: A Book Review offers a critical evaluation of recent publications in the field, providing readers with insights into the book's content, significance, and relevance to ongoing scholarly discussions.

Submission Guidelines
Content: Reviews should:
Length: Typically between 1,500 to 2,500 words.
Summarize the book's main themes and arguments.
Assess the strengths and weaknesses of the work.
Discuss the book's contribution to the field and its relevance to current research or practice.
Situate the book within the existing literature, noting any unique perspectives or approaches.
Title: Include the book's full title, author(s), publisher, publication year, page count, and ISBN at the beginning of the review.
Tone: Maintain an objective and scholarly tone, offering balanced critiques supported by evidence.

Review Process
Book Reviews will be evaluated by the editorial team for clarity, depth of analysis, and relevance to the journal's readership

Preparation of the Figures and Tables

The submission system should submit figures, graphics, and photographs as separate files (in JPEG format).

- The files should not be embedded in a Word document or the main document.
- When there are figure subunits, the subunits should not be merged to form a single image. Each subunit should be submitted separately through the submission system.
- Arabic numbers should number images to indicate figure subunits.
- The minimum resolution of each submitted figure should be 300 DPI.
- Figure legends should be listed at the end of the main document.
- Information or illustrations must not permit the identification of patients, and written informed consent for publication must be sought for any photograph.

Tables should be embedded in the main document or submitted as separate files, but if tables are submitted separately, please note where it is suitable in the main text. Tables are limited to six tables. All tables should be numbered consecutively in the order they are used to within the main text. Tables legends should be listed at the end of the main document.

References

The references used in the article must be written in parenthesis at the end of the sentences. References should be numbered in the order they appear in the text and placed at the end of the article. References must contain surnames and initials of all authors, article title, name of the journal, the year, and the first and last page numbers. Articles with 6 or more authors 'et al.' are mixed with the first three authors. Abbreviations should be according to index Medicus.
Authors must add the DOI (Digital object identifier) at the end of each reference.

For Examples;
Article in journal: 1. Tasci A, Tugcu V, Ozbay B, Mutlu B, Cicekler O. Stone formation in prostatic urethra after potassium-titanyl-phosphate laser ablation of the prostate for benign prostatic hyperplasia. J Endourol 2009;23:1879-81. https://doi.org/10.1089/end.2008.0596
For Books: 1.Günalp İ: Modern Üroloji. Ankara: Yargıçoğlu matbaası, 1975. Chapters in books: Anderson JL, Muhlestein JB. Extra corporeal ureteric stenting during laparoscopic pyeloplasty. Philadelphia: W.B. Saunders; 2003. p. 288-307
For website; Gaudin S. How moon landing changed technology history [Internet]. Computerworld UK. 2009 [cited 15 June 2014]. Available from: http://www.computerworlduk.com/in-depth/it-business/2387/how-moon-landing-changed-technology-history/
For conference proceeding; Proceedings of the Symposium on Robotics, Mechatronics and Animatronics in the Creative and Entertainment Industries and Arts. SSAISB 2005 Convention. University of Hertfordshire, Hatfield, UK; 2005.
For Thesis; Ercan S. Venöz yetmezlikli hastalarda kalf kası egzersizlerinin venöz fonksiyona ve kas gücüne etkisi. Suleyman Demirel University Faculty of Medicine Sports Medicine Department Thesis. Isparta: Suleyman Demirel University. 2016.
Retraction or Reject; Manuscript Retraction: For other reasons, authors may withdraw their manuscript from the journal with a written declaration.

Manuscript Reject

Withdrawal of the Article: Authors are required to submit a written application addressed to the Editor who has declared their withdrawal request and justification. They must wait for the Editor's response before submitting the manuscript to another journal.
Rejection: The manuscripts which are not accepted to be published are rejected with explanations.

AFTER ACCEPTANCE

If the manuscript is accepted, the acceptance letter is sent within two weeks, the last version of the manuscript is sent to the author for the last correspondence. The journal owner and the editorial board are authorized to decide which volume of the accepted article will be printed.
Authors may publish their articles on their personal or corporate websites by linking them to the appropriate cite and library rules.
Should you wish to request a change of author (name, author addition), we kindly ask that you submit this to the Editorial Board (publisher/journal address) with a letter signed by all authors before the evaluation process is completed.

For more information about withdrawals and corrections, please see the Retraction and Correction Policy page.

Peer Review Process
Yayın Değerlendirme Süreci

Çift-Kör Değerlendirme Süreci

1. Makale Başvurusu

İlgili yazar, makalesini Dergipark çevrimiçi sistemi aracılığıyla dergiye gönderir.

2. Editöryal Değerlendirme

Editörlük, ilgili makalenin derginin yazım kurallarına göre düzenlenip düzenlenmediğini kontrol eder. Bilimsel içeriği bu aşamada değerlendirmez.

3. Editör tarafından değerlendirme

Editör, makalenin orijinal olup olmadığını denetler. Değilse, makale ret edilerek süreç tamamlanır.

4. Hakem Daveti

Editör, makalenin bilimsel içeriğinin değerlendirilmesi için konu ile ilgili hakemlere davet gönderir. Genellikle 2 hakeme davet gönderilir. İlgili yazıyı hakemlerden birisi ret diğeri kabul ettiği takdirde, bölüm editörü uygun görürse üçüncü bir hakemin incelemesi için davetiye gönderebilir.

5. Davete Yanıt

Seçilen hakemler, daveti gönderilen yazıyı kendi uzmanlıklarına, çıkar çatışmalarına ve kullanılabilirlik durumlarına karşı gizli olarak değerlendirir. Daha sonra kabul veya reddetmektedirler.

6. İnceleme Süreci

Hakem, makaleyi çeşitli açılardan değerlendirdikten sonra (15 gün içerisinde) eleştiri ve önerilerini içeren hakem değerlendirme formunu editöre gönderir. Major veya minör revizyonlar sonrasında hakem yazıyı tekrar değerlendirmek istemiş ise öneri ve eleştiriler yazarlara iletilerek düzeltilmiş yazıyı tekrar sisteme yüklemeleri istenir. Bu süreç hakemin kabul veya ret cevabı verene kadar devam eder.

7. Derginin Değerlendirme Süreci

Bölüm Editörü, genel bir karar vermeden önce geri gönderilen tüm değerlendirmeleri dikkate alır. Hakem değerlendirme sonuçları çok farklıysa, editör bir karar almadan önce fazladan bir fikir edinmek için ek bir inceleme isteyebilir.

8. Kararın İletilmesi

Bölüm Editörü, yazı hakkındaki son kararına hakem isimleri gizlenerek hakem raporlarını da ekler ve yazara çevrimiçi sistem ve e-mail aracılığı ile gönderir.

9. Sonraki Adımlar

Makale kabul edilirse, dil editörüne gönderilir. Bu aşamalardan sonraki adımlar;

- Son kopya gönderisi
- Mizanpaj
- Düzeltmeler
- Yayınlanacak gönderilerin erken baskı olarak web sayfasına yerleştirilmesi
- Sayı oluşturulması
- İçindekiler sayfası düzenlenmesi
- Web sitesinde sayı olarak yayınlanması ve baskı

**Kurum içi değerlendirme sürecinde; çift kör değerlendirme sürecindeki adımlar izlenmektedir.*

The Double-Blind Peer Review Process

1. Submission of Paper

The corresponding author submits the paper via Dergipark online system to the journal.new

2. Editorial Office Assessment

Editorial Office checks the paper's composition and arrangement against the journal's Author Guidelines to make sure it includes the required sections and stylizations. The quality of the paper is not assessed at this point.

3. Appraisal by the Editor

Editor checks that the paper is appropriate for the journal and is sufficiently original and interesting. If not, the paper may be rejected without being reviewed any further.

4. Invitation to Reviewers

Editor sends invitations to individuals he or she believes would be appropriate reviewers. As responses are received, further invitations are issued, if necessary, until the required number of acceptances is obtained – commonly this is 2.

5. Response to Invitations

Potential reviewers consider the invitation as anonymous against their own expertise, conflicts of interest and availability. They then accept or decline. If possible, when declining, they might also suggest alternative reviewers.

6. Review is Conducted

The reviewer sets time aside to read the paper several times. The first read is used to form an initial impression of the work. If major problems are found at this stage, the reviewer may feel comfortable rejecting the paper without further work. Otherwise they will read the paper several more times, taking notes so as to build a detailed point-by-point review. The review is then submitted to the journal, with a recommendation to accept or reject it – or else with a request for revision (usually flagged as either major or minor) before it is reconsidered.

7. Journal Evaluates the Reviews

The Section Editor considers all the returned reviews before making an overall decision. If the reviews differ widely, the editor may invite an additional reviewer so as to get an extra opinion before making a decision.

8. The Decision is Communicated

The Section Editor sends a decision email to the author including any relevant reviewer comments as anonymous.

9. Next Steps

If accepted, the paper is sent to language Editor. If the article is rejected or sent back for either major or minor revision, the Section Editor should include constructive comments from the reviewers to help the author improve the article. At this point, reviewers should also be sent an email or letter letting them know the outcome of their review. If the paper was sent back for revision, the reviewers should expect to receive a new version, unless they have opted out of further participation. However, where only minor changes were requested this follow-up review might be done by the Section Editor. After these;

- Copyedit submission
- Layout
- Corrections
- Publishing the submissions on the web page as early print
- Creating issues
- Organize Table of Contents
- Publishing the issue on the web page and printing hardcopy

**We are applying the same steps on The Double-Blind Peer Review Process when we got the in-house submission.*

Prof.Nurettin Öktel St
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