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Original Article
Özgün Araştırma

Endourol Bull. 2024;16(1):1-7. doi:10.54233/endourologybull-1345899

Predicting Factors of the Success Rate of Extracorporeal Shock Wave Lithotripsy in Ureteral Stones: A Retrospective Evaluation with Large Patient Participiant

Üreter Taşlarında Ekstrakorporeal Şok Dalga Litotripsisinin Başarısını Öngörmede Belirleyici Faktörler: Geniş Hasta Katılımlı Retrospektif Değerlendirme

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ÖZET

Amaç: Retrospektif olarak planladığımız çalışmamızda; ekstrakorporeal şok dalga litotripsisi (ESWL) yöntemi ile tedavi edilen, üreter taşı olan hastalarımızda ESWL başarısını öngören faktörleri ve güvenirliğini araştırmayı amaçladık.

Gereç ve Yöntemler: Çalışma 2008-2013 yılları arasında Atatürk Üniversitesi Üroloji Kliniği'nde üreter taşı nedeniyle tedavi edilen 489 hastayı kapsamaktadır. Hastalara en fazla üç seans ESWL uygulandı. İki seansa kadar kırılanlar başarılı kabul edildi. Üreter taşı nedeniyle ESWL uygulanan hastalar hastane kayıtlarından retrospektif olarak incelendi. ESWL başarısını öngörmede, cinsiyet, yaş, opasitesi, taraf ile komplikasyon oranları, ek prosedür gerekliliği gibi parametreler değerlendirildi. ESWL sonrası taşsız olan ya da kontrol görüntülemede 4 mm'den küçük rezidü taşı olan hastalarda ESWL başarılı olarak kabul edilip taşsızlık sağlandı olarak değerlendirildi. Sedoanaljezi sadece çocuk hastalara uygulandı.

Bulgular: Üreter taşlarından ESWL'ye alınan toplam 486 hasta çalışmaya dahil edildi. Hastalar da yaş gruplarına göre 3 gruba ayrıldı.1- 18 yaşa kadar birinci grup 20-40 arası ikinci grup ve 40 üstü üçüncü grubu oluşturuyordu. Yaş grupları ve cinsiyet parametreleri açısından taşsızlık istatiksel olarak anlamlı değildi. Komplikasyon olarak 3 hastada taş yolu, 2 hastada hematüri gelişti. Komplikasyonlar ile taşların lokalizasyonu arasında anlamlılık saptanmadı (p=0.531). Taş boyutu ile taşsızlık sağlanması ve komplikasyon gelişmesi açısından anlamlılık saptanmıştır (sırası ile p=0.016, p=0.0001).

Sonuç: ESWL'de tedavi başarısını öngörmek, hastaları gereksiz tedavi ve işlemden kaynaklanabilecek komplikasyonlardan, zaman kaybından ve morbiditeden korumak esastır. Geniş hasta katılımlı çalışmamızda ESWL'nin üreter taşlarında güvenle tercih edilebilecek bir yöntem olduğunu yüksek başarı ve düşük komplikasyon oranları ile gösterdik. Bizim çalışmamızda taş boyutu başarıyı ön görmede önemli bir prediktif değer olarak saptanmıştır.

Anahtar Kelimeler: ekstrakorporeal şok dalga litotripsisi, üreter taşı, komplikasyon, taşsızlık

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ABSTRACT

Objective: In our retrospectively planned study; treated with ESWL method; we aimed to investigate the factors that predict the success of Extracorporeal Shock Wave Lithotripsy (ESWL) and its reliability in our patients with ureteral stones.

Material and Methods: The study includes 489 patients treated for ureteral stones at Atatürk University Urology Clinic between 2008 and 2013. Patients underwent a maximum of three sessions of ESWL. Those who had fractures within two sessions were considered successful. Patients who underwent ESWL due to ureteral stones were retrospectively examined from hospital records. In predicting ESWL success, parameters such as gender, age, opacity, side and complication rates, and the need for additional procedures were evaluated. In patients who were stone-free after ESWL or had residual stones smaller than 4 mm on control imaging, ESWL was considered successful and stone-free was achieved. Sedoanalgesia was applied only to pediatric patients.

Results: A total of 486 patients who underwent ESWL for ureteral stones were included in the study. The patients were divided into 3 groups according to age groups. Ages 1-18 were the first group, ages 20-40 were the second group, and people over 40 were the third group. Stone-free status was not statistically significant in terms of age groups and gender parameters. As a complication, stone street developed in 3 patients and hematuria developed in 2 patients. No significance was found between complications and the location of the stones (p=0.531). There was a significance between stone size and stone-free status and the development of complications (p=0.016, p=0.0001, respectively).

Conclusion: It is essential to predict treatment success in ESWL and to protect patients from complications, time loss and morbidity that may arise from unnecessary treatment and procedures. In our study with large patient participation, we showed that ESWL is a method that can be safely preferred in ureteral stones with high success and low complication rates. In our study, stone size was found to be an important predictive value in predicting success.

Keywords: extracorporeal shock wave lithotripsy, ureteral stones, complication, stone free

INTRODUCTION

Extracorporeal Shock Wave Lithotripsy is based on the principle that a high-intensity low-frequency acoustic wave produced from a source called an external lithotripter focuses on the stone and fragments the stone. Since the 1980s, when ESWL was included in the treatment program, it has been a treatment modality that has been feasible, safe, effective, inexpensive, noninvasive, and non-complicated renal and ureteral stones less than 2 cm in diameter. (1,2,3) The success of ESWL is measured by fragmentation and clearance and this ratio is in the range of 46-91% (4-7). In recent years, developments in endourological and minimally invasive methods and high success rates in these methods have reduced the procedure of ESWL. The success of this technique is multifactorial. Device-related factors and patient-related parameters are significative for success. Device related factors can be listed as device type, energy level, pulse frequency, patient-matching of the device and correct placement of the patient. Patient related factors are the type of stone, the degree of hardness, the position of the stone, its size, whether it is opaque or not. As in all invasive or non-invasive interventional procedures, it is essential to predict the success of treatment in ESWL, and to protect patients from unnecessary procedure of ESWL and complications, loss of time, and morbidity that may result from the procedure.

MATERIAL AND METHODS

After the approval of the ethics committee, the patients who applied to the Atatürk University Research Hospital Urology Clinic lithotripsy unit between 2008 and 2013 and who had undergone ESWL due to ureteral stones were evaluated retrospectively from the hospital records. The location of the stones was recorded. The location of the stones was recorded as proximal above and distal below the pelvic structure. Stone size was determined by measuring from the farthest ends of stone. All treatments were done with Siemens Lithostar Modularis system (Siemens Healthcare German). All operations were performed by an experienced technician. Sedoanalgesia was applied only to pediatric patients. Pentothal sodium 3-4 mg/kg and fentanyl 1-2 µg given as pharmacological agents by anesthesiologist

physician. Adult patients were not given analgesic before and after the procedure. While planning ESWL before the procedure, the patients were evaluated by Urinary ultrasonograpy, X-Ray and if necessary Intravenous Urograpy or non-contrast abdominal CT (computed tomography) was taken. ESWL was performed for distal located ureteral stones in prone position and for proximal ureteral stones in supin position. For each pediatric patients ESWL was applied maximum 2000 shocks and for other patients 2000-3000 shocks according to patients' pain tolerance. For all the patients the operation was initiated by low energy and increased step by step according patients pain tolerance. After every 500 shocks the stone checked by flouroscopy whether the stone was fragmanted or on target. The patients were divided into three groups as age groups: 1-18 years old, second group 18-40 years old, and third group over 40 years old. Patients were evaluated for stone-free status with USG and X-ray film after each session. Stone-free status was defined as no stone fragments remaining or stone fragments less than 4 mm in size. ESWL was not performed in patients who had contraendications. Therefore, the patients with solitary kidney, urinary tract infection, stenosis distal to stone, staghorn stone, morbid obesity, cardiac pacemaker and bleeding diathesis, aortic aneurysm, and those using antiplatelet/anticoagulant agents was excluded to study naturally.
Success in ESWL was evaluated based on those who underwent up to 2 sessions.

Statistical Analysis

The data were analyzed with SPSS version 25.0. The stone-free status was correlated with patient characteristics and various stone features with the aid of t-test and Pearson's chi-squared test. Factors with a significant impact on success rate were further analyzed using multivariate analysis. A p value of less than 0.05 was accepted statistically significant.

RESULTS

A total of 489 patients who were taken to ESWL for ureteral stones were included in the study. Of the patients, 367 (74.90%) were male and 122 (25.10%) were female. 48.66% of the patients underwent ESWL on the right side and 51.34% on the left side. Requiring an additional procedure after 2 sessions of ESWL or remaining a fragment larger than 4 mm was considered a failure. In terms of stone size, the patients were evaluated in three groups as less than 10 mm, 10-15 mm and over 15 mm, according to the European Urology Guideline, and in terms of stone size. Stone-free status was not statistically significant in terms of age groups and gender parameters. Stone-free rates was calculated as 93% for proximal ureteral stones, 95.1% for distal ureteral stones, and 93.7% for total (Figure 1). Proximally and distally, stone-free localization was not statistically significant (p=0.371). Likewise, whether the stones were opaque or not was not statistically significant (p=0.839) (Table1). However, there was no statistical significance between the need for an additional procedure and proximal and distal ureteral stone location and stone size (p=0.869, p=0.201, respectively). As a complication, stone street developed in 3 patients and hematuria developed in 2 patients. No significance was found between complications and the location of the stones (p=0.531). There was a significance between stone size and stone-free status and the development of complications (p=0.016, p=0.0001, respectively) (Table 2).

As additional procedures, ureterorenoscopy, Double J stent (DJS) placement, and ureterolithotomy were performed. Stone street and hematuria were reported as complications in five patients.

Table 1. Success rates according to stone location and opacity

	opaque	nonopaque	p
Successful	93.7%	92.3%	0.839
Unsuccessful	6%	7.7%	

	proximal	distal	p
Successful	93%	95.1%	0.371
Unsuccessful	7%	4.9%	

Table 2. Success and complication rates according to stone size

	<10	10 20	15>	p
Complication	0.4%	0.9%	25%	0.0001
Noncomplicated	99.6%	99.1%	75%	

	<10	10 15	15>	p
Successful	95.8%	91.7%	75%	0.016
Unsuccessful	4.2%	8.3%	25%	

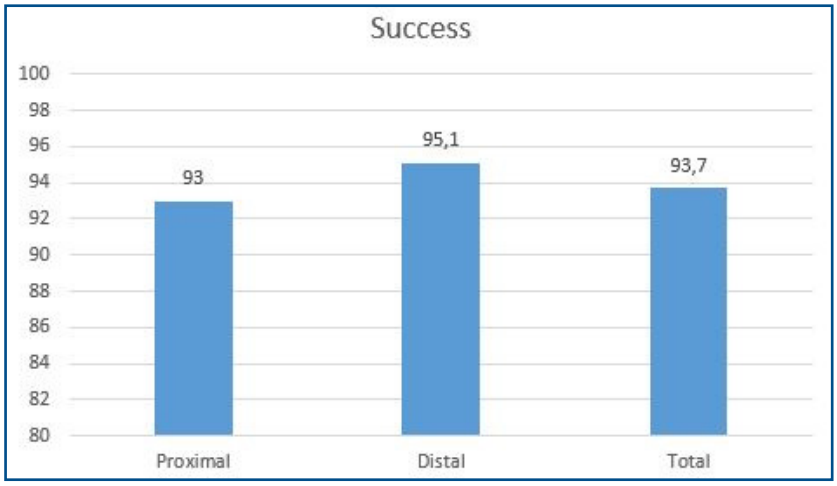

Figure 1. Success rate of localizations

DISCUSSION

Although optimal treatment planning for proximal ureteral stones is still a controversial issue due to advances in minimally invasive treatments, current guidelines still consider ESWL as the first treatment option. Because ESWL is a non-invasive and practical technique that is mostly applied without anesthesia (8). In our study, we showed that ESWL is still current procedure with its high success and low complication rates, the reason is, success in ESWL was evaluated based on those who underwent up to 2 sessions. In literature Alsmadi et al. underwent up to 2 sessions as our study (9). In distal ureteral stones, the success of the procedure decreases due to the inability to focus and effectively break due to the bone pelvis where the stone is located. However, in our study, although only one-third of the stones were distal ureteral stones, high success was achieved. Because we think that the reasons for this are every package program allowed contain up to maxiumum three sessions, high experience and equipment success due to the dense patient population. The success of emergency stone breaking and delayed breaking is similar in studies (8).

Antibiotic prophylaxis was not applied to the patients before the procedure. Studies have shown that antibiotic prophylaxis does not reduce fever and infection. In the guidelines, prophylactic antibiotics are not recommended (Recommendation A) (10).

In addition, DJS was not inserted in the patients before the procedure. In the guidelines, it is stated that DJS insertion does not affect stone-free and does not decrease complication rates. While there are studies showing low complication rates of URS (ureterorenoscopy), Lee et al. found a higher complication rate in the study of URS (11). Likewise, while there are studies showing high rates of hematuria after ESWL, there are also studies showing less hematuria after ESWL (12). In another study, voiding symptoms after treatment were higher in URS than in the ESWL group (13). Pain

rates were found to be significantly higher after URS in two studies (11,13). Studies have shown that ESWL is cost-effective (14). Although high stone-free rates are reported for URS, ESWL remains current due to low morbidity and complication rates (15,16). According to the Cochrane meta-analysis conducted in 2012, all complication rates were found to be lower in ESWL than URS (17). In studies, generally, evaluations with quality-of-life score and lower urinary system symptoms are not performed. However, lower urinary system symptoms are lower in ESWL and the quality-of-life score is higher in ESWL (13). Low complication rates were also reported in our study.

The most important factors in predicting the success of treatment are the size of the stone, stone location, density, obesity (stone-skin distance), congenital anomalies, and kidney failure. In their study, Perk et al. evaluated the three most important predictive factors as skin stone distance, stone composition, attenuation, and other factors as BMI (body mass), stone size, and stone location (18). In the study of Wiesenthal et al. to determine the success of treatment, found 60.3% success in ureteral stones in a single session. They evaluated BMI and stone size as predictive factors in predicting stone success (19). In the study of Kanao et al. found that the number of stones was a predictive factor in the success of ESWL (20). They also found that the highest success was in a single proximal ureteral stone less than 5 mm. In a few prospective studies, it was determined that BMI and stone density were effective in predicting treatment success (21).

Efiloğlu et al found the overall success rate of ESWL in ureteric stones 75%. They determined that the factors affecting the success of ESWL in ureteric stones were age and stone size (22).

According to the meta-analysis, the success rate in patients who underwent emergency ESWL was 78% (75-82%), success in proximal ureter stones was 79% (61-95), 78% (69-88) in the middle ureter and 79% (74-84) in the distal ureter they found (23).

The limitations of our study are that we counted the treatment package up to 2 sessions as success and did not consider patients who underwent ESWL for more than 2 sessions as unsuccessful because they required an additional procedure, which led to a high success rate. Most of patients include in our study had not CT scan those we could not study this parameter.

CONCLUSION

Despite the developments in the technology of endoscopic interventions in ureteral stones, ESWL is still the first treatment method for proximal ureteral stones according to the current European Urology guideline. In our study with large patient participation, we showed that ESWL is a method that can be safely preferred in ureteral stones with high success and low complication rates, and in our study, stone size was found to be an important predictive value in predicting success.

REFERENCES

1.Chaussy C, Brendel W, Schmiedt E. Extracorporeally induced destruction of kidney stones by shock waves. Lancet. 1980;2(8207):1265-1268. https://doi.org/10.1016/S0140-6736(80)92335-1

2.Bach C, Buchholz N. Shock wave lithotripsy for renal an ureteric stones. Eur Urol Suppl. 2011;10:423-432. https://doi.org/10.1016/j.eursup.2011.07.004

3. Akal HR. The role of extracorporeal shock wave lithotripsy in the treatment of upper ureteral stone disease. Thi-Qar Medical Journal. 2011;5(3):16-27. http://jmed.utq.edu.iq/index.php/main/article/view/263/344

4. Abe T, Akakura K, Kawaguchi M. et al. Outcomes of shockwave lithotripsy for upper urinary-tract stones: a large-

scale study at a single institution. J Endourol. 2005;19(7):768-773. https://doi.org/10.1089/end.2005.19.768

5. Shinde S, Al Balushi Y, Hossny M, Jose S, Al Busaidy S. Factors Affecting the Outcome of Extracorporeal Shockwave Lithotripsy in Urinary Stone Treatment. Oman Med J. 2018;33(3):209-217. https://doi.org/10.5001/omj.2018.39

6. Albala DM, Assimos DG, Clayman RV. et al. Lower pole I: a prospective randomized trial of extracorporeal shock wave lithotripsy and percutaneous nephrostolithotomy for lower pole nephrolithiasis-initial results. J Urol. 2001;166(6):2072-2080. https://doi.org/10.1016/S0022-5347(05)65508-5

7. Coz F, Orvieto M, Bustos M. et al. Extracorporeal shockwave lithotripsy of 2000 urinary calculi with the modulith SL-20: success and failureaccording to size and location of stones. J Endourol. 2000;14(3):239-246. https://doi.org/10.1089/end.2000.14.239

8. Turna B, Akbay K, Ekren F, et al. Comparative study of extracorporeal shock wave lithotripsy outcomes for proximal and distal ureteric stones. Int Urol Nephrol. 2008;40:23-9. https://doi.org/10.1007/s11255-007-9214-x

9.Alsmadi J. Role of Patient Age and Stone Density in Predicting Outcomes of Shockwave Lithotripsy in Lower Ureteral Stones. Med Arch. 2023;77(3):222-226. https://doi.org/10.5455/medarh.2023.77.222-226

10. Lu Y, Tianyong F, Ping H, Liangren L, Haichao Y, Qiang W. Antibiotic prophylaxis for shock wave lithotripsy in patients with sterile urine before treatment may be unnecessary: a systematic review and meta-analysis. J Urol. 2012;188:441. https://doi.org/10.1016/j.juro.2012.04.014

11. Lee YH, Tsai JY, Jiaan BP, Wu T, Yu CC. Prospective randomized trial comparing shock wave lithotripsy and ureteroscopic lithotripsy for management of large upper third ureteral stones. Urology. 2006;67:480-4. https://doi.org/10.1016/j.urology.2005.09.067

12. Karlsen SJ, Renkel J, Tahir AR, Angelsen A, Diep LM. Extracorporeal shockwave lithotripsy versus ureteroscopy for 5- to 10-mm Stones in the proximal ureter: prospective effectiveness patient-preference trial. J Endourol. 2007;21:28-33. https://doi.org/10.1089/end.2006.0153

13. Cui Y, Cao W, Shen H, et al. Comparison of ESWL and ureteroscopic holmium laser lithotripsy in management of ureteral stones. PLoS One. 2014;9:e87634. https://doi.org/10.1371/journal.pone.0087634

14. Zhang J, Shi Q, Wang GZ, Wang F, Jiang N. Cost-effectiveness analysis of ureteroscopic laser lithotripsy and shock wave lithotripsy in the management of ureteral calculi in eastern China. Urol Int. 2011;86:470-5. https://doi.org/10.1159/000324479

15. Assimos D, Krambeck A, Miller NL, et al. Surgical management of stones: American Urological Association/ Endourological Society Guideline. Part I J Urol. 2016;196:1153-60. https://doi.org/10.1016/j.juro.2016.05.090

16. Assimos D, Krambeck A, Miller NL, et al. Surgical management of stones: American Urological Association/ Endourological Society Guideline. Part II. J Urol. 2016;196:1161-9. https://doi.org/10.1016/j.juro.2016.05.090

17. Aboumarzouk OM, Kata SG, Keeley FX, McClinton S, Nabi G. Extracorporeal shock wave lithotripsy (ESWL) versus ureteroscopic management for ureteric calculi. Cochrane Database Syst Rev 2012:Cd006029. https://doi.org/10.1002/14651858.CD006029.pub3

18. Perks AE, Schuler TD, Lee J, et al.Stone attenuation and skin-to-stone distance on computed tomography predicts for stone fragmentation by shock wave lithotripsy. Urology. 2008;72:765-9. https://doi.org/10.1016/j.urology.2008.05.046

19.Wiesenthal JD, Ghiculete D, Ray AA, Honey RJ, Pace KT. A clinical nomogram to predict the successful shock wave lithotripsy of renal and ureteral calculi J Urol. 2011;186:556-62. https://doi.org/10.1016/j.juro.2011.03.109

20.Kanao K, Nakashima J, Nakagawa K,et al. Preoperative nomograms for predicting stone-free rate after extracorporeal shock wave lithotripsy. J Urol. 2006;176:1453-6. https://doi.org/10.1016/j.juro.2006.06.089

21. El-Nahas AR, El-Assmy AM, Mansour O, Sheir KZ. A prospective multivariate analysis of factors predicting stone disintegration by extracorporeal shock wave lithotripsy: the value of high-resolution noncontrast computed tomography. Eur Urol. 2007;51:1688-93. https://doi.org/10.1590/1806-9282.61.01.065

22.Efiloğlu Ö. , Çakıcı M. Ç. , Kazan H. Ö. , Keser F. , Yıldırım A. , Atis G. Böbrek ve üreter taşlarında ESWL başarısını öngörmede radyografik ve litotriptör parametrelerinin klinik önemi. Endourology Bulletin. 2021;13(3):78-8422.

23.Picozzi SC, Ricci C, Gaeta M, et al. Urgent shock wave lithotripsy as first-line treatment for ureteral stones: a metaanalysis of 570 patients. Urol Res. 2012;40:725-31. https://doi.org/10.1007/s00240-012-0484-0

Original Article
Özgün Araştırma

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Investigating the Influence of Tutukon and Alfuzosin on Stone Expulsion After Retrograde Intrarenal Surgery

Tutukon ve Alfuzosin'in Retrograd İntrarenal Cerrahi Sonrası Taş Ekspulsiyonu Etkisinin Araştırılması

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ÖZET

Amaç: Retrograd intrarenal cerrahi (RIRC) uygulanan hastalarda bir alfa-bloker (alfuzosin) ile bitkisel bir ajan olan "Tutukon®»un taşsızlık oranları üzerindeki etkilerini karşılaştırmak.

Gereç ve Yöntemler: Ocak 2020 ve Haziran 2020 tarihleri arasında RIRC uygulanan yetmiş beş hasta prospektif olarak değerlendirildi ve retrospektif olarak raporlandı. RIRC sonrası ilaçların taşsızlık oranları üzerindeki etkisini analiz etmek için hastalar üç gruba ayrıldı. Birinci gruba "Tutukon®», ikinci gruba alfuzosin 10 mg ve üçüncü gruba kontrol grubu olarak sadece deksketoprofen reçete edilmiştir. Hastalar ameliyatın dördüncü haftasından sonra taşsızlık oranları açısından tekrar değerlendirildi.

Bulgular: Gruplar (Tutukon®/Alfuzosin/Kontrol) arasında yaş (44.4 ±3.14/43.16 ±2.81/46.00±2.88), taş boyutu, taşın yeri ve ekstrakorporeal şok dalga litotripsi (ESWL) öyküsü açısından fark gözlenmedi (p>0.05). Ameliyat sonrası dördüncü haftada tam taşsızlık oranları; Grup 1 (Tutukon®) %96, grup 2 (alfuzosin) %84 ve grup 3 (kontrol) %76 (p=0.163) olup, Grup 1'deki taşsızlık oranı kontrol grubuna göre anlamlı derecede yüksekti (Grup 1 vs. 3; p= 0.044, Grup 2 vs. 3; p=0.363). Tamamen taşsız hastalar ve klinik olarak önemsiz rezidüel taşları olan hastalar değerlendirildiğinde gruplar arasında fark saptanmadı (p=0.234).

Sonuç: Tutukon® kullanımından elde edilen veriler, alfuzosinin tıbbi eksülsif tedavide kullanımına benzer sonuçlara sahip olup, endoskopik taş cerrahisi sonrası fragman atılmasında tercih edilebilecek bir fitoterapi yöntemi olabileceğini düşündürmektedir.

Anahtar Kelimeler: medikal ekspulsif tedavi, ürolitiyazis, bitkisel ajan, alfa bloker, retrograd intrarenal cerrahi

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ABSTRACT

Objective: To compare the effects of an alpha-blocker (alfuzosin) versus a herbal agent, "Tutukon®,» on stone-free rates in patients who underwent retrograde intrarenal surgery (RIRS).

Material and Methods: We evaluated seventy-five patients who underwent RIRS prospectively consecutively and reported retrospectively between January 2020 and June 2020. Patients were divided into three groups to analyze the effect of medications on stone-free rates after RIRS. "Tutukon®» was prescribed to the first group, alfuzosin 10 mg to the second group, and only dexketoprofen to the third group as the control group. The patients were re-evaluated for stone-free rates after the fourth week of surgery.

Results: Among the groups (Tutukon®/Alfuzosin/Control), no differences were observed in terms of age (44.4±15 .71/43.16±14.05/46.00±14.43), stone size, stone location and extracorporeal shock wave lithotripsy (ESWL) history (p>0.05). Complete stone-free rates at the fourth postoperative week; Group 1 (Tutukon®) was 96%, group 2 (alfuzosin) 84%, and group 3 (control) 76% (p=0.163), and the stone-free rate in Group 1 was significantly higher than that in the control group (Group 1 vs. 3; p= 0.044, Group 2 vs. 3; p=0.363). Evaluation of completely stone-free patients and patients with clinically insignificant residual stones showed no difference between the groups (p=0.234).

Conclusion: The data obtained from the use of Tutukon® have similar results to the use of alfuzosin in medical expulsive therapy, suggesting that it may be a preferred phytotherapy method for fragment expulsion after endoscopic stone surgery.

Keywords: medical expulsive treatment, urolithiasis, herbal agent, alfa blocker, and retrograde intrarenal surgery

INTRODUCTION

Retrograde intrarenal surgery (RIRS) has recently gained popularity for the endoscopic surgical treatment of kidney stones. Despite being a minimally invasive treatment method, RIRS can cause complications such as infection, bleeding, sepsis, and steinstrasse (especially stones > 2 cm) (1). Steinstrasse is seen in 2-10% of patients according to stone size. Twenty-three percent of patients with steinstrasse are asymptomatic, and conservative treatment is the first choice (2).

The aim of the medical treatment of ureteral stones is symptomatic relief, facilitating the passage of stones from the ureter and preventing recurrence. Medical expulsive therapy (MET) increases stone removal rates, decreases the time required for stone removal, reduces the need for analgesic use, and shortens the hospitalization time of patients (3). Additionally, MET is targeted to relax the smooth muscle structure of the ureter without disturbing the ureteral peristalsis, reduce the intensity and frequency of pain felt by the patient, and reduce edema and inflammation in the ureteral mucosa due to stones (4). Researchers have tested various drug options for MET, including nonsteroidal anti-inflammatory drugs, antimuscarinics, phosphodiesterase type-5 inhibitors, steroids, calcium channel blockers, and alfuzosins. Alpha-blockers are the most commonly preferred medical agents (5,6).

The smooth muscle in the distal 1/3 segment of the ureter is known to harbor alpha-1 receptors. Alpha receptor blockage inhibits basal smooth muscle cell tonus and hyperperistaltic wave frequency (6). Various studies have shown that alpha-blockers accelerate stone excretion and facilitate stone passage by causing relaxation of the smooth muscles of the ureteral wall (7,8).

For over two decades, plant-derived terpenes have been employed in ureteral stones medical treatment (9,10). Many patients prefer traditional herbal agents (11,12). Tutukon® is a plant-derived herbal agent that consists of phytosterols, flavonoids, polysaccharides, terpenes, and flavone glycosides. Due to their antioxidant, anti-inflammatory, diuretic, muscle-relaxing, antibacterial, and kidney-protective effects, herbal agents are used in profilaxis of calcium oxalate stones. These herbal agents reduces the excreation of calcium and oxalate in the urine (13).

The current study aimed to compare the effects of alfuzosin versus "Tutukon®" as a herbal agent on stone-free rates in patients who underwent RIRS.

MATERIAL AND METHODS

Study Participants

Data from 75 patients who underwent RIRS between January and June 2020 were collected in a prospective, consecutive manner as part of a systematically designed database. The outcomes were then analyzed and reported retrospectively. Patients were included in the groups in order (1:1:1). Routine hematological and biochemical examinations (serum urea, creatinine, hemoglobin, platelet count, and coagulation tests), urinalysis, and urine culture were performed before surgery. Preoperatively, kidney-ureter-bladder (KUB) and non-contrast abdominal computed tomography (NCCT) were conducted.

Patient age, stone size, stone location, previous stone surgery, and extracorporeal shock wave lithotripsy (ESWL) histories were recorded. This study included patients aged 18 years or above, whose stone size was > 7 mm, with a Hounsfield Unit of 800 or higher, and with visible stones in the KUB, or those with a history of unsuccessful ESWL The study excluded patients who had ureteral stone, were either younger than 18 years or older than 75 years, had elevated levels of urea-creatinine, had a significantly enlarged prostate, reported adverse effects from medication or declined to use medication, had a double-j catheter, had kidney anomalies (e.g. ectopic kidney, horseshoe kidney), had posture disorders, had ureteral stenosis, or had a previous history of stone removal or stone surgery. Patients in whom ureteral access sheath (UAS) could not be placed during surgery were also excluded from the study.

Tutukon® (herbal agent, Laboratorio Miguel&Garriga, S.A. Barcelona, Spain) (3 × 20 ml) was prescribed to the first 25 patients (Group 1) who underwent RIRS as medical expulsive therapy, and alfuzosin (10 mg) was started in the second 25 patients (Group 2). The third 25 patients (Group 3) were included in the study as the control group, and only analgesic treatment (dexketoprofen) was suggested. All patients received existing treatments for four weeks.

Operative Procedure

Two similarly experienced surgeons performed the operative procedures. All operations were performed using a 7.5 Fr fiber-optic flexible ureteroscope (Storz Flex-X2, Tuttlingen, Germany), 9.5/11.5 Fr (Cook, Blooming, USA) UAS and a 0.038-inch hydrophilic guidewire. Standard RIRS was performed under C-arm fluoroscopy in both the groups. Under general anesthesia, following diagnostic ureteroscopy with a rigid ureterorenoscope, dual guidewires were placed into the renal pelvis in lithotomy position. Subsequently, the UAS was placed under fluoroscopy. Stones were fragmented with low power holmium: yttrium–aluminum–garnet (Ho: YAG) laser (200 µm Ho: YAG laser fiber, long pulse 0.4-0.6 J/15-20 Hz for dusting ; short pulse 0.8-1 J/10-15 Hz for fragmentation). Basket catheters were not used for the stone extraction. A 4.8 Fr, 26 cm double J stent was placed in all patients either after the RIRS procedure or in cases where it could not be inserted UAS prior to RIRS. The Double-J stent was removed in the fourth week post-operative.

Evaluation of the Stone Clearance

The KUB, urinary system ultrasonography (US), and NCCT were utilized to evaluate the stone-free rates of patients in the fourth-week post-surgery. Stone clearance was examined using KUB and US in all patients. When residual stone or hydronephrosis was detected by US and KUB, we confirmed the presence of stone by NCCT. Additionally, patients were recorded based on stone-free status and clinically insignificant residual stones. Patients with stones less than 4 mm and without any dilatation, urinary tract infection or pain were considered to have clinically insignificant stones (14).

Statistical Analyses

"SPSS 22 for Windows" was used for statistical calculations. Descriptive statistics for numerical data included mean and standard deviation, while categorical data were expressed as percentages and counts. Normality of the data was assessed using the Shapiro-Wilk test. The chi-square distribution test was used to compare categorical data, and the Mann-Whitney U test was employed for non-normally distributed quantitative data. When comparing more than two groups, the Kruskal-Wallis analysis of variance was utilized. The 95% confidence interval ($p<0.05$) was also considered statistically significant.

RESULTS

When the mean age of the patients in Group 1 (Tutukon®) and Group 2 (alfuzosin) (44.4±15.71 vs. 43.16±14.05) were compared with the control group (Group 3) (46.00±14.43), no significant differences were observed (p=0.771). Similarly, no statistically significant differences were observed between Group 1 (Tutukon®), Group 2 (alfuzosin), and the Group 3 in terms of mean stone size, stone location, and ESWL history **(**respectively p=0.189, p=0.694, p=0.177**) (Table 1).**

Table 1. Comparison of demographic data of patients

	Group 1 (Tutukon), n=25	Group 2 (Alfuzosin), n=25	Group 3 (Control), n=25	p
Age(year) Min-Max Median	44.4 (20-75) 42	43.16 (18-72) 39	 (21-74) 46	0.771
ESWL (n), (%)	6 (24%)	7 (28%)	12 (48%)	0.177
Stone size (mm) Median	 (7-35) 15	 (6-40) 15	 (7-48) 20	0.189
Stone location (n), (%)	pelvis: 19 (76%) multiple calyces: 6 (24%)	pelvis: 18 (72%) multiple calyces : 7 (28%)	pelvis: 21 (84%) multiple calyces : 4 (16%)	0.694

SD: standart deviation, **mm:** milimetres, **n:** number of patients, **ESWL:** Extracorporeal shock wave litotripsy

Complete stone-free rates were 96% in Group 1 (Tutukon®), 84% in Group 2 (alfuzosin), and 76% in Group 3 (control) at the fourth postoperative week (p=0.163) **(Table 2).** When the groups were compared, the stone-free rate in Group 1 was statistically significantly higher than in the control group (Group 1 vs. Group 3; p=0.044). However, there was no statistically significant difference between Group 2 and the control group (Group 2 vs. Group 3; p=0.484).

Three (12%) patients in Group 2 and 3 had clinically insignificant residual stones. When completely stone-free patients and those with clinically insignificant residual stones were evaluated, no difference was observed between the groups (p=0.234) **(Table 2).**

Table 2. Comparison of the stone-free data of the patients

Residue stone	Group1 (Tutukon), n=25	Group2 (Alfuzosin), n=25	Group3 (Control), n=25	p
Completely stone-free (n), (%)	24 (%96)	21 (%84)	19 (%76)	0.163
Clinically insignificant residual stone (n), (%)	0	3 (%12)	3 (%12)	0.234

n: number of patients, **ESWL:** extracorporeal shock wave lithotripsy, mm: millimeters

Postoperative complications were evaluated using the modified Clavien-Dindo classification. Fever requiring postoperative antipyretic treatment was observed in one patient in Group 1 and two in Group 3. No adverse effects were observed due to the use of Tutukon® in Group 1. Two patients in Group 2 experienced hypotension and fatigue due to the use of an alfuzosin; however, no cessation of the medication was necessary, and symptoms regressed after rest and increased fluid intake (p=0.769). Urinary tract infections were detected in one patient in Group 1 and one patient in Group 2 (p=1), and those patients were treated with appropriate antibiotics according to urine culture. Two patients in Group 3 had steinstrasse and needed a re-operation, while the Double-J stent was removing (p=0.324).

DISCUSSION

This study evaluates stone expulsion rates after RIRS with Tutukon®, alfuzosin, and control groups. It is the first study to show the stone expulsion rate with a herbal agent. The Tutukon® group had higher stone expulsion rates than the alfuzosin and control groups. This difference was statistically significant compared to the control group (p=0.044).

Ho: YAG laser is a widely used method for laser lithotripsy. It is considered the gold standard method for lithotripsy because it effectively and safely breaks stones of all compositions and volumes. Considering studies comparing high-power Ho: YAG lasers and low-power lasers in recent years, it has been determined that there is no difference between the stone-free rates, although the operation times and laser usage times are shorter in high-power devices (15,16). In the present study, stones were fragmented using a low-power Ho: YAG laser. The stones were fragmented in dusting mode (dusting setting 0.4-0.6 J/15-20 Hz). A short pulse of 0.8-1 J/10-15 Hz energy was used to fragment hard stones that could not be fragmented in the dusting mode. After the stone fragments were reduced to less than 2 mm, fragmentation was terminated. A basket catheter was not used for stone extraction in any of the patients.

Fragment expulsion after RIRS is critical. Patients and physicians have tried many herbal agents for this purpose owing to their diuretic, antispasmodic, and anti-urolithic effects (9,12). However, precise data on the duration and doses of these agents are yet to be determined. Therefore, our study investigated the effect of "Tutukon®," a herbal agent, on stone-free rates.

Currently, there is no validated protocol or gold-standard method for evaluating residual stones after lithotripsy. NCCT is the gold standard method for demonstrating the presence of residual stones after surgery. However, radiation exposure confuses its use (17). Although approximately 90% of stones are opaque, using KUB alone after lithotripsy is insufficient to show stones less than 2 mm (18). The use of US alone is considered to have lower sensitivity and specificity than NCCT, especially in the absence of hydronephrosis in detecting stones less than 4 mm (19). Catalano et al. compared the combined use of US and KUB with NCCT and showed that the sensitivity of NCCT was higher (92% vs. 77%), as well as the negative predictive value (87% vs. 68%) and overall accuracy (94% vs. 83%) (20). In the present study, we used KUB and US together to determine the post-operative stone-free rates. In cases accompanying hydronephrosis or in patients where residual stones were detected through ultrasound and KUB, the presence of residual stones was confirmed with non-contrast abdominal computed tomography (NCCT).

In a study by Öztürk et al., each physician completed an 11-question form at a relevant clinic to learn about the approaches of 106 urology residents and specialists to ureteral stones. Of the physicians participating in the study, 83% reported using anti-inflammatory analgesics for MET, 90% preferred alpha-blockers, and 5% preferred corticosteroids (21). In a meta-analysis reported by Sharma et al., thirty-one studies were examined. In the study's primary outcome, it was observed that alpha-receptor blockers led to a significant enhancement in the rate of ureteral stone expulsion. Secondary outcome measurements have shown that alpha-receptor blockers increase expulsion of stones, especially those greater than 5 mm, localized in the distal ureter, and shorten the time of stone clearance. This effect has not been demonstrated in stones located in the proximal and middle ureters or those smaller than 5 mm (22). A meta-analysis of randomized controlled studies conducted by Alsaikhan et al. showed that stone-free rates

increased in patients who required ureteroscopy for ureteral stones after alpha-blockers were started preoperatively and continued to be used for four weeks (23).

The concentrations of calcium and oxalate in urine are pivotal factors in the crystallization of stones. Consequently, medications that diminish the urinary excretion of these ions can effectively hinder the genesis and deposition of stone crystals (24). Moreover, alongside the utilization of these pharmaceutical agents, recent findings unequivocally indicate the rising significance of herbal remedies as an efficacious alternative for mitigating the often underestimated toxic effects induced by certain drugs, which may lead to morphological and functional alterations in various organ systems (25). Phytotherapy can be used to ease the toxic effects of these drugs. Research has demonstrated that the majority of phytotherapeutic compounds possess diuretic, anti-inflammatory, antioxidant, vasodilatory, and spasmolytic properties. Essential oils, flavonoids, saponins, xanthine derivatives, and glycosides have been identified as the key active constituents responsible for these specific effects (26,27).

In the study conducted by Yuruk et al., the investigation centered on the impact of Tutukon® on the calcification of zinc disks implanted in the rats bladder. Over a four-week period, they assessed the weights of these zinc disks on days 7, 14, and 28. Their findings indicated that Tutukon® led to a significant reduction in calcification (p=0.275) (28). In the research with rats conducted by Şahin et al.,revealed that Tutukon® administration effectively prevented or mitigated the emergence of apoptotic changes in the renal tubular epithelium, both in the early (14th day) and late (28th day) stages of the study. Moreover, when they evaluated animals given Tutukon® subsequent to the induction of hyperoxaluria, they demonstrated the drug's protective influence on the presence and severity of crystal formation, which was significantly reduced in the Tutukon®-administered group (p=0.031) (29).

A study conducted with some plant extracts in Tutukon® showed that the phytotherapeutic agent used in the patient group treated with endourological methods facilitated the removal of stone fragments and prevented new stone formation (21). Additionally, a review of herbal agents used in patients with kidney disease in Morocco mentioned that Rosmarinus officinalis improves oxonate-induced renal damage in hyperuricemia, and Herniaria hirsuta prevents calcium oxalate and cystine stone formation (30).

No studies have been found in the literature on the use of Tutukon® for MET. In our study, Tutukon® was used for the first time in terms of the kidney stone-free rate, and it was observed that the stone-free rate increased with Tutukon®. Additionally, fragment expulsion after RIRS was higher than in patients without treatment (p=0.047). Although its mechanism of action has not yet been clearly clarified, the data obtained with Tutukon® suggest that it may be a preferred phytotherapy method in medical expulsive treatment and in terms of fragment expulsion after endoscopic stone surgery.

The study's main limitations are the limited sample size and, although not statistically significant, stone size and previous ESWL history differed between groups. Again, although the study was designed prospectively, the fact that it was written in a retrospective nature can be considered another limitation of the study. Despite this, the current study can lead to further studies as a pilot study.

CONCLUSION

In our study, it is believed that Tutukon®, a herbal agent, increased the rates of complete stone clearance after RIRS due to its diuretic and litholytic active metabolities. The main benefit of Tutukon® is that herbal treatment yields similar outcomes to medications. Furthermore, the patient's adherence to the treatment is also improved since it is an herbal agent with minimal side effects.

Conflict of İnterest: The authors have no conflicts of interest to declare.

Statement of Ethics: All procedures involving human participants were performed in accordance with the ethical standards of the Institutional and local Scientific Research ethics committees and with the 1964 Helsinki Declaration. Upon recruitment, each patient provided written informed consent. Ethics committee approval was received for this study from the ethics committee of Gaziantep University (decision no: 2022/249).

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REFERENCES

1. Benson DA, Maxwell RM, Poeter E, et al. EAU guidelines on urolithiasis. European Association of Urology. 2019;49(1):1-88.
2. Soyupek S, Armağan A, Koşar A, et al. Risk factors for the formation of a steinstrasse after shock wave lithotripsy. Urologia internationalis. 2005;74(4):323-5. https://doi.org/10.1159/000084431
3. Amer T, Osman B, Johnstone A, et al. Medical expulsive therapy for ureteric stones: Analysing the evidence from systematic reviews and meta-analysis of powered double-blinded randomised controlled trials. Arab journal of urology. 2017;15(2):83-93. https://doi.org/10.1016/J.AJU.2017.03.005
4. Tao RZ, Qin ZQ, Liu F De, et al. Efficacy and Safety of Tamsulosin in the Medical Expulsion Therapy for Distal Ureteral Calculi: A Systematic Review and Meta-Analysis of Placebo-Controlled Trials. Urology journal. 2019;16(3):224-31. https://doi.org/10.22037/UJ.V0I0.4758
5. Somani BK, Aboumarzouk O, Traxer O, et al. Medical expulsive therapy for ureteral stones: where do we go from here? Nature reviews Urology. 2016;13(10):608-12. https://doi.org/10.1038/NRUROL.2016.146
6. Celik S, Akdeniz F, Yildirim MA, et al. Tadalafil versus alpha blockers (alfuzosin, doxazosin, tamsulosin and silodosin) as medical expulsive therapy for. Archivio italiano di urologia, andrologia : organo ufficiale [di] Societa italiana di ecografia urologica e nefrologica. 2018;90(2):117-22. https://doi.org/10.4081/AIUA.2018.2.117
7. Koski RR, Zufall WH. Efficacy and Safety of Alpha-Blockers for Kidney Stones in Adults. The Journal of pharmacy technology : jPT : official publication of the Association of Pharmacy Technicians. 2018;34(2):54-61. https://doi.org/10.1177/8755122517750398
8. Liu XJ, Wen JG, Wan YD, et al. Role of silodosin as medical expulsive therapy in ureteral calculi: a meta-analysis of randomized controlled trials. Urolithiasis. 2018;46(2):211-8. https://doi.org/10.1007/S00240-017-0974-1
9. Khan A, Bashir S, Khan SR. Antiurolithic effects of medicinal plants: results of in vivo studies in rat models of calcium oxalate nephrolithiasis-a systematic review. Urolithiasis. 2021;49(2):95-122. https://doi.org/10.1007/S00240-020-01236-0
10. Alyaev YG, Rudenko VI, Perekalina AN, et al. [Plant-derived terpenes in treating patients with urolithiasis]. Urologiia (Moscow, Russia :1999). 2016;(2 Suppl 2):103-10.
11. Gürocak S, Küpeli B. Consumption of historical and current phytotherapeutic agents for urolithiasis: a critical review. The Journal of urology. 2006;176(2):450-5. https://doi.org/10.1016/J.JURO.2006.03.034
12. Nirumand MC, Hajialyani M, Rahimi R, et al. Dietary plants for the prevention and management of kidney stones: Preclinical and clinical evidence and molecular mechanisms. International Journal of Molecular Sciences. 2018;19(3). https://doi.org/10.3390/ijms19030765

13. Atmani F, Slimani Y, Mimouni M, et al. Prophylaxis of calcium oxalate stones by Herniaria hirsuta on experimentally induced nephrolithiasis in rats. BJU international. 2003;92(1):137-40. https://doi.org/10.1046/J.1464-410X.2003.04289.X

14. Rassweiler JJ, Renner C, Eisenberger F. The management of complex renal stones. BJU international. 2000;86(8):919-28. https://doi.org/10.1046/J.1464-410X.2000.00906.X

15. Shrestha A, Corrales M, Adhikari B, et al. Comparison of low power and high power holmium YAG laser settings in flexible ureteroscopy. World Journal of Urology. 2022;40(7):1839-44. https://doi.org/10.1007/s00345-022-04040-0

16. Ventimiglia E, Pauchard F, Quadrini F, et al. High- and Low-Power Laser Lithotripsy Achieves Similar Results: A Systematic Review and Meta-Analysis of Available Clinical Series. Journal of endourology. 2021;35(8):1146-52. https://doi.org/10.1089/END.2020.0090

17. Prezioso D, Barone B, Di Domenico D, et al. Stone residual fragments: A thorny problem. Urologia Journal. 2019;86(4):169-76. https://doi.org/10.1177/0391560319860654

18. Cheung MC, Leung YL, Wong BBW, et al. Prospective study on ultrasonography plus plain radiography in predicting residual obstruction after extracorporeal shock wave lithotripsy for ureteral stones. Urology. 2002;59(3):340-3. https://doi.org/10.1016/S0090-4295(01)01584-9

19. Resorlu B, Kara C, Resorlu EB, et al. Effectiveness of ultrasonography in the postoperative follow-up of pediatric patients undergoing ureteroscopic stone manipulation. Pediatric Surgery International. 2011;27(12):1337-41. https://doi.org/10.1007/s00383-011-2979-0

20. Catalano O, Nunziata A, Altei F, et al. Suspected ureteral colic: primary helical CT versus selective helical CT after unenhanced radiography and sonography. AJR American journal of roentgenology. 2002;178(2):379-87. https://doi.org/10.2214/AJR.178.2.1780379

21. Öztürk MI, Gürbüz C, Koca O, et al. Current situation of ureteral stone diagnosis and treatment: A cross-sectional survey from Istanbul. Turk Uroloji Dergisi. 2010;36(2):125-31. https://doi.org/10.5152/tud.2010.005

22. Sharma G, Pareek T, Kaundal P, et al. Comparison of efficacy of three commonly used alpha-blockers as medical expulsive therapy for distal ureter stones: A systematic review and network meta-analysis. International braz j urol : official journal of the Brazilian Society of Urology. 2022;48(5):742-59. https://doi.org/10.1590/S1677-5538.IBJU.2020.0548

23. Alsaikhan B, Koziarz A, Lee JY, et al. Preoperative Alpha-Blockers for Ureteroscopy for Ureteral Stones: A Systematic Review and Meta-Analysis of Randomized Controlled Trials. Journal of endourology. 2020;34(1):33-41. https://doi.org/10.1089/END.2019.0520

24. Dawson CH, Tomson CRV. Kidney stone disease: pathophysiology, investigation and medical treatment. Clinical medicine (London, England). 2012;12(5):467-71. https://doi.org/10.7861/CLINMEDICINE.12-5-467

25. Kasote DM, Jagtap SD, Thapa D, et al. Herbal remedies for urinary stones used in India and China: A review. Journal of ethnopharmacology. 2017;203:55-68. https://doi.org/10.1016/J.JEP.2017.03.038

26. Aggarwal A, Singla SK, Tandon C. Urolithiasis: phytotherapy as an adjunct therapy. Indian journal of experimental biology. 2014;52(2):103-11.

27. Garbens A, Pearle MS. Causes and prevention of kidney stones: separating myth from fact. BJU international. 2021;128(6):661-6. https://doi.org/10.1111/BJU.15532

28. Yuruk E, Tuken M, Sahin C, et al. The protective effects of an herbal agent tutukon on ethylene glycol and zinc disk induced urolithiasis model in a rat model. Urolithiasis. 2016;44(6):501-7. https://doi.org/10.1007/S00240-016-0889-2

29. Sahin C, Sarikaya S, Basak K, et al. Limitation of apoptotic changes and crystal deposition by Tutukon following hyperoxaluria-induced tubular cell injury in rat model. Urolithiasis. 2015;43(4):313-22. https://doi.org/10.1007/S00240-015-0777-1

30. Noureddine B, Mostafa E, Mandal SC. Ethnobotanical, pharmacological, phytochemical, and clinical investigations on Moroccan medicinal plants traditionally used for the management of renal dysfunctions. Journal of Ethnopharmacology. 2022;292:115178. https://doi.org/10.1016/J.JEP.2022.115178

Original Article
Özgün Araştırma

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Emergency Placed Percutaneous Nephrostomy Catheter Provides Safe and Effective Access for Future Percutaneous Nephrolithotomy Operation

Acil Durumda Yerleştirilen Perkütan Nefrostomi Kateteri Gelecekteki Perkütan Nefrolitotomi Operasyonu İçin Güvenli ve Etkili Erişim Sağlar

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ÖZET

Amaç: Acil durumlarda yerleştirilen perkütan nefrostomi (PCN) kateterinin gelecekteki perkütan nefrolitotomi (PNL) operasyonunda kullanılabilirliğinin araştırılması amaçlandı.

Gereç ve Yöntemler: Ocak 2013 ile Aralık 2018 tarihleri arasında PNL ameliyatı öncesinde acil durumlarda girişimsel radyolog tarafından PCN kateteri takılan hastalar çalışmaya dahil edildi. Demografik özellikler, PCN takılma endikasyonu, taş özellikleri, ameliyat öncesi ve sonrası laboratuvar değerleri, ameliyat sırasındaki veriler, PCN kateterinin renal erişim için kullanılabilirliği/kullanılamazlığı, ameliyat sonrası veriler ve komplikasyonlar kaydedildi.

Bulgular: Çalışmaya toplam 32 hasta dahil edildi. (PCN kullanılabilir: 21, kullanılamaz: 11). Kateter takılma endikasyonu 26 (%81,25) hastada obstrüksiyon, 6 (%18,75) hastada ise idrar yolu enfeksiyonuydu. PNL sırasında 21 (%65,62) hastada PCN kateter yolu kullanılarak renal erişim sağlandı. En yaygın PCN erişimi alt kutuptan kullanıldı. On bir (%34,37) hastada PCN traktı erişim için elverişli değildi. Kaliksin giriş için uygun olmaması nedeniyle PCN'nin kullanılamadığı hastalarda en sık yeni erişim yeri 6 hastada alt kaliks, 3 hastada üst kaliks ve 2 hastada orta kaliks oldu. PCN kateterinin PNL erişimi için kullanılabilir olduğu ve kullanılamadığı iki grup arasında ortalama hastanede kalış süresi dışında (p=0.039) istatistiksel olarak anlamlı fark yoktu (p>0,05).

Sonuç: PNL ameliyatı öncesinde yerleştirilen PCN kateterleri, ameliyat sırasında renal erişim amacıyla etkin ve güvenli bir şekilde kullanılabilir. Ancak acil durumlarda, ileride ameliyat olacak hastalarda PCN kateterinin uygun kaliksten yerleştirilmesi önemlidir.

Anahtar Kelimeler: nefrolitotomi, perkütan nefrostomi, böbrek erişimi, girişimsel radyoloji, taş

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ABSTRACT

Objective: It was aimed to investigate the feasibility of the percutaneous nephrostomy (PCN) catheter placed in an emergency in the future percutaneous nephrolithotomy (PNL) operation.

Material and Methods: Patients who underwent PCN catheter insertion by an interventional radiologist under emergency situations prior to PNL surgery between January 2013 and December 2018 were included in the study. Demographic characteristics, indication for PCN insertion, stone characteristics, pre- and post-operative laboratory values, intra-operative data, usability/non-usability of PCN catheter for renal access, post-operative data and complications were recorded.

Results: A total of 32 patients were included in the study. (PCN usable: 21, unusable: 11). Indications for catheter insertion were obstruction in 26 (81.25%) patients and urinary tract infection in 6 (18.75%) patients. Renal access was achieved in 21 (65.62%) patients by using the PCN catheter tract during PNL. The most common PCN access was used in the inferior pole. In 11 (34.37 %) patients, the PCN tract was not usable for access. In patients in whom PCN was unusable due to an unsuitable calyx for access, the most common new access site was the inferior calyx in 6 patients, the superior calyx in 3 patients and the middle calyx in 2 patients. There was no statistically significant difference between the two groups in which the PCN catheter was usable and unusable for PNL access ($p>0.05$), except for the mean length of hospital stay ($p=0.039$).

Conclusions: PCN catheters inserted prior to PNL surgery can be used effectively and safely for renal access during surgery. However, in emergency cases, it is important that the PCN catheter is inserted through the appropriate calyx in patients undergoing future surgery.

Keywords: nephrolithotomy, percutaneous nephrostomy, renal access, interventional radiology, stone

INTRODUCTION

Percutaneous nephrolithotomy (PNL) is currently the preferred method for the treatment of complex kidney stones larger than 2 cm (1). The most important step of the procedure is to provide appropriate renal access with minimal complications (2). The access is performed intraoperatively by an interventional radiologist or an endourologist depending on the experience of the clinic and the surgeon (3). In addition to intraoperative renal access, PCN catheters previously placed for acute urinary obstruction, pyelonephritis and acute renal failure can be used for renal access.

There are studies in the literature comparing data from patients who had a PCN catheter placed prior to PNL surgery with patients who had renal access during surgery. The availability of a PCN catheter preoperatively may have some advantages, but it may not always be possible to use this tract for renal access (4-6). A limited number of studies have investigated the availability of renal access in patients with previous PCN catheter placement in emergency situations (7-9).

The aim of this study was to investigate the intraoperative usability of the present tract in patients undergoing emergency PCN catheter insertion by the interventional radiologist prior to PNL surgery and the factors influencing this.

MATERIALS AND METHODS

After obtaining approval from the local ethics committee (University of Health Sciences, Bakırkoy Dr. Sadi Konuk Training and Research Hospital, 483 /16 November 2020), patients who underwent PNL surgery between January 2013 and December 2018 at the University of Health Sciences, Bakırkoy Dr. Sadi Konuk Training and Research Hospital were retrospectively reviewed. Patients over 18 years of age who had a preoperative PCN catheter inserted by an interventional radiologist in an emergency situation were included in the study. Patients who had a PCN catheter inserted during PNL and received a catheter for the second session of PNL surgery, patients with planned PCN placement, and patients with missing or irregular study data were excluded from the study. Two patients who had

undergone preoperative PCN placement by an interventional radiologist for retrorenal colon, three patients who had retained a catheter for the second session of a previous PNL procedure, and two patients with missing data were excluded from the study. Finally, 32 patients who fulfilled the study criteria were included in the study. Patients were divided into 2 groups, group 1: usable preoperative PCN catheters and group 2: unusable PCN catheters.

Demographic characteristics, pre-operative and post-operative laboratory values, stone characteristics, intra-operative data, indication for PCN catheter insertion, use/non-use of PCN catheter for renal access, post-operative data and complications were recorded. Complications were classified according to the Clavien-Dindo classification system (10).

PCN Catheter Insertion: Under local anesthesia or intravenous sedation, the pelvicalyceal system was entered with an 18 G needle under US and fluoroscopic guidance. After 8F dilatation over the guidewire, a 10F drainage catheter was inserted into the collecting system. All PCN catheters were inserted by an experienced interventional radiologist. Use of PCN catheter: A 5.0F retrograde straight ureteral catheter was placed in all patients except those with transplanted kidneys and skeletal anomalies. The collecting system was opacified by the administration of radiopaque material through the nephrostomy and/or straight ureteral catheter. The sensor guide in the PCN catheter was inserted into the collecting system. After removal of the PCN catheter, access to the renal system was obtained by Amplatz dilation over the guide.

Statistical analysis: Categorical variables were presented as numbers and percentages, and continuous variables were presented as means and standard deviations. The normal distribution of continuous variables was assessed using the Shapiro-Wilk test. The Student t-test was used to compare the means of two independent groups with normal distribution, and the Mann-Whitney U test was used to compare the means of two groups without normal distribution. Pearson chi-square and Fisher's exact test were used to compare the frequencies of categorical variables. $P < 0.05$ was considered statistically significant.

RESULTS

Seventeen patients were male and 15 were female. The mean age was 41.31±17.8 (5-72) years. The mean BMI was 24.6 ± 3.75 kg/m2. Stone location was the left kidney in 14 patients, the right kidney in 16 patients and the right pelvic transplanted kidney in 2 patients. The most common stone location was the renal pelvis. The mean stone size was 2.64 ± 0.82 mm, the mean stone-to-skin distance was 8.65 ± 2.63 cm and the mean Hounsfield unit (HU) was 1101 ± 340 IU. Demographic and stone characteristics of the patients are summarised in Table 1.

Indications for preoperative PCN placement were obstruction (hydronephrosis, acute renal failure) in 26 (81.25%) patients and urinary tract infection (pyelonephritis, pyonephrosis, urosepsis) in 6 (18.75%) patients. The most common preoperative PCN catheter location was the inferior calyx (n: 14, 43.8%). In 21 patients (65.62%) renal access was achieved using the previous PCN tract during PNL (Figure 1.). In two of these patients, the PNL procedure was performed on the transplanted kidney and in one patient on the horseshoe kidney. The average duration of the nephrostomy catheter until the PNL operation was calculated as 10.55 ± 4.65 days. There were 11 patients in whom the previous PCN tract was unsuitable for access. The reasons for the unsuitability of the current tract in these patients were as follows: in 7 patients the calyx was not suitable for stone access (Figure 2), in 2 patients the PCN catheter was placed directly in the renal pelvis, in 1 patient the guidewire could not be advanced due to calcification of the PCN catheter and in 1 patient the PCN tract was not suitable for dilatation due to infundibular access (Table 2). In patients in whom the PCN catheter was unusable due to unsuitability for stone access, the new access site was the inferior calyx in 6 patients, the superior calyx in 3 patients and the middle calyx in 2 patients.

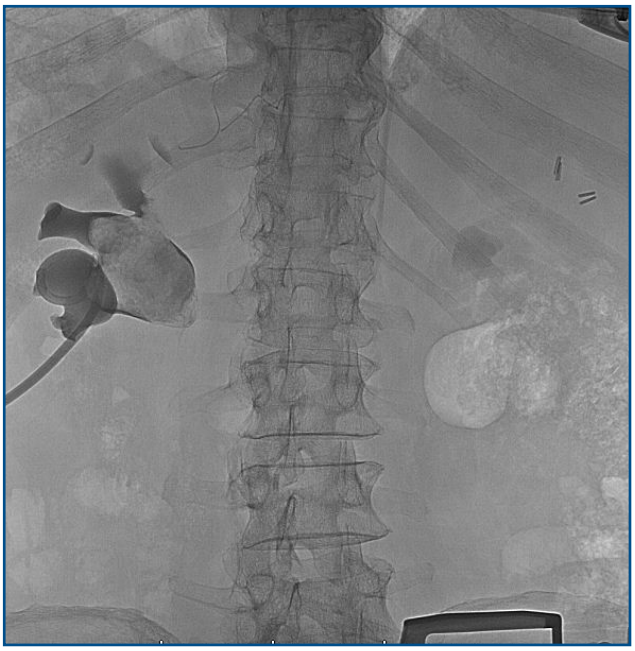

Figure 1. Usable inferior calyx nephrostomy catheter

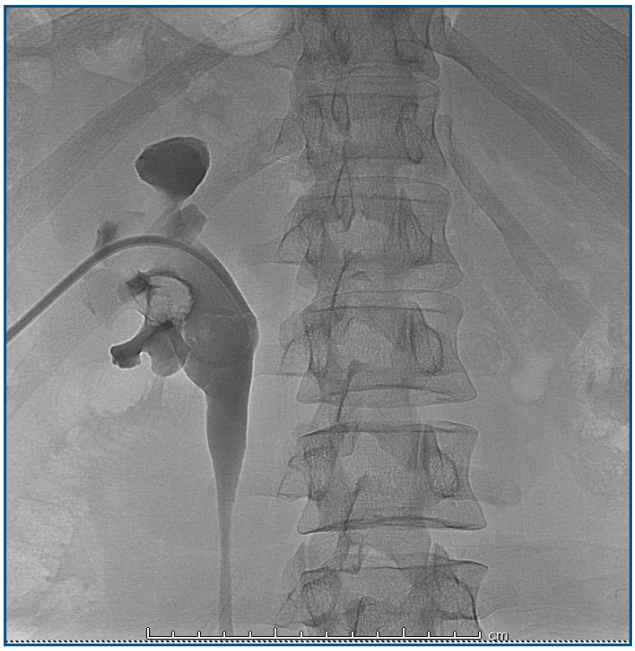

Figure 2. Unusable superior calyx nephrostomy catheter, new tract created from the inferior calyx

There was no statistically significant difference between the groups in terms of demographics and stone characteristics (p>0.05). There was no statistically significant difference in mean operative time between the two groups (p: 0.979). The mean length of hospital stay was shorter in the nephrostomy catheter tract-usable patient group (3.52 ± 1.12 vs 6.36 ± 4.69, p=0.039). There were Clavien grade 1 complications including transient fever in 2 patients and serum creatinine increase in 1 patient in group 1 and Clavien grade 1 complications including transient fever in 3 patients in group 2. There was one bleeding requiring blood transfusion in group 1 and Clavien grade 2 complications including persistent fever in 3 patients in group 2. Both groups had grade 3 complications requiring postoperative D-J catheter insertion. Although higher complication rates were observed in group 1, there was no statistically significant difference. The postoperative stone-free rate was 71.4% in group 1 and 63.6% in group 2 and there was no statistically significant difference between the groups. Pre- and post-operative data are shown in Table 3.

Table 1. Demographic data and clinical characteristics of the whole study population

Mean age ± SD, (years) Median (IQR)	41.3 ± 17.8 43.5 (5-72)
Mean BMI ± SD, kg/m2 Median (IQR)	24.6 ± 3.75 24.8 (17-35)
Gender, n (%) Male Female	 17 (53.1) 15 (46.9)
ASA, n (%) ASA 1 ASA 2 ASA 3 ASA 4	 9 (28.1) 19 (59.4) 3 (9.4) 1 (3.1)
Comorbidity, n (%)	15 (46.9)

Laterality, n (%)	
Right	16 (50.0)
Left	14 (43.8)
Transplanted Kidney	2 (6.3)
Mean stone diameter ± SD, (cm)	2.64 ± 0.82
Median (IQR)	2.55 (1.5-4.2)
Mean stone density ± SD, (HU)	1101 ± 340
Median (IQR)	1194 (350-1856)
Mean stone skin distance ± SD, (cm)	8.65 ± 2.63
Median (IQR)	8.55 (4.8-14.2)
Indications of PCN, n (%)	
Hydronephrosis (renal colic)	17 (53.1)
Hydronephrosis (AKI)	9 (28.1)
Pyonephrosis	3 (9.4)
Pyelonephritis	2 (6.3)
Urosepsis	1 (3.1)
Mean duration between PCN cathater placement and PNL ± SD, (days)	26.4 ± 10.9
Median (IQR)	24 (7-45)
PCN cathater tract location, n (%)	
Pelvis	2 (6.2)
Superior calyx	1 (3.1)
Middle calyx	12 (37.6)
Inferior calyx	17 (53.1)
Usage of prior PCN cathater for PNL, n (%)	21 (65.6)
Location of new PCN for PNL, n (%)	
Superior calyx	3 (21.9)
Middle calyx	2 (3.1)
Inferior calyx	6 (31.3)
Mean preoperative HGB value ± SD, g/dl	12.6 ± 1.91
Median (IQR)	12.3 (7.7-16.9)
Mean postoperative HGB value ± SD, g/dl	11.5 ± 1.69
Median (IQR)	11.6 (7.4-15.3)
Mean HGB drop ± SD, g/dl	0.91 ± 0.94
Median (IQR)	0.70 (0.2-5.4)
Mean surgical time ± SD, (min.)	105 ± 21.9
Median (IQR)	105 (65-140)
Complication, n (%)	14 (43.8)
Complications according to CCS, n (%)	
Clavien 1	6 (18.8)
Clavien 2	4 (12.5)
Clavien 3b	4 (12.5)
Mean LOS ± SD, (days)	4.50 ± 3.13
Median (IQR)	3 (2-15)
SFR, n (%)	22 (68.8)
Additional treatment after PNL, n (%)	8 (25.0)
Additional treatment after PNL, n (%)	
ESWL	1 (3.1)
URS/RIRS	6 (18.8)
PNL	1 (3.1)
Long term DJS placement	1 (3.1)

SD, standart deviation; IQR, interquantile range; BMI, body mass index; ASA, American society of anaesthesiology score; HU, hounsfield unite; AKI, acute kidney injury; PNL, percutaneous nephrolithotomy; HGB, hemoglobin; CCS, Clavien complication classification; LOS, lenght of hospital stay; SFR, stone free rate; URS, ureteroscopy; RIRS, retrograde intrarenal surgery; DJS, double j stent

Table 2. Reasons for the PCN catheter tract unusable for PNL access

Unusable PCN catheter tract (n)	11
PCN catheter tract unsuitable for stone access	7 (63.7%)
PCN catheter located directly in the renal pelvis	2 (18.1%)
Inability to advance the guide wire due to calcification of the PCN catheter	1 (9.1%)
Unsuitability of the PCN tract for dilatation due to infundibular access	1 (9.1%)

Table 3. Comparison of groups in terms of PCN cathater tract usage as PNL access

Variables	Usable	Unusable	P value
Number of patients	21	11	
Mean age ± SD, (years)	42.5 ± 16.7	38.9 ± 20.5	0.591*
Mean BMI ± SD, kg/m2	25.4 ± 3.72	23.3 ± 3.58	0.133*
Gender, n (%) Male Female	 11 (52.4) 10 (47.6)	 6 (54.5) 5 (45.5)	0.907#
ASA, n (%) ASA 1 ASA 2 ASA 3 ASA 4	 6 (28.6) 12 (57.1) 3 (14.3) 0 (0)	 3 (27.3) 7 (63.6) 0 (0) 1 (9.1)	0.368&
Comorbidity, n (%)	12 (57.1)	3 (27.3)	0.108#
Laterality, n (%) Right Left Graft	 9 (42.9) 10 (47.6) 2 (9.5)	 5 (45.5) 6 (54.5) 0 (0)	0.864&
Mean stone diameter ± SD, (cm)	2.47 ± 0.80	2.97 ± 0.80	0.104*
Mean stone density ± SD, (HU)	1044 ± 384	1209 ± 208	0.211**
Mean stone skin distance ± SD, (cm)	8.84 ± 2.88	8.30 ± 2.17	0.595*
Indications of PCN , n (%) Hydronephrosis (renal colic) Hydronephrosis (AKI) Pyonephrosis Pyelonephritis Urosepsis	 8 (38.1) 8 (38.1) 3 (14.3) 1 (4.8) 1 (4.8)	 9 (81.8) 1 (9.1) 0 (0) 1 (9.1) 0 (0)	0.086&
Mean duration between PCN cathater placement and PNL ± SD, (days)	26.4 ±11.5	26.2 ± 10.2	0.961*
PCN cathater tract location, n (%) Pelvis Superior calyx Middle calyx Inferior calyx	 0 (23.8) 0 (0) 8 (38.1) 13 (61.9)	 2 (18.2) 1 (9.1) 4 (36.4) 4 (36.4)	0.634&
Mean postoperative HGB value ± SD, g/dl	10.8 ± 2.82	11.9 ± 1.47	0.249*

Mean perioperative HGB value ± SD, g/dl	1.62 ±1.98	0.77 ± 0.37	0.578**
Mean surgical time ± SD,(min.)	105 ±20.4	105 ±25.8	0.979*
Complication, n(%)	7 (33.3)	7 (50.0)	0.142#
Complications according to CCS, n(%)			
Clavien 1	3 (42.9)	3 (42.9)	
Clavien 2	1 (14.3)	3 (42.9)	0.371&
Clavien 3b	3 (42.9)	1 (14.3)	
Mean LOS ± SD, (days)	3.52 ± 1.12	6.36 ± 4.69	0.039**
SFR, n(%)	15 (71.4)	7 (63.6)	0.703&
Additional treatment after PNL, n (%)	5 (23.8)	4 (36.4)	0.681&
Additional treatment after PNL, n (%)			
ESWL	0 (0)	1 (25.0)	
URS/RIRS	4 (80.0)	2 (50.0)	0.524&
PNL	1 (20.0)	0 (0)	
Long term DJS placement	0 (0)	1 (25.0)	

*Independent sample t test, **Mann whitney U test, #Pearon Chi Square test, &Fisher's Exact test
SD, standart deviation; BMI, body mass index; ASA, American society of anaesthesiology score; HU, hounsfield unite; AKI, acute kidney injury; PNL, percutaneous nephrolithotomy; HGB, hemoglobin; CCS, Clavien complication classification; LOS, lenght of hospital stay; SFR, stone free rate; URS, ureteroscopy; RIRS, retrograde intrarenal surgery; DJS, double j stent

DISCUSSION

Indications for PCN catheter placement include conditions leading to urinary tract obstruction, acute pyelonephritis and their combination (11,12). PCN catheters are usually inserted in emergency situations to provide rapid decompression without definitive treatment. In a recent series published by Sabler et al, only 21 (29%) of 73 PCN catheter routes placed by interventional radiology in emergencies were subsequently used for PNL (9). Cobb et al. argue that most PCN placements performed by interventional radiologists in emergencies are adequate for drainage but not for subsequent PNL (7). In their series of 41 PCN procedures, they reported that only 9 (22%) could be effectively used for PNL. In contrast to these studies, high rates of renal access with PCN catheters have also been reported in the literature. Of 35 PCN catheters placed in emergencies, 18 (51%) were found to be suitable for dilatation and usable for PNL (8). In another study, Tomaszewski et al. showed that 66% (24/38) of PCN catheters placed by interventional radiologists in emergency and non-emergency situations prior to PNL were usable (3). In our study, PCN catheters were used for renal access in 21 (65.62%) patients. Our results show that PCNs placed in an emergency situation can be used safely and effectively, with a high rate of use.

The most common placement of usable PCN catheters is in the inferior pole, with a rate of 56% in the Bradshaw et al. and 47% in the Sabler et al. series (8,9). Considering that the PCN tract is unusable, access other than the upper pole was performed intraoperatively in 53% of cases (8). In the study by Patel et al, it was reported that urologists do not hesitate to use the upper pole, especially for renal access, but the upper pole access may be a concern for the interventional radiologist (13). In our series, only one of the patients with a preoperative PCN catheter had upper pole access. Furthermore, in line with the literature, lower pole PCN catheters were most commonly used for access, similar to the study by Bradshaw et al (8). Furthermore, in our series, in patients in whom the PCN catheter could not be used due to unsuitability for stone access, the new access site was the inferior calyx in 6 patients, the superior calyx in 3 patients and the middle calyx in 2 patients.

One study reported that patients with a PCN catheter definitely required additional percutaneous renal access during PNL (3). Cobb et al. reported in their study that PCN catheters could be used with additional access in 5% of cases

and described this as partially usable (7). None of the patients in our series had a partially usable PCN catheter or additional access.

The reasons for the unsuitability of the PCN catheter were reported as pelvic or infundibular placement (30.0%) and suboptimal anatomical placement (70.0%) in the series of Sabler et al. (9). Although there was a high rate of PCN tract suitable for renal access in our series compared to the literature, the current PCN tract was found to be unsuitable in 11 patients and new renal access was required intraoperatively. The reasons for the unsuitability of the current tract in these patients were: unsuitable calyx in 7 patients, pelvic location of the PCN catheter in 2 patients, calcification of the PCN catheter in 1 patient and unsuitability of the PCN tract for dilatation due to infundibular access in 1 patient. Infundibular or direct access to the renal pelvis (14), which is technically difficult and carries a risk of bleeding, was found in a total of 3 patients in our series. The fact that this partially dangerous and not unusable procedure for future percutaneous PCN was less frequent in our series may be attributed to the placement of PCN catheters by a single experienced interventional radiologist.

In the series of Barghouthy et al, the rate of suitability of the previous PCN tract for PNL was reported to be 22% (15). In their series of 23 patients, different renal access was performed in 3 (13%) patients and "re-positioning" was performed in 15 (65%) patients. The authors made an ideal skin incision 5mm from the initial skin incision by passing a guidewire through the PCN catheter. The distal end of the guidewire was moved to the ideal skin incision without changing where the guidewire entered the kidney proximally, resulting in a shorter tract with a better angle. The authors stated that the inappropriate access can be corrected with a repositioning procedure. In our series, no patient using PCN required repositioning.

The advantages of a pre-placed PCN catheter for PNL surgery are that it reduces operative time and may reduce infectious complications following PNL. In a study of PNL patients by Benson et al, operative time was significantly shorter in the preoperative PCN group than in the intraoperative renal access group. It was also reported that the presence of a preoperative PCN significantly reduced post-PNL sepsis. The authors interpreted this as the use of antibiotics appropriate to the culture obtained from the preoperative nephrostomy (5). In contrast, in the study by Chen et al, the presence of preoperative PCN did not significantly contribute to a reduction in operative time (6). In the same study, the PCN catheter did not make a significant difference in terms of complications. Similarly, in another study, the presence of a preoperative PCN did not reduce complication rates or increase the success of PNL (4). In the series by Sabler et al, no statistically significant difference was found, although more complications were observed in patients without a preoperative PCN (9). In our series, there was no difference in terms of operative time and complications. Although the two groups were statistically similar in terms of the number of complications, more transient and persistent fever occurred in group 2. (group 1: two transient fevers, group 2: three transient fevers, three persistent fevers) Considering that the length of stay is prolonged in patients with infective complications, it is understandable that the mean length of stay in group 2 is statistically significantly longer than in group 1.

In our study, unlike other series, the PNL procedure was performed on a transplanted kidney in two patients and on a horseshoe kidney in one patient. It may be advantageous to plan PCN catheter placement with an interventional radiologist, especially in patients with anatomical anomalies such as pelvic, ectopic or transplanted kidneys, in patients with positioning difficulties such as musculoskeletal anomalies, and in patients with a history or prediction of difficult ureteral catheterization. In addition, co-planning of PCN catheter placement in all patient groups by interventional radiologists and urologists with consideration of future definitive surgery will increase the use rate of PCN catheters placed in emergency conditions.

The main limitations of our study are its retrospective design and the small number of patients. Another important

limitation is the lack of a control group consisting of patients without a preoperative PCN catheter.

CONCLUSIONS

Renal access is an important step in the PNL procedure. A PCN catheter placed as an emergency in the preoperative period can be used effectively and safely for renal access during surgery. However, if a PCN catheter is planned for all patients, especially specialized patients, it should be placed considering future PNL.

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Informed Consent Statement: Written informed consent was obtained from all the patients for inclusion in this study.

Data Availability Statement: Data is available upon request to corresponding author.

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REFERENCES

1. Patel SR, Nakada SY. The modern history and evolution of percutaneous nephrolithotomy. J Endourol. 2015;29(2):153-7. https://doi.org/10.1089/end.2014.0287
2. Tepeler A, Armağan A, Akman T, Polat EC, Ersöz C, Topaktaş R, et al. Impact of percutaneous renal access technique on outcomes of percutaneous nephrolithotomy. J Endourol. 2012;26(7):828-33. https://doi.org/10.1089/end.2011.0563
3. Tomaszewski JJ, Ortiz TD, Gayed BA, Smaldone MC, Jackman SV, Averch TD. Renal access by urologist or radiologist during percutaneous nephrolithotomy. J Endourol. 2010;24(11):1733-7. https://doi.org/10.1089/end.2010.0191
4. Bearelly P, Lis C, Trussler J, Katz MH, Babayan RK, Wang DS. Nephrostomy tube placement prior to percutaneous nephrolithotomy does not impact outcomes. Can J Urol. 2018;25(5):9497-9502. PMID: 30281007
5. Benson AD, Juliano TM, Miller NL. Infectious outcomes of nephrostomy drainage before percutaneous nephrolithotomy compared to concurrent access. J Urol. 2014;192(3):770-4. https://doi.org/10.1016/j.juro.2014.03.004
6. Chen SH, Wu WJ, Chou YH, Yeh HC, Tsai CC, Chueh KS, et al. Comparison one-step procedure with two-step

procedure in percutaneous nephrolithotomy. Urolithiasis. 2014;42(2):121-6. https://doi.org/10.1007/s00240-013-0616-1

7. Cobb KD, Gomella PT, DiBianco JM, Batter TH, Eisner BH, Mufarrij PW. Are Emergently Placed Nephrostomy Tubes Suitable for Subsequent Percutaneous Endoscopic Renal Surgery? Urology. 2019;126:45-48. https://doi.org/10.1016/j.urology.2019.01.006
8. Bradshaw AW, Bechis SK, Cobb KD, Friedlander DF, DiPina T, Sur RL. Nephrostomy tubes placed emergently prior to percutaneous renal stone surgery are practical for obtaining access. Arch Esp Urol. 2020;73(9):837-842. English, Spanish. PMID: 33144538
9. Sabler IM, Katafigiotis I, Sfoungaristos S, Lorber A, Leotsakos I, Yutkin V, et al. Is emergency percutaneous antegrade drainage of the upper urinary tract useful for future percutaneous nephrolithotomy access? Investig Clin Urol. 2019;60(1):29-34. https://doi.org/10.4111/icu.2019.60.1.29.
10. de la Rosette JJ, Opondo D, Daels FP, Giusti G, Serrano A, Kandasami SV, et al; CROES PCNL Study Group. Categorisation of complications and validation of the Clavien score for percutaneous nephrolithotomy. Eur Urol. 2012;62(2):246-55. https://doi.org/10.1016/j.eururo.2012.03.055
11. Pearle MS, Pierce HL, Miller GL, Summa JA, Mutz JM, Petty BA, et al. Optimal method of urgent decompression of the collecting system for obstruction and infection due to ureteral calculi. J Urol. 1998;160(4):1260-4. PMID: 9751331
12. Yossepowitch O, Lifshitz DA, Dekel Y, Gross M, Keidar DM, Neuman M, et al. Predicting the success of retrograde stenting for managing ureteral obstruction. J Urol. 2001;166(5):1746-9. PMID: 11586215
13. Patel AP, Bui D, Pattaras J, Ogan K. Upper pole urologist- obtained percutaneous renal access for PCNL is safe and efficacious. Can J Urol. 2017;24:8754-8. PMID: 28436364
14. Taylor E, Miller J, Chi T, Stoller ML. Complications associated with percutaneous nephrolithotomy. Transl Androl Urol. 2012;1(4):223-8. https://doi.org/10.3978/j.issn.2223-4683.2012.12.01
15. Barghouthy Y, Kourmpetis V, Dekalo S, Bar-Yosef Y, Conti S, Greenstein A, et al. A Novel Method for Repositioning Suboptimally Preoperatively Placed Nephrostomy Tubes for Percutaneous Nephrolithotomy Without Renal Repuncture. J Endourol. 2021;35(6):908-911. https://doi.org/10.1089/end.2017.0725

Original Article
Özgün Araştırma

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Urologists' Approach to Nocturia: Routine vs. Standardized Approach

Ürologların Noktüriye Yaklaşımı: Rutin veya Standardize Yaklaşım

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ÖZET

Amaç: Noktüri şikayeti olan hastalarda ürologların rutin yaklaşımı ile standardize yaklaşımının hastalık yönetimi ve tedavi sonuçlarına etkisini karşılaştırmayı amaçladık.

Gereç ve Yöntem: Çalışma, Mart-Temmuz 2023 tarihleri arasında randomize olmayan prospektif kohort çalışması olarak tasarlandı. İlk aşamada 6 üroloji uzmanının rutin klinik yaklaşımı değerlendirildi. Hastaların demografik verileri, komorbiditeleri, başlangıçtaki noktüri sayısı, yaşam kalitesi ve multidisipliner yaklaşım tercihleri kaydedildi (Grup-1). İkinci aşamada hastaların demografik verileri, komorbiditeleri ve ayrıca işeme günlüğü ve "Sonuçlara Yönelik Bireyin Noktüri Etiyolojisinin Hedeflenmesi" (TANGO) anketi sorgulandı (Grup-2). Verilen tedavilerin/önerilerin ardından tüm hastalar ilk ayda tekrar değerlendirildi. İki yaklaşım arasında multidisipliner yaklaşımdaki fark ile hastaların noktüri sayısı ve yaşam kalitesindeki değişim karşılaştırıldı.

Bulgular: Her gruba 47 hasta dahil edildi. Her iki gruptaki hastaların demografik ve klinik özellikleri istatistiksel olarak benzerdi. Charlson komorbidite indeksi Grup-2'de daha yüksekti (p=0,01). Multidisipliner tedavi yaklaşımı Grup-2'de daha yüksek düzeydeydi (%59,6 vs %8,5, p=0,001). Grup-1'de ortalama noktüri sayısı 4,6'dan 2,19'a düşerken, grup-2'de 5,15'ten 1,21'e düştü. Birinci ayda noktüri sayısı ve yaşam kalitesi skorları grup-2'de daha düşüktü. Grup-2'de ortalama noktüri sayısı ve yaşam kalitesindeki azalma grup-1'e göre istatistiksel olarak anlamlı derecede daha yüksekti.

Sonuç: Noktüriye yaklaşımda komorbiditelerin sorgulanması ve multidisipliner yönetimin uygulanması noktüri tedavisinde daha anlamlı sonuçlar sağlamakta ve yaşam kalitesini arttırmaktadır.

Anahtar Kelimeler: alt üriner sistem semptomları, multidisipliner, noktüri, sorgulama formu, yaşam kalitesi

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ABSTRACT

Objective: We aimed to compare the effect of urologists' routine approach and standardized approach on disease management and treatment results in patients suffering from nocturia.

Material and Methods: The study was designed as a non-randomized prospective cohort study between March and July 2023. In the first stage, the routine clinical approach of 6 urology specialists was evaluated. Demographic data, comorbidities, baseline nocturia number, quality of life, and multidisciplinary approach preference of the patients were recorded (Group 1). In the second stage, the patients' demographic data, comorbidities, and additionally the voiding diary and "Targeting the individual's Aetiology of Nocturia to Guide Outcomes" (TANGO) questionnaire were questioned (Group 2). All patients were re-evaluated in the first month of the treatments/recommendations given. The difference in the multidisciplinary approach and the change in the number of nocturia and the quality of life of the patients were compared between the two approaches.

Results: Forty-seven patients were included in each group. The demographic and clinical characteristics of the patients in both groups were statistically similar. Charlson's comorbidity index was higher in Group 2 (p=0.01). The multidisciplinary treatment approach was at a higher level in Group 2 (59.6% vs 8.5%, p=0.001). While the average number of nocturia decreased from 4.6 to 2.19 in group 1, it decreased from 5.15 to 1.21 in group 2. In the first month, the number of nocturia and quality of life scores were lower in group 2. The decrease in the average number of nocturia and quality of life in group 2 was statistically significantly higher than in group 1.

Conclusion: In the approach to nocturia, questioning comorbidities and applying multidisciplinary management provides more meaningful results in nocturia treatment and increase the quality of life.

Keywords: lower urinary tract symptoms, multidisciplinary, nocturia, questionnaire, quality of life

INTRODUCTION

Nocturia is defined as the complaint of waking up from sleep at least once to urinate (1). Nocturia is a condition that significantly reduces the quality of life and is difficult to manage because nocturia does not only occur as a result of urological diseases. European Urology Guidelines recommend a multidisciplinary approach and emphasize a shared care pathway to nocturia (2). Nocturia may be caused by urological diseases such as benign prostatic hyperplasia (BPH), overactive bladder, chronic pelvic pain syndrome, or due to non-urological conditions such as behavioral, systemic, and sleep disorders (3).

In the routine clinical approach to nocturia management, investigation of non-urological diseases is often overlooked by urologists due to patient load and lack of a specific approach. For this reason, patients are mostly treated with alpha-blockers or anticholinergic drugs, and the response to treatment is low. It is important to mainly evaluate cardiometabolic disorders, sleep disorders, urological conditions, and general patient health to better benefit disease management. The TANGO questionnaire was proposed to evaluate these situations and promote the multidisciplinary approach. TANGO is the abbreviation of "Targeting the individual's Aetiology of Nocturia to Guide Outcomes" and is a form consisting of 22 questions that question the causes of nocturia such as cardiometabolic, sleep, urinary tract, and general well-being (4,5). International Continence Society also suggests using validated questionnaires, bladder diaries, and finally multidisciplinary approach (6).

In this study, we aimed to investigate the effect of urologists' routine approach to nocturia and the effect of a standardized approach using the validated TANGO questionnaire and bladder diaries on the improvement in nocturia and quality of life.

MATERIAL AND METHODS

This study was conducted according to the ethical guidelines outlined by our institution's local ethical committee. Local ethical board approval was also granted (Ethics committee number: 2023/03-25).

The study was designed as a non-randomized prospective cohort study between March and July 2023. It was designed as a two-stage study. In the first stage, the routine clinical approach of 6 urology specialists was evaluated. The urologists' routine approach included no intervention and the content of the study was not mentioned. Demographic data, comorbidities, baseline nocturia number, quality of life, and multidisciplinary approach preference of the patients were recorded (Group 1). In the second phase, the same urologists were given a standardized nocturia questionnaire and a bladder diary. In the second stage, the patients' demographic data, comorbidities, and additionally the voiding diary and "TANGO" questionnaire were questioned (Group 2). All patients were re-evaluated in the first month of the treatments/recommendations given. The difference in the multidisciplinary approach and the change in the number of nocturia and the quality of life of the patients were compared between the two approaches. Quality of life was evaluated using a Likert form for urinary symptoms, ranging from 0 to 6, from best to worst.

Patients in need of any invasive treatment due to bladder outlet obstruction were excluded from the study. Patients with active urinary tract infection and patients who did not want to participate in the study and had no follow-up were also excluded.

Statistical Analysis

Statistics of the study were done using the Statistical Package for Social Sciences (SPSS) version 26 (SPSS Inc, Chicago, IL, USA). In statistical analysis, the chi-square test was used to compare categorical variables, and the independent sample t-test to compare numerical data. The dependent variable t-test was used to compare the effectiveness within two groups and repeated measures ANOVA was used to compare both groups with each other. Statistical significance was defined as $p<0.05$.

RESULTS

A total of 94 patients and 47 patients in each group were included in the study. Gender, age, body mass index, and accompanying comorbidities were similar between the two groups. The average Charlson comorbidity index in Group 2 was higher than the other group (3.23 vs. 2.53, $p=0.010$). There was a similar level of diuretic drug use in both groups. Uroflow parameters and medical treatments administered to the patients were also similar between the two groups. The rate of the multidisciplinary approach in group 2 was significantly higher than in group 1 (59.6% vs. 8.5%, $p = 0.001$) (Table 1). In the TANGO questionnaire assessed through Group 2, the majority of patients had urinary tract problems (11/47), followed by sleep (10/47) and cardiometabolic problems (6/47).

While the average number of nocturia decreased from 4.6 to 2.19 in group 1, it decreased from 5.15 to 1.21 in group 2 (Figure 1). The average quality of life score decreased from 3.7 to 2.17 in group 1 and it decreased from 5.0 to 1.34 in group-2 (Figure-2). At the first month evaluation, both the average number of nocturia and the quality of life score of the patients in group 2 were lower (Table 2). The decrease in both the number of nocturia and the quality of life score was significantly higher in group 2 ($p<0.001$).

Table 1. Demographic and clinical characteristics between groups

	Group-1 N=47	Group-2 N=47	p
Gender			
-Female	8 (17.0%)	11 (23.4%)	
-Male	39 (83.0%)	36 (76.6%)	0.441
Age, mean±SD	64.7 ±10.3	65.7 ±8.5	0.595
BMI, mean±SD	29.03 ±2.96	29.8 ±4.6	0.330
Charlson Comorbidity Index, mean±SD	2.53 ±1.3	3.23 ±1.27	0.010*
Hypertension			
-No	22 (46.8%)	14 (29.8%)	
-Yes	25 (53.2%)	33 (70.2%)	0.090
Diabetes			
-No	31 (66.0%)	28 (59.6%)	
-Yes	16 (34.0%)	19 (40.4%)	0.522
Congestive heart failure			
-No	40 (85.1%)	36 (76.6%)	
-Yes	7 (14.9%)	11 (23.4%)	0.294
Diuretic drug use			
-No	30 (63.8%)	24 (51.1%)	
-Yes	17 (36.2%)	23 (48.9%)	0.211
Qmax	12.5 ±7.4	12.6 ±5.6	0.328
Qort	8.5 ±7.3	6.3 ±2.8	0.330
Volume	192.1 ±98.3	220.1 ±84.8	0.204
Treatment given			
-Lifestyle recommendation	2 (4.3%)	3 (6.4%)	
- Anticholinergic	14 (29.8%)	16 (34.0%)	
-Alpha blocker	27 (57.4%)	24 (51.1%)	
-Combination	4 (8.5%)	4 (8.5%)	0.917
Multidisciplinary approach			
-No	43 (91.5%)	19 (40.4%)	
-Yes	4 (8.5%)	28 (59.6%)	0.001*

BMI: Body mass index, SD: Standard deviation
Chi-square test
Independent samples t-test
*Statistically significant p<0.05

Table 2. Nocturia, Quality of Life changes between groups before and after treatment

	Group 1	Group 2	p
Baseline nocturia, mean±SD	4.62 ±1.87	5.15 ±1.60	0.142
First month number of nocturia, mean±SD	2.19 ±1.81	1.21 ±1.18	0.003*
Basal quality of life, mean±SD	3.70 ±1.32	5.0 ±0.83	0.001*
First month quality of life, mean±SD	2.17 ±1.56	1.34 ±1.09	0.003*

SD: Standard deviation
Dependent variable t-test
*Statistically significant p<0.05

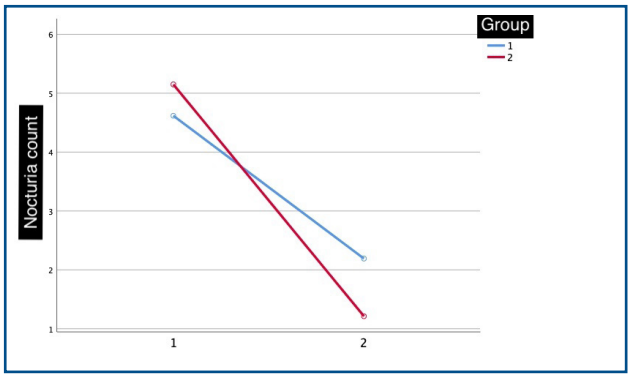

Figure 1. Comparison of nocturia number between basal and 1st month

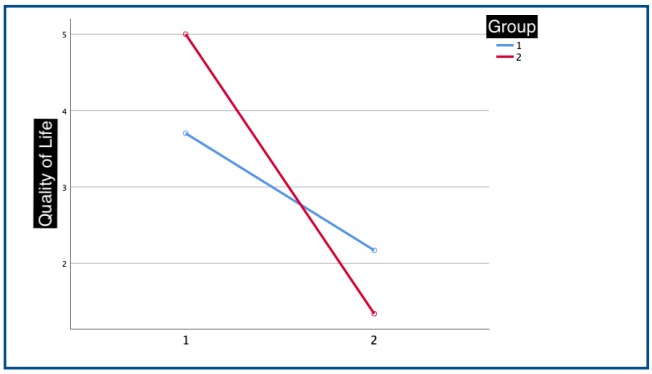

Figure 2. Comparison of quality of life between basal and 1st month

DISCUSSION

While the underlying causes of nocturia may be urological diseases, most of them are caused by non-urological conditions. Causes of nocturia include behavioral reasons (inappropriate fluid intake), systemic diseases (diseases related to nephrology such as tubular dysfunction, renal failure, cardiovascular diseases, endocrine diseases such as diabetes mellitus/insipidus causing diuresis, pituitary interventions, neurological diseases such as autonomic dysfunction, obstructive apnea syndrome. and sleep disorders (7). In this study, we investigated the effect of urologists' routine approach to nocturia management and the standardized approach created using validated questionnaires and bladder diaries investigating multifactorial etiologies on treatment success. Accordingly, it was determined that a multidisciplinary approach was preferred more frequently in patients evaluated within a standardized framework, a greater reduction in the number of nocturia was achieved in the first month, and the quality of life of the patients increased more.

Nocturia management begins with a detailed differential diagnosis and continues with lifestyle changes, fluid intake, sleep, and toilet habit modifications. Medical treatment of nocturia includes mostly alpha-blockers, antimuscarinic drugs, β3-Adrenergic agonists, or desmopressins in the urology outpatient clinics (8). In this study, alfa blockers were also the most preferred drug against nocturia (57.4% in group 1, 51.1% in group 2). It is known that alpha-blockers are useful in reducing the number of nocturia and improving the quality of life (9). However, it should not be forgotten that nocturia is a multifactorial disease and often requires a multidisciplinary approach.

A multidisciplinary approach is very important in the management of nocturia, and a detailed differential diagnosis of the disease should be made and it should be determined which factors the patient complains of nocturia. In our study, the standardized management increased the multidisciplinary approach significantly (59.6% vs. 8.5%). Likely, higher success in disease management is also associated with this. Therefore, evaluation of nocturia by a team including a urologist, geriatrician, cardiologist, nephrologist, and gynecologist when necessary will ensure that patients benefit more from the treatment (10).

In the group where the standardized approach was preferred, a significantly higher improvement was detected in the number of nocturia and quality of life of the patients at the first-month follow-up after treatment compared to the other group. Nocturia is a condition that negatively affects the quality of life, and each increase in the number of nocturia further deteriorates the quality of life (11) waking at night to void. It has been shown that it causes sleep disorders, and sleep disorders cause daytime fatigue and reluctance in the patient (12,13).

Although all patients in the second group were given a 3-day voiding diary, some patients were not able to complete

them optimally. Although patients who cannot fill optimally are a minor group, they can be considered a limitation. The small number of patients can also be considered a limitation. Although the evaluation of patients by 6 specialist urologists was preferred in terms of being adaptable to general urology outpatient clinics, the clinician's experience, level of knowledge about nocturia, or time per patient in the outpatient clinic can be seen as other factors affecting disease management. Conducting similar studies in specific outpatient clinics where lower urinary tract symptoms are evaluated may lead to different results.

CONCLUSION

In the management of nocturia, a standardized approach with multifactorial questionnaire forms for etiology will provide a significant improvement in the number of nocturia and quality of life of patients.

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Ethics Committee Approval: Kütahya Health Scıences Unıversıty Non-invasive Clinical Research Ethics Committee approval was received. The study protocol followed the ethical guidelines of the Declaration of Helsinki (Ethics committee number: 2023/03-25).

REFERENCES

1. Abrams P, Cardozo L, Fall M, Griffiths D, Rosier P, Ulmsten U, van Kerrebroeck P, Victor A, Wein A, Standardisation Sub-committee of the International Continence Society. The standardisation of terminology of lower urinary tract function: report from the Standardisation Sub-committee of the International Continence Society. Neurourol Urodyn. 2002;21:167-178. https://doi.org/10.1002/nau.10052.
2. J.N. Cornu (Chair), M. Gacci, H. Hashim, T.R.W. Herrmann, S. Malde, C. Netsch, M. Rieken, V. Sakalis, M. Tutolo, Guidelines Associates: M. Baboudjian, N. Bhatt,, M. Creta, M. Karavitakis, L. Moris. EAU Guidelines on the Management of Non-neurogenic Male LUTS [Internet]. Uroweb - European Association of Urology. 2023 [cited 2024 Jan 16]. Available from: https://uroweb.org/guidelines/management-of-non-neurogenic-male-luts/chapter/citation-information.
3. Marshall SD, Raskolnikov D, Blanker MH, Hashim H, Kupelian V, Tikkinen KAO, Yoshimura K, Drake MJ, Weiss JP, International Consultations on Urological Diseases. Nocturia: Current Levels of Evidence and Recommendations From the International Consultation on Male Lower Urinary Tract Symptoms. Urology. 2015;85:1291-1299. https://doi.org/10.1016/j.urology.2015.02.043.
4. Bower WF, Rose GE, Ervin CF, Goldin J, Whishaw DM, Khan F. TANGO - a screening tool to identify comorbidities on the causal pathway of nocturia. BJU Int. 2017;119:933-941. https://doi.org/10.1111/bju.13774.
5. Culha MG, Culha Y, Buyukyilmaz F, Turan N, Bower W. "TANGO" nocturia scanning tool: Turkish validity and reliability study. Low Urin Tract Symptoms. 2021;13:88-92. https://doi.org/10.1111/luts.12336.
6. Everaert K, Hervé F, Bosch R, Dmochowski R, Drake M, Hashim H, Chapple C, Van Kerrebroeck P, Mourad S, Abrams P, et al. International Continence Society consensus on the diagnosis and treatment of nocturia. Neurourol Urodyn. 2019;38:478-498. https://doi.org/10.1002/nau.23939.
7. Tyagi S, Chancellor MB. Nocturnal polyuria and nocturia. Int Urol Nephrol. 2023;55:1395-1401. https://doi.org/10.1007/s11255-023-03582-5.
8. Voyvoda B. Can We Use the Silodosin as Second Line Treatment of Benign Prostate Hyperplasia? Grand J Urol [Internet]. [cited 2024 Jan 28];1. doi: 10.5222/GJU.2021.10820.

9. Gravas S, Manuel-Palacios J, Chavan C, Roehrborn CG, Oelke M, Averbeck MA, Biswas A, García LM, Mohamed K, Cortes V. Modeling study of the effect of placebo and medical therapy on storage and voiding symptoms, nocturia, and quality of life in men with prostate enlargement at risk for progression. Prostate Cancer Prostatic Dis. 2023; https://doi.org/10.1038/s41391-023-00731-w.

10. Robinson D, Suman S. Managing nocturia: The multidisciplinary approach. Maturitas [Internet]. 2018 [cited 2024 Jan 19];116:123-129. https://doi.org/10.1016/j.maturitas.2018.08.007.

11. Tikkinen KAO, Johnson TM, Tammela TLJ, Sintonen H, Haukka J, Huhtala H, Auvinen A. Nocturia frequency, bother, and quality of life: how often is too often? A population-based study in Finland. Eur Urol. 2010;57:488-496. https://doi.org/10.1016/j.eururo.2009.03.080.

12. Shao I-H, Wu C-C, Hsu H-S, Chang S-C, Wang H-H, Chuang H-C, Tam Y-Y. The effect of nocturia on sleep quality and daytime function in patients with lower urinary tract symptoms: a cross-sectional study. Clin Interv Aging. 2016;11:879-885. https://doi.org/10.2147/CIA.S104634.

13. Kobelt G, Borgström F, Mattiasson A. Productivity, vitality and utility in a group of healthy professionally active individuals with nocturia. BJU Int. 2003;91:190-195. https://doi.org/10.1046/j.1464-410x.2003.04062.x.

Review Article
Derleme

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International Urolithiasis Union (IAU) Retrograde Intrarenal Surgery Guide

Uluslararası Ürolitiyazis Birliği (IAU) Retrograd İntrarenal Cerrahi Kılavuzu

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ÖZET

Uluslararası Ürolitiyazis Birliği (IAU) tarafından taş hastalığı (ürolitiyazis)'nın tedavisine ilişkin bir dizi kılavuzun ikincisini belirlemek ve ürologlar için retrograd intrarenal cerrahi (RIRC) ile ilgili klinik standardize yaklaşımlar sağlamaktır.

Öneriler oluşturulurken 1 Ocak 1964 ile 1 Ekim 2021 arasında yayınlanan RİRC ile ilgili literatürün taranması amacıyla PubMed veri tabanı, sistematik derlemeler ve değerlendirmeler kullanıldı, önerilen tavsiyelerin derecelendirmesi amacıyla "modifiye GRADE'' metodolojisinden yararlanıldı . Ek olarak, öneriler için kanıt seviyesi ise "Oxford Kanıta Dayalı Tıp Merkezi Kanıt Düzeyleri Sistemi" kriterleri baz alınarak belirlendi. Sonuçlar üzerine yorum yapıldı.

RİRC klinik uygulamaları ile ilgili olarak, kontrendikasyonlar; ameliyat öncesi görüntüleme; preoperatif stent yerleştirme; ameliyat öncesi ilaçlar; perioperatif antibiyotikler; antitrombotik tedavinin yönetimi; anestezi; hasta pozisyonu; gerekli alet; litotripsi; ameliyat sonlandırma ve komplikasyonları kapsayan 36 öneri geliştirildi ve derecelendirildi.

Klinik RİRC uygulamalarında etkili ve güvenli sonuçlar alınması amacıyla kanıta dayalı veriler ışığında gerekli tavsiyelerde bulunulmuştur.

Anahtar Kelimeler: böbrek taşları, endoüroloji, fleksibl üreterorenoskopi, kılavuz, ürolitiyazis, retrogradintrarenal cerrahi, RIRC, tedavi

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ABSTRACT

The purpose of the review is to set out the second guidelines on the treatment of urolithiasis by the International Alliance of Urolithiasis that concerns retrograde intrarenal surgery (RIRS).

While creating the recommendations, the PubMed database, systematic reviews and evaluations were used to scan the literature on RIRS published between January 1, 1964 and October 1 2021, and the "modified GRADE" methodology was used for the recommendations. Besides, the level of evidence for the recommendations was determined based on the "Oxford Center for Evidence-Based Medicine Levels of Evidence System" criteria.

Regarding RIRS clinical applications, contraindications; preoperative imaging; preoperative stent placement; preoperative medications; perioperative antibiotics; management of antithrombotic therapy; anesthesia; position of the patient; required tool infrastructure; lithotripsy; 36 recommendations covering surgery termination and complications were developed and graded.

The series of recommendations have been along with the related commentary and supporting documentation in order to obtain effective and safe results in RIRS.

Keywords: guideline, urolithiasis, treatment, retrograde intrarenal surgery, RIRS, flexible ureterorenoscopy, kidneystone, endourology

GIRIŞ

Ürolitiyazis klinik uygulamalarda en sık görülen benign ürolojik durumlardan biridir ve kılavuzlar cerrahi tedaviyi uygulanabilir olarak önermektedir. Amerikan Üroloji Derneği (AUA), Avrupa Üroloji Derneği (EAU), Çin Üroloji Derneği (CUA) gibi bazı dernekler hazırladıkları kılavuzlarda bu işlem ile ilgili olarak bazı önerilerde bulunmuştur (1), ancak bu kılavuzların hazırlanılması sırasında verilen öncelikler; teknik detaylar ve işlem bağımlı noktalar olmaktan daha ziyade hasta yönetimi ve sonrasındaki sorunlar konusunda olmuştur.

Retrograd intrarenal cerrahi (RİRC), uzun süredir üst üriner sistem taşlarının tedavisinde uygulanmakta olan bir yöntemdir (2). Ancak gelişebilecek komplikasyonlar ve standart olmayan uygulamalar bu tekniğin yaygınlaşmasını engellemektedir. RİRC'ın amacı üriner sistem taşlarının minimal invazif tedavisinde etkili ve güvenli bir yaklaşım oluşturmaktır ve kanıta dayalı ve işlemin bütün basamaklarının açıklandığı kılavuzlar klinik pratik için gereklidir. Uluslararası Ürolitiyazis Birliği (IAU) taş hastalığının tedavisi konusunda esas olarak cerrahi yaklaşımı içeren bir kılavuz oluşturmayı amaçlamıştır. IAU'nun taş hastalığının tedavisini içeren ilk kılavuzu perkütan nefrolitotomi (PNL) üzerinde hazırlanarak yayınlanmıştır (3) ve RİRC kılavuzu ikinci olarak planlanmıştır. Bu kılavuzun amacı, RİRC yöntemini uygulayan cerrahlar için peri-operatif yönetim, intra-operatif uygulama konusunda öneriler ve işlem sonrası hasta yönetimi hakkında genel kabul görecek ortak bir fikir oluşturulmasıdır.

IAU kılavuzu panelinde yer alan yazarlar taş hastalığı konusunda ve RİRC uygulaması konusunda üst düzey deneyime sahip uzmanlardan oluşmaktadır ve tüm panel üyesi yazarlar hiçbir çıkar çatışmasının olmadığını beyan etmektedir.

Veri Tanımlaması

Uluslararası Ürolitiyazis Birliği RİRC kılavuzunda bütün öneriler sistemik derlemelerin ve mevcut literatür verilerinin değerlendirilmesi sonrasında ortaya çıkmıştır. 1 Ocak 1964 ve 1 Ekim 2021 tarihleri arasındaki RİRC ile ilgili literatür, Pubmed veritabanı üzerinden taranmıştır. 172 çalışma ve derleme taranmış olup 100 tanesi derlemeye dâhil edilmiştir. Anahtar kelimeler olarak 'retrograd intrarenal cerrahi, RİRC, fleksibl üreterorenoskopi (fURS) ve üreteroskopi' kullanılmıştır.

Evreleme ve Önerilerin Sınıflaması

Önerileri evrelemek için (GR) modifiye GRADE (Grading of Recommendations, Assessment, Development and Evaluations) metodolojisi kullanıldı (4). Bu sisteme göre kanıt düzeyleri A (yüksek kanıt düzeyi), B (orta kanıt düzeyi) ve C (düşük kanıt düzeyi) olarak sınıflandırıldı.

Kanıt seviyesi (LE) ise, "Oxford Centre of Evidence-Based Medicine Levels of Evidence" sistemi kullanılarak sınıflandırıldı (5). Seviye 1 en yüksek kanıt düzeyi, seviye 5 en düşük kanıt düzeyi olarak değerlendirmeye alınan çalışmaların ayrıntıları ve homojenitesine göre belirlendi.

Tablo 1. Kanıt düzeyleri

Düzey	Kanıt Düzeyi
1a	Randomize çalışmaların meta-analizlerinden elde edilmiş kanıt
1b	En az bir randomize çalışmadan elde edilmiş kanıt
2a	İyi tasarlanmış, en az bir randomize olmayan kontrollü çalışmadan elde edilmiş kanıt
2b	İyi tasarlanmış, en az bir diğer tipte yarı deneysel çalışmadan elde edilmiş kanıt
3	Karşılaştırmalı çalışmalar, korelasyon çalışması ve olgu bildirimi gibi iyi tasarlanmış deneysel olmayan çalışmalardan elde edilmiş kanıt
4	Uzman komite raporları ve itibarlı otoritelerin klinik deneyimlerinden elde edilmiş kanıt.
5	Uzman görüşleri

SONUÇ

Endikasyonlar

RİRC ve ekstrakorporeal şok dalga litotripsi (ESWL) yöntemi <20 mm intrarenal taşlar ve proksimal üreter taşlarında ilk basamak olarak önerilen tedavidir (6). Ancak ESWL ile kıyaslandığında RİRC, daha yüksek oranda tek seansta operasyonu bitirme ve daha az oranda tekrar operasyon şansına sahiptir (7).

Alt kaliks taşları, dar infundibulopelvik açı ve diğer anatomik anomalilerden dolayı RİRC uygulaması için zorlayıcı olabilir.

RİRC genelde PNL monoterapisinin uygun olmadığı 2 cm'den büyük kompleks taşlarda "endoskopik kombine intrarenal cerrahinin" (ECIRS) bir parçası olarak görülmektedir (8).

Büyük taşların tedavisinde RİRC aşamalı olarak birkaç seans tedavi gerektirebilir (9).

Antikoagülan ilaç kullanan hastalar (2);

- 20 mm'den küçük intra-rarenal taşlar ve proksimal üreter taşları (LE:1, GR:A)
- PNL işleminin uygun olmadığı veya kontraendike olduğu 20 mm'den büyük intrarenal taşlar ve proksimal üreter taşları (LE:2, GR:B)

Kontraendikasyonları

Akut semptomatik bakteriürisi olan hastalarda eğer ateş veya septik şok tespit edilmişse ve hasta antibiyotik tedavisi almıyorsa, taş kırmadan önce drenaj amaçlı nefrostomi veya JJ stent yerleştirilmesi gerekmektedir. Aksi takdirde RİRC ürosepsis gibi hayatı tehdit edici önemli komplikasyonlara sebep olabilir (10).

RİRC uygulamaları için genellikle genel veya rejyonel anestezi gerekmektedir (11); bu sebeple anestezinin kontraendike olduğu hastalara RİRC uygulanmamalıdır.

- Akut semptomatik üriner sistem enfeksiyonları (LE:1, GR: A)
- Genel veya rejyonel anestezi için uygun olmayan hasta (LE:4, GR: A)

Preoperatif Stent Yerleştirilmesi

Preoperatif stent yerleştirmenin taşsızlık oranını (SFR) artırdığına dair zayıf kanıtlar bulunsa da; bazı yayınlarda 1-2 hafta

pasif dilatasyon amaçlı üreter stentinin yerleştirilmesinin üreteral giriş kılıfının (UAS) yerleştirilme oranını artırdığı ve ciddi üreteral hasar riskini azalttığı görülmüştür (12). Ek olarak preoperatif stent yerleştirilmesi obstrükte veya enfekte renal ünitelerin drene olabilmesi için gerekli olabilmektedir. Bunlara karşın RİRC öncesi rutin olarak üreteral stent yerleştirilmesi; ek risk ve maliyet oluşturması, ikinci defa anestezi gereksinimi, fazladan radyasyon maruziyeti ve uzamış stent uygulamasının yan etkilerinden dolayı önerilmemektedir (13).

- RİRC işlemi öncesinde rutin olarak stent yerleştirilmesi önerilmemektedir (LE:1, GR: A).
- RİRC işlemi sırasında üretere 'üreteral giriş kılıfı' yerleştirilemeyen vakalarda, üreteral stent yerleştirilmesi pasif üreter dilatasyonunun sağlanması ve ikinci seansın yapılabilmesi açısından önerilmektedir (LE:1, GR: A).

Preoperatif Görüntüleme

Düşük doz kontrastsız BT (NCCT) üriner sistem taşlarının belirlenmesinde mevcut en hassas yöntemdir ve düşük radyasyon oranına sahiptir (14). NCCT diğer yöntemlerle kıyaslandığında direkt üriner sistem grafisi (DÜSG), ultrasonografi (USG) taşın büyüklüğü, içeriği, yoğunluğu ve renal parenkim özellikleri hakkında daha net bilgi elde edilmesini sağlamaktadır. Kontrastlı bilgisayarlı tomografi (BT) ve intravenöz ürografinin boşaltım fazı ise renal pelvikaliksiyel anatomiyi görüntüleme ve aynı zamanda özellikle renal toplayıcı sistemin anatomisinin detaylı değerlendirilmesinde tercih edilmektedir. Örneğin, RİRC sonrası taşsızlık oranını öngörmede infundibulopelvik açı, infundibulopelvik genişlik ve uzunluk gibi önemli risk faktörlerini ölçmede kullanılır (15). Üç boyutlu spiral BT yöntemi ise bazı komplike vakalarda gerekli olabilir (16).

- NCCT, diğer radyolojik görüntüleme yöntemlerininin (DÜSG ve USG) yeterli bilgi verememesinden dolayı RİRC uygulamalarında öncelikli olarak önerilmektedir (LE:3, GR: B).
- Kontrastlı BT ve intravenöz ürografininin boşaltım fazı renal pelvis ve kaliksiyel sistemin detaylı incelenmesi gerektiğinde önerilmektedir (LE:3, GR: C).

Preoperatif Medikasyon

α Bloker Kullanımı

Bazı sınırlı çalışma sonuçları, operasyondan 3-7 gün önce başlayarak α bloker uygulamasının, operasyon öncesi üreteral stent takılmamış hastalarda, UAS yerleştirilmesi sırasında gelişebilecek potansiyel üreter hasarı riskini azaltabileceğini göstermiştir (17-18).

- RİRC öncesi α bloker ajanlar kısa süreli olarak kullanılabilir (LE:2, GR: A).

Antibiyotikler

- Hâlihazırda RİRC işlemi öncesinde antibiyotik proflaksisi ve idrar yolu enfeksiyonu tedavisinde yukarıda belirtildiği şekilde (19) genel kabul gören bir fikir birliği olmasına rağmen, yeterli kanıt olmamasından dolayı bu konu belirsizliğini korumaktadır. Ayrıca idrar analizinde lökosit ve/veya nitrit pozitifliği, asemptomatik ve semptomatik bakteriüri olması ile ilgili tartışmalar halen devam etmektedir. Lökosit ve nitrit pozitif olan idrar tahlili ürosepsis için bağımsız bir risk faktörü olmasına rağmen (20), idrar kültürü steril olup idrar analizinde nitrit ve/veya lökosit olan hastalarda preoperatif antibiyotik tedavisinin uygulaması konusunda çok merkezli randomize kontrollü çalışmalara (RCTs) ihtiyaç vardır. Asemptomatik bakteriürisi olan hastalarda RİRC uygulaması öncesinde üriner sistem enfeksiyonunu kontrol altına almak amacıyla uygun antibiyotik tedavisi uygulanmalıdır. Bununla birlikte asemptomatik bakteriürisi olan hastalarda eğer ateş ve septik şok meydana gelirse, RİRC işlemi öncesi üst üriner sistem drenajı için nefrostomi veya JJ stent yerleştirilmesi gerekmektedir.
- RİRC öncesi tam idrar analizi ve idrar kültürü çalışılmalıdır (LE:1, GR: A).
- Orta akım idrar kültüründe üreme olan hastalarda, antibiyogram sonucuna göre uygun antibiyotik(ler) kullanılmalıdır (LE:1, GR: A).

- RİRC öncesi orta akım idrar kültüründe üreme olmayan hastalarda lokal antibiyotik direncine göre tek doz antibiyotik proflaksisi yapılmalıdır (LE:1, GR:A).

Antitrombotik Tedavi Yönetimi

RİRC kanama açısından düşük riskli cerrahi uygulamalar kategorisinde bir işlem olup antikoagülan ve antiplatelet tedavi alan hastalar için güvenli ve etkili bir modalitedir (21) ve RİRC öncesi antitrombotik tedavinin kesilmesine gerek olmamaktadır. Buna karşın bazı çalışmalar antitrombotik ve özellikle antikoagülan tedavininin (varfarin, direkt antikoagülanlar, subkütan düşük molekül ağırlıklı heparin) prosedür ile ilgili kanama riskini artırabileceği şüphesi olmasına karşılık (22) antiplatelet tedavi için (aspirin, klopidogrel) böyle bir şüphe bulunmamaktadır (23). Bu sebepten dolayı RİRC işlemi öncesinde anestezist, sorumlu cerrah ve dahiliye uzmanları arasında yeterli iletişim sağlanmalıdır ve antitrombotik tedavi altında yapılacak RİRC girişimleri tecrübeli cerrahlar tarafından yapılmalıdır.

- RİRC oprasyonu geçirecek hastalarda antitrombotik tedavinin kesilmesi zorunlu değildir (LE:3, GR:B).

Anestezi

RİRC için genel anestezi ve rejiyoner anestezi kabul edilir ve uygulanabilir modalitelerdir (24). Genel anestezi daha kolay intraoperatif hasta yönetimi sağlayıp, hasta için daha pratik olabiliyorken, rejiyoner anestezi operasyon sonrası ağrının az olması ve daha ekonomik olması açısından hasta için daha faydalı olabilir (24-25). RİRC veya endoskopik kombine yaklaşım (ECIRS) işlemleri sırasında, Holmium: YAG (Ho: YAG) litotripsi uygulaması için genel anestezi fayda sağlayacak bir respirasyon kontrolüne izin verdiği için daha çok tercih edilmektedir (26). Yine de bu konu ile ilgili olarak daha fazla çok merkezli randomize kontrollü çalışmaların (RCTs) yapılması gerekmektedir.

- RİRC işlemi hem genel anestezi hem de rejiyonel anestezi altında uygulanabilir (LE:3, GR: A).
- Rejiyoner anestezi genel anesteziye alternatif olarak uygulanabilir, bu uygulamada postoperatif ağrının daha az olması ve uygulamanın daha ekonomik olması nedeniyle rejyoner anestezi tekniği hastanın yararına olabilir (LE:3, GR:B).

İntraoperatif Pozisyon Verme

Standart litotomi pozisyonunun yanı sıra, özel durumlarda RİRC için T-tilt pozisyonu gibi diğer pozisyonlar da mevcuttur (27). ECIRS uygulamaları ise RİRC işlemi için sırtüstü (supin veya Galdakao modifiye sırtüstü Valdivia pozisyonu) veya pron ayrılmış bacak pozisyonunda gerçekleştirilebilir (28). Hem pron ayrılmış bacak pozisyonu hem de supin pozisyonlar ile ECIRS uygulanabilir ve elde edilen taştan yoksunluk oranları birbirine benzerdir (29).

İntraoperatif pozisyon verilemeyen (vücut deformitesi olan hastalar) hastalarda diğer tedavi seçenekleri, özellikle PNL tercih edilmelidir.

- Standart litotomi pozisyonu, RİRC uygulaması için en yaygın kullanılan pozisyondur (LE:5, GR: A).

Kılavuz Tel Yerleştirme

Bazı çalışmalara ait sonuçlar her ne kadar RİRC işlemi sırasında özellikle böbrekteki taşları tedavi ederken (30) bir güvenlik kılavuz telinin yerleştirilmesinin gerekli olmayacağını gösterse de, genellikle üst üreter taşlarının tedavisi sırasında tam güvenlik sağlamak amacıyla önerilir. Güvenlik kılavuzu teli, kanama veya üreterik yaralanma durumunda hızlı ve kolay bir şekilde JJ stent yerleştirmeyi kolaylaştırabilir. Kılavuz tel yerleştirilmeden önce retrograd ürogram uygulması ile böbrek toplayıcı sistem anatomisini değerlendirmek ve kılavuz telin yerinin iyi belirlemek açısından önemlidir.

- Üreteroskopik işlemlerin çoğunda ilk basamak olarak bir güvenlik kılavuz telinin yerleştirilmesi önerilir (LE:3, GR: B).

Üreteral Giriş Kılıfının Yerleştirilmesi

Üreteral giriş kılıfının yerleştirilmesi, operasyonu hızlandırmak ve renal toplayıcı sisteme çoklu girişi kolaylaştırmanın yanı sıra operasyon sırasında mevcut taş fragmanlarının basketle alınmasına da imkân tanımaktadır. UAS yerleştirilmesi ayrıca böbrekten sürekli idrar akımını sağlayarak, intrarenal basıncın azalmasını ve enfeksiyöz komplikasyonların sınırlanmasını sağlar (31). Buna karşın yapılan çalışmalar UAS kullanılmasının taşsızlık oranı ve operasyon süresi üzerine pozitif etkisini gösterememiştir (32) ancak üreteral hasara yol açabileceğini göstermiştir (33). UAS kullanımı iki ucu keskin bıçak olarak düşünülebilir ve uygulaması için her vakada avantajları ve dezavantajları değerlendirilerek cerrah tarafından dikkatli karar verilmelidir.

X-ray kullanılmadan UAS yerleştirilmesi işleminin komplike olmayan vakalarda (34) uygulanabilmesine rağmen, muhtemel üreter hasarı nedeni ile işlem düzenli floroskopik kontrol altında yapılmalıdır (35). Üreteral balon dilatasyon işlemi UAS yerleştirilmesinde rutin olarak önerilmemekle beraber zorlu girişlerde tercih edilebilir. (36). Operasyon öncesi JJ stent yerleştirilmesi üreter dilatasyonunu sağlamakta ve üreter hasarı riskini azaltmaktadır (12). Buna karşın, operasyon öncesi üreteral stent takılması, ek masraf, fazladan radyasyon maruziyeti ve stente bağlı yan etkilere sahiptir (13).

- Üreteral giriş kılıfının yerleştirilmesi, RİRC işlemini kolaylaştırır ancak taşsızlık oranını arttırdığına ve komplikasyon oranının azalttığına yönelik kanıtlar yoktur. (LE:1, GR:A).

İrrigasyon

Bazı çalışmalar steril suyun endoürolojik prosedürlerde endoskopik daha iyi vizyon sağladığını gösterse de (37), serum fizyolojik tercih edilmekte olup, izotonik olmayan solüsyonlar hemoliz, hiponatremi ve eğer sıvı absorbsiyonu olursa kalp yetmezliğine de neden olabilmektedir (38).

Elle pompalama otomatik irrigasyon ve yer çekimine dayanan irrigasyonlar RİRC operasyonu sırasında kullanılan ve yeterli basıncı sağlayan irrigasyon çeşitleridir. El ile pompalama irrigasyon yöntemi akımın ve basıncın kolay kontrol edilebilmesi konusunda avantajlı olabilse de eğer kontrol edilmeden uygulanır ise anlamlı intrarenal basınç artışına neden olabilir. Otomatik irrigasyon daha düzenli akım imkânı sağlasa da düzenli yüksek sistem içi basınç artışına ve piyelovenöz geri akıma neden olabilir (39).

Operasyon süresi, taşsızlık oranı, komplikasyonlar ve irrigasyon sıvısının hacmi değerlendirildiğinde; RİRC operasyonlarında elle pompalama ve otomatik irrigasyon kıyaslamasının sonuçları net değildir (40). İrrigasyon akımı, intrarenal basınç ve operasyon sonrası sonuçlar ile ilgili irrigasyon metodlarının kıyaslandığı daha fazla çalışma sonuçlarına ihtiyaç duyulmaktadır.

- RİRC operasyonu sırasında standart olarak kullanılan solüsyon serum fizyolojiktir. (LE:3, GR: A)
- Elle irrigasyon ve otomatik irrigasyon metodları; operasyon süresi, taşsızlık oranı ve komplikasyon oranları açısından benzer sonuçlara sahiptir. (LE:2, GR: B)

Fleksible Üreterorenoskopi

Tek Kullanımlık Fleksible Üreterorenoskoplara Karşı Tekrar Kullanılabilir Fleksible Üreterorenoskoplar

Tek kullanımlık fleksible üreterorenoskoplar (su-fURS), tekrar kullanılan üreteroskoplara ait yüksek satın alma ve devam eden bakım maliyetleri gibi sınırlamalar açısından daha avantajlıdır (41-44). Ayrıca su-fURS, uygulamadaki yüksek hasar riski nedeniyle büyük taşlar (>2 cm), dik infundibulopelvik açılı alt pol taşı, üriner diversiyon veya anormal böbrek anatomisi gibi karmaşık ve zorlu durumlar için çok uygundur (45-46). Su-fURS kullanımı düşük yoğunluklu hasta olan merkezlerde ve asistanlara eğitim verilen hastanelerde daha uygun maliyetli olabilir (47). Bu üreterorenoskoplar

enfeksiyon riskini azaltmak için bağışıklık sistemi baskılanmış hastalar veya çoklu ilaca dirençli bakteriyel enfeksiyonu olan hastalar için uygundur (44-48). Bununla birlikte su-fURS'a karşı yeniden kullanılabilir esnek üreteroskoplar (re-fURS) kullanımıyla ilişkili karbon emisyonlarına ve çevre kirliliğine de dikkat edilmelidir (49,50). Tek kullanımlık fleksible üreteroskop kullanımı ile tekrar kullanılabilen skopların kullanımı arasında cerrahi sonuçlar açısından anlamlı bir fark yoktur (51-54). Bununla birlikte tek kullanımlık skopların manevra kabiliyeti tekrarlanarak kullanılanlara göre daha düşüktür. Ayrıca fiber optik skoplar genellikle dijital skoplara göre daha iyi end-tip defleksiyona ve daha küçük kalibreye sahiptir (52).

- su-fURS, klinik etkinlik açısından re-fURS karşılaştırılabilir (LE:2, GR:A).
- Fiber optik ve fURS dayanıklılığı ve cerrahi sonuçları karşılaştırılabilirken fiber optik fURS genellikle daha fazla uç defleksiyonuna ve daha küçük çapa sahiptir (LE:2, GR:B).

Çalışma Kanalı (Tek Kanal ve Çift Kanal)

Çift kanallı skoplar tek kanallı skoplara benzer bir defleksiyon olanağına sahiptir ancak çalışma kanalında daha fazla alan sağlar. Sonuç olarak bu üreterorenoskoplar özellikle çalışma kanalında aletleri kullanırken daha iyi akış ve görüntü sağlamaktadır. Bununla birlikte çift kanallı skopun büyük çapa sahip olması üreteral lümende daha fazla gerginliğe sebep olarak üreter yaralanmalarına neden olabilecek daha büyük kalibreli bir giriş kılıfı gerektirmektedir (55-57).
-Çift çalışma kanalına sahip üreterorenoskoplar tek kanallı üreterorenoskoplara kıyasla daha fazla irrigasyon akışı ve görüntüyü sağlayabilir. (LE:3, GR:2)

Fleksible Üreterorenoskopun Minyatürizasyonu

Üreterorenoskop boyutunun küçülmesi yine daha küçük kalibreli bir UAS yerleştirilmesini sağlar, böylece özellikle büyük kalibreli bir UAS (58) ile erişilemeyen daralmış/sıkı bir üreter varlığında büyük boyutlu bir UAS'a bağlı gelişebilecek üreteral hasarı riskini azaltabilir. Küçük kalibreli üreterorenoskoplar, aynı kalibreye sahip bir UAS yardımı ile büyük kalibreli üreterorenoskoplara kıyasla daha fazla sıvı akışı, daha düşük intrarenal basınç ve daha iyi rezolüsyon sağlar (59,60).

- Fleksible skopların çaplarının küçültülmesi üreterorenoskopun üretere yerleştirilmesini kolaylaştıracak ve gelişmiş sıvı akışı nedeniyle daha düşük intrarenal basınç ve daha iyi görüntüyü sağlayacaktır. (LE:2, GR:1).

Robotik Üreterererorenoskop

Ön kanıtlar robot destekli RİRC'ın geleneksel RİRC (61,62) ile karşılaştırıldığında manevra kabiliyeti ve operasyon sonuçları açısından herhangi bir önemli avantaj sunmadığını göstermektedir. Robot destekli RİRC mesleki radyasyona maruz kalmayı ve insan gücü talebini azaltsa da yüksek satın alma ve bakım maliyetlerinin yanı sıra işletme tesislerindeki alan gereksinimleri üreteroskopi için robotik bir sistemin yaygın olarak kabul görmesini sınırlamaktadır (63,64).

- Robot destekli RİRC, klasik RİRC uygulamalarına benzer sonuçlar sağlar (LE:2, GR:2).
- Robot destekli RİRC mesleki radyasyona maruz kalmayı azaltır ancak yüksek satın alma ve bakım maliyetleri bulunmaktadır (LE:2, GR:2).

Lazer Litotripsi

RİRC'ta kullanılan yüksek güçlü Ho:YAG lazer cihazları daha düşük güçlü Ho:YAG lazer cihazlarına kıyasla daha kısa çalışma süresi ve daha yüksek taştan yoksunluk oranları ile ilişkilendirilebilir (65-68). Daha düşük frekans, daha yüksek enerji ve daha kısa darbe süresi ayarlarına sahip Holmium: Yttrium Aluminium Garnet (Ho:YAG) lazer taşları parçalarken; daha yüksek frekans, daha düşük enerji ve daha uzun darbe süresi ayarlarına sahip Ho:YAG lazer uygulaması ise taşı toz yapma yeteneğine sahiptir (69,70).

Thulium fiber lazer RİRC'ta litotripsi için yeni bir yöntemdir ve hem etkili hem de güvenli olduğu gösterilmiştir. Yüksek frekanslar ve azaltılmış geri yer değiştirme dahil olmak üzere thulium fiber lazerin çok yönlü kullanım imkanı, Ho:YAG lazere kıyasla daha yüksek taş fragmantasyon verimliliğini sağlar (71-75). Ancak özellikle yetersiz irrigasyonun olduğu dilate olmayan toplayıcı sistemlerde ve uzun süreli bir işlem durumunda daha yüksek ayarlarda hem Ho:YAG hem de thulium fiber lazer uygulamasının ortaya koyacağı termal etki dikkate alınmalıdır. Bu bulguları doğrulamak için daha fazla çalışma gereklidir.

- Ho:YAG lazer RİRC'ta litotripsi için konvansiyonel tedavi yöntemidir; thulium fiber lazer ise yeni, umut verici ve uygulanabilir bir alternatiftir (LE:2, GR:B).

Taş Geri Alma

Bir taş yönetimi stratejisinin diğerine (toz haline getirme veya parçalama) tercih edilmesini destekleyecek çok az kanıt olduğundan taşın özelliği ve üroloğun tercihine göre bireysel olarak karar verilmelidir (76,77). Taşları parçalama yaklaşımı daha kısa işlem süresi ile ilişkilendirilmiştir ancak taş parçaları RİRC'tan sonra kendiliğinden geçiş için bırakıldığından bu taş parçalarının varlığı ile ilişkili istenmeyen olayların oranı daha yüksek olabilir (78). Basket veya aspirasyon tekniği ile taş parçalarının aktif olarak çıkarılması daha yüksek bir taştan yoksunluk oranı sağlayabilir ancak bu gözlemleri desteklemek için çok merkezli randomize kontrollü çalışmalara ihtiyaç vardır. (79-81).

- Hem toz haline getirme hem de fragmanların RİRC sırasında basket ile alınması taş temizleme açısından eşdeğer yöntemlerdir (LE:2, GR:1)
- Aspirasyon (suction) özelliği taşıyan giriş kılıfları; taş retropulsiyonunu azaltabilir, taştan yoksunluk durumunu iyileştirebilir, görüntü kalitesini iyileştirebilir ve intrarenal basıncı azaltabilir (LE:3, GR:1)

Sonlandırma Stratejisi

Bir çıkış stratejisi olarak doğrudan görüş altında UAS'ın çıkarılması gözden kaçabilecek üreteral hasarı tespit etmek için zorunludur (82). Genellikle üreterik yaralanma ve taş fragmanları varlığında yeterli idrar akışını sağlamak için bir JJ stent yerleştirilir (83). Ameliyat sonrası JJ stent yerleştirilmesi daha küçük kalibreli üreterler için daha uzun stent süresi gerektirip, stent yerleştirme gerekliliği üreteral ödem ve üreter hasarı durumuna bağlıdır (84,85). Bununla birlikte JJ stent varlığı bazı hastalarda alt üriner sistem semptomlarına (LUTS) yol açabilir (86). Bu nedenle stent yerleştirme kararı cerrah tercihine ve hasta faktörlerine dayanmaktadır. JJ stentin yerleştirilmesi basit vakalarda veya hastanın zaten yerinde stenti varsa (önceki ameliyatta proksimal kısma erişilememesi nedeniyle veya önceki tedavinin ardından yerleştirilmiş olan) atlanabilir; bu durum post-operatif stent ihtiyacını ortadan kaldıracaktır. Bir ucu ipli stent geleneksel JJ stent varlığının neden olduğu potansiyel LUTS'u hafifletebilir. LUTS'u iyileştirmek için α-blokerlerin veya antikolinerjik ajanların kullanılması önerilir (87-89).

- Bir çıkış stratejisi olarak UAS'ın doğrudan görüş altında alınması önerilir (LE:3, GR:A).

Ameliyat Sonrası Görüntüleme ve Taşsızlık Durumunun (SFR) Değerlendirmesi

Ultrasonografi, KUB ve NCCT, taştan yoksunluk durumunu değerlendirmek için yaygın olarak kullanılan görüntüleme yöntemleridir. Ultrasonografi ve KUB takipte potansiyel obstrüksiyonu düşündüren geri kalan taş parçaları ile dilatasyonun varlığını, derecesini tanımlamak için yeterli yöntemlerdir (90), NCCT ise 2 mm'den küçük taş parçalarının belirlenmesinde yüksek güvenilirlik derecesi ile tavsiye edilir (91). Düşük radyasyon dozu ile uygulanan NCCT obez olmayan hastalar için yeterlidir (VKİ <30 kg/m2) ve normal NCCT ile benzer teşhis oranlarına sahiptir ancak daha düşük radyasyon maruziyeti önemli avantajıdır. Günümüzde taşsızlık durumu literatürde tam olarak yeterince tanımlanmamış olup ve bu durumun değerlendirmesi için düşünülen optimal zamanlama konusu da belirsizdir.

Taşsızlık durumu değerlendirmek için kabul edilebilir geri kalan taş fragman boyutunu, incelemenin zamanlamasını ve en uygun görüntüleme modalitesini tanımlamak için geniş serileri içeren daha fazla kontrollü çalışmaya ihtiyaç vardır (92,93).

- Ultrasonografi ve KUB takipte potansiyel obstrüksiyonu düşündüren geri kalan taş parçaları ile dilatasyonun varlığını, derecesini tanımlamak için yeterli yöntemlerdir (LE:3, GR:A).
- Taşsızlık oranı RİRC'tan 3 ay sonra değerlendirilmelidir ve NCCT bunun için en doğru yöntemdir (LE:1, GR:A).

Komplikasyonlar

Modifiye Clavien-Dindo sınıflaması RİRC operasyonunu takip eden komplikasyonların ciddiyet derecesini sınıflandırmak amacıyla kullanılır (94-96). RİRC ile ilişkili komplikasyonların çoğu hafif olup, bildirilmiş olan komplikasyonların %67,7 si evre I, 22,7'si evre II ve %7,2'si ise evre III'tür. Ciddiyeti yüksek komplikasyonların (evre IV) oranı ise %2,4'tür (97).

Tablo 2. RİRC Komplikasyonları ve Oranları

Komplikasyon Derecesi	Yüzde
Evre I	%67,7
Evre II	%22,7
Evre III	%7,2
Evre IV	%2,4

Kanama

RİRC sonrası vasküler komplikasyonlar oldukça azdır. Potansiyel damar hasarının nedeni üreter ve toplayıcı sistemin aletler tarafından perfore olması olabilir (örneğin UAS yerleştirilmesi, Ho:YAG lazer litotripsi uygulaması, kılavuz tel veya kateter yerleştirilmesi ile gelişebilen). Ayrıca kronik böbrek yetmezliği ile antikoagülan tedavi varlığı veya yüksek böbrek içi basıncın aniden hızla dekompresyonu ile de gelişebilir (94,95,98).

Üreter perforasyonu veya avülsiyonu semi-rigid URS sırasında oldukça fazla bildirilmiş olsa da (99) bu olaylardan sonra ciddi kanama gelişme durumu oldukça nadirdir. Zorlamalı UAS yerleştirilmesine bağlı renal toplayıcı sistemin perfore olması ciddi kanamalara neden olabilir. Ho:YAG lazer litotripsi kullanımı yanlışlıkla pelvis ve kaliksiyel mukozada termal hasar oluşumuna ve kanamaya neden olabilir ancak bu şekilde gelişen kanamalar çoğunlukla kendisini sınırlamaktadır. Bu durumlarda mevcut üreteral giriş kılıfının kapağının geçici süreliğine kapatılması pıhtı oluşumunu ve kanamanın durmasını sağlayabilmektedir.

RİRC sonrası perirenal hematom, psödoanevrizma formasyonu veya arterio-venöz fistül oluşumu raporlanmıştır (99). Yüksek intrarenal basınç ve uzamış operasyon süresi aynı zamanda üriner sistem enfeksiyonu riskini arttıran önemli faktörlerdir. Bu komplikasyonlar sonrasında anjiografi ve süperselektif embolizasyon ilk tedavi yöntemi olarak önerilmekte olup, nadiren nefrostomi takılması gerekebilir (99).

- RİRC sonrası kanama genelde kendini sınırlayan kanamalardır, şiddetli kanama oranı nadirdir. (LE:4, GR: A)
- Şiddetli kanama genellikle renal toplayıcı sistemin aletler iler perfore olmasıyla, direkt veya indirekt, artmış intrarenal basıncın ani dekompresyonu sonucu oluşur (LE:4, GR:A)

Enfeksiyöz komplikasyonlar

Post-operatif enfeksiyon, RİRC sonrası en çok raporlanan komplikasyondur. İşlem sonrası gelişen ateş (%4,9), sepsis (%0,5) ve septik şok (%0,3) en sık görülen enfektif problemlerdir (98).

Orta akım idrar kültüründe üreme olması, enfeksiyon taşları, fazla taş yükü, irrigasyonun fazla olması ve uzamış operasyon süresi RİRC sonrası enfeksiyon gelişimi için temel risk faktörleridir (96). Pre-operatif semptomatik bakteriürisi olan hastalarda uygun antibiyoterapinin verilmesi gerekirken, üriner sistem enfeksiyonu olmayan hastalarda uzamış antibiyoterapi verilmesinden kaçınılarak tek doz uygun proflaktik antibiyoterapi verilmesi en uygun yaklaşımlardır. İdrar kültüründe üreme olan hastalarda uygun antibiyoterapi verilmesi, kültür negatif olan hastalarda geniş spektrumlu proflaktik antibiyoterapi verilmesi, uygun prosedürle yerleştirilmiş UAS, iyi seçilmiş irrigasyon yönetimi, intraoperatif intrarenal basıncı minimale indirgemek, operasyon süresinin uzamasından kaçınmak ve operasyon sonrası foley kateter yerleştirmek postoperatif enfeksiyondan korunmak için uygulanabilecek en önemli yaklaşımlardır (95). RİRC işlemi sırasında vakumlu aletleri kullanmanın intrarenal basıncı düşürdüğü ve operasyon süresini kısalttığı gözlemlenmiş olup (80) operasyon sonrasında enfeksiyon riskini azaltabileceği düşünülmektedir.

Genellikle idrar yolu enfeksiyonuna bağlı operasyon sonrası ateş kültüre uygun antibiyoterapi ile gerilerken, ürosepsis ve septik şok tablosunda erken ve hızlı tanımlama yapılarak tedavi için gerekenler hızla yapılmalıdır. Q-SOFA skoru (değişmiş mental durum, [Glasgow Koma Skoru <15], hipertansiyon [sistolik<100 mmHg), artmış solunum sayısı [>22/dakika] potansiyel üreosepsis durumunu öngörmeyi en kolay ve hızlı sağlayabilecek faktörledir. Beyaz küre sayısının <3 X 10^9/L olması sepsis varlığı için bir gösterge olabilir (99). Uygun ve erken antibiyotik tedavisi resisütasyon desteği, transfüzyon veya vasopressör ajan kullanımı, entübasyon veya mekanik ventilasyon septik şokun tedavisinde gerekli olabilecek yaklaşımlardır. (100).

- İntrarenal basınç ve operasyon süresi RİRC operasyonunda sınırlandırılmalıdır. (LE:3, GR:A)

Üreter Hasarı

RİRC sonrası bildirilen üreter hasarı oranı azdır, bunun nedeni ise UAS çıkarıldıktan sonra üreterin rutin olarak tekrar değerlendirilmemesidir (98). Bu nedenle RİRC sonrasında üreteroskopi yapılarak üreter lümeni UAS çıkarıldıktan sonra rutin olarak görüntülenmelidir ve üreter duvar hasarı, Endoskopik Sınıflama Sistemine göre sınıflandırılmalıdır (83,84). Üreter duvarına ait hasarlar bu yaklaşımla %30,4- 46,5 oranında daha fazla oranda raporlanabilir. (41)

Hafif mukoza hasarları ve yüzeyel lezyonların tedavisi üreteral stentin 10-14 gün kalması dışında özel önlemler gerektirmemektedir. Üreter perforasyonu durumunda ise üreteral stent 6 haftaya kadar uzun süre tutulabilir (99). Komplet üreter avülziyonu olması durumunda ise üreteral rekonstrüksiyon işlemi gerekmektedir (100).

- Operasyon öncesi üreteral stent takılması üreterde pasif dilatasyona neden olabilir ve üreter giriş kılıfı ile ilişkili olabilecek hasarı engelleyebilir (LE:2, GR: A).

TARTIŞMA

RİRC operasyonunun etkili ve güvenli bir şekilde yapılabilmesi için gerekli olan öneriler ve destekleyici belgeler bu kılavuzda verilmiştir.

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REFERANSLAR

1. Assimos D, Krambeck A, Miller NL et al. Surgical management of stones: American urological association/

endourological society guideline. J Urol. 2016;196:1153-69. https://doi.org/10.1016/j.juro.2016.05.090

2. Zeng G, Zhao Z, Mazzon G, Pearle M et al. European Association of Urology section of urolithiasis and international alliance of urolithiasis joint consensus on retrograde intrarenal surgery for the management of renal stones. Eur Urol Focus 2021; S2405-4569(21)00290-X. https://doi.org/10.1016/j.euf.2021.10.011

3. Zeng G, Zhong W, Mazzon G et al. International Alliance of Urolithiasis (IAU) guideline on percutaneous nephrolithotomy. Minerva Urol Nephrol 2022. https://doi.org/10.23736/S2724-6051.22.04752-8

4. Guyatt GH, Oxman AD, Vist GE et al. GRADE: an emerging consensus on rating quality of evidence and strength of recommendations. BMJ. 2008;336:924-6. https://doi.org/10.1136/bmj.39489.470347.AD

5. OCEBM Levels of Evidence Working Group. OCEBM levels of evidence. Available at: http://www.cebm.net. Accessed June 2022.

6. Hyams ES, Monga M, Pearle MS et al. A prospective, multi-institutional study of flexible ureteroscopy for proximal ureteral stones smaller than 2cm. J Urol. 2015;193:165-9. https://doi.org/10.1016/j.juro.2014.07.002

7. Sener NC, Imamoglu MA, Bas O et al. Prospective randomized trial comparing shock wave lithotripsy and flexible ureterorenoscopy forlower pole stones smaller than 1 cm. Urolithiasis. 2014;42:127-31. https://doi.org/10.1007/s00240-013-0618-z

8. Hamamoto S, Yasui T, Okada A et al. Endoscopic combined intrarenal surgery for large calculi: simultaneous use of flexible ureteroscopy and mini-percutaneous nephrolithotomy overcomes the disadvantageous of percutaneous nephrolithotomy monotherapy. J Endourol. 2014;28:28-33. https://doi.org/10.1089/end.2013.0361

9. Breda A, Ogunyemi O, Leppert JT, Lam JS, Schulam PG. Flexibleureteroscopy and laser lithotripsy for single intrarenal stones 2 cm orgreater-is this the new frontier? J Urol. 2008;179:981-4. https://doi.org/10.1016/j.juro.2007.10.083

10. Zhong W, Leto G, Wang L, Zeng G. Systemic inflammatory response syndrome after flexible ureteroscopic lithotripsy: a study of risk factors. JEndourol. 2015;29:25-8. https://doi.org/10.1089/end.2014.0409

11. Zeng G, Zhao Z, Yang F, Zhong W, Wu W, Chen W. Retrograde intrarenal surgery with combined spinal-epidural vs general anesthesia: aprospective randomized controlled trial. J Endourol. 2015;29:401-5. https://doi.org/10.1089/end.2014.0249

12. Hoare DT, Wollin TA, De S, Hobart MG. Success rate of repeat flexible ureteroscopy following previous failed access: an analysis of stentduration. Can Urol Assoc J. 2021;15:255-8. https://doi.org/10.5489/cuaj.7064

13. Falagario UG, Calo B, Auciello M, Carrieri G, Cormio L. Advanced ureteroscopic techniques for the management of kidney stones. Curr Opin Urol. 2021;31:58-65. https://doi.org/10.1097/MOU.0000000000000835

14. Xie Y, Tao J, Liu H et al. The use of low-dose CT with adaptive statisstical iterative reconstruction for the diagnosis of urinary calculi. Radiat Prot Dosimetry. 2020;190:200-7, https://doi.org/10.1093/rpd/ncaa094

15. Tastemur S, Senel S, Kizilkan Y, Ozden C. Evaluation of the anatomical factors affecting the success of retrograde intrarenal surgery for isolated lower pole kidney stones. Urolithiasis. 2021;50:65-70. https://doi.org/10.1007/s00240-021-01279-x

16. Hu H, Hu X-Y, Fang X-M, Chen H-W, Yao X-J. Unenhanced helical CT following excretory urography in the diagnosis of upper urinary tract disease: a little more cost, a lot more value. Urol Res. 2010;38:127-33. https://doi.org/10.1007/s00240-009-0237-x

17. Xu Y, Lyu J-L. The value of three-dimensional helical computed tomography for the retrograde flexible ureteronephroscopy in the treatment of lower pole calyx stones. Chronic Dis Transl Med. 2016;2:42-7. https://doi.org/10.1016/j.cdtm.2016.02.001

18. Kaler KS, Safiullah S, Lama DJ et al. Medical impulsive therapy (MIT): the impact of 1 week of preoperative tamsulosin on deployment of 16-French ureteral access sheaths without preoperative ureteral stent placement. World J Urol. 2018;36:2065-71. https://doi.org/10.1007/s00345-018-2336-1

19. Zhao Z, Fan J, Sun H et al. Recommended antibiotic prophylaxis regimen in retrograde intrarenal surgery: evidence from a randomised controlled trial. BJU Int. 2019;124:496-503. https://doi.org/10.1111/bju.14832 179:1379-90. https://doi.org/10.1016/j.juro.2008.01.068

20. Jian ZY, Ma YC, Liu R, Li H, Wang K. Preoperative positive urine nitrite and albumin-globulin ratio are independent risk factors for predicting postoperative fever after retrograde intrarenal surgery based on a retrospective cohort. BMC Urol. 2020;20:50. https://doi.org/10.1186/s12894-020-00620-7

21. Culkin DJ, Exaire EJ, Green D et al. Anticoagulation and antiplatelet therapy in urological practice: ICUD/AUA review paper. J Urol. 2014;192:1026-34. https://doi.org/10.1016/j.juro.2014.04.103

22. Sharaf A, Amer T, Somani BK, Aboumarzouk OM. Ureteroscopy in patients with bleeding diatheses, anticoagulated, and on anti-platelet agents: a systematic review and meta-analysis of the literature. J Endourol. 2017;31:1217-25, https://doi.org/10.1089/end.2017.0253

23. Westerman ME, Scales JA, Sharma V, Gearman DJ, Ingimarsson JP, Krambeck AE. The effect of anticoagulation on bleeding-related complications following ureteroscopy. Urology. 2017;100:45-52, https://doi.org/10.1016/j.urology.2016.09.034

24. Luo Z, Jiao B, Zhao H, Huang T, Zhang G. Comparison of retrograde intrarenal surgery under regional versus general anaesthesia: a systematic review and meta-analysis. Int J Surg 2020;82:36-42, https://doi.org/10.1016/j.ijsu.2020.08.012

25. Cakici MC, Ozok HU €, Erol D et al. Comparison of general anesthesia and combined spinal-epidural anesthesia for retrograde intrarenal surgery. Minerva Urol Nefrol. 2019;71:636-43, https://doi.org/10.23736/S0393-2249.19.03481-7

26. El Sayed H, Moawad AS, Hefnawy E. Spinal vs. general anesthesia for percutaneous nephrolithotomy: a prospective randomized trial. Egypt J Anaesth. 2015;31:71-5. https://doi.org/10.1016/j.egja.2014.08.004

27. Liaw CW, Khusid JA, Gallante B, Bamberger JN, Atallah WM, Gupta M. The T-tilt position: a novel modified patient position to improve stone-free rates in retrograde intrarenal surgery. J Urol. 2021;206:1232-9. https://doi.org/10.1097/JU.0000000000001948

28. Cracco CM, Scoffone CM. ECIRS (endoscopic combined intrarenal surgery) in the Galdakao-modified supine Valdivia position: a new life for percutaneous surgery? World J Urol 2011; 29: 821–7. https://doi.org/10.1007/s00345-011-0790-0

29. Kawase K, Okada T, Chaya R et al. Comparison of the safety and efficacy between the prone split-leg and Galdakao-modified supine Valdivia positions during endoscopic combined intrarenal surgery: a multi-institutional analysis. Int J Urol. 2021;28:1129-35. https://doi.org/10.1111/iju.14655

30. Eandi JA, Hu B, Low RK. Evaluation of the impact and need for use of a safety guidewire during ureteroscopy. J Endourol. 2008;22:1653-8. https://doi.org/10.1089/end.2008.0071

31. Stern JM, Yiee J, Park S. Safety and efficacy of ureteral access sheaths. J Endourol. 2007;21:119-23. https://doi.org/10.1089/end.2007.9997

32. Yitgin Y, Yitgin E, Verep S, Gasimov K, Tefik T, Karakose A. Is Access sheath essential for safety and effective retrograde intrarenal stone surgery? J Coll Physicians Surg Pak. 2021;31:1202-6. https://doi.org/10.29271/jcpsp.2021.10.1202

33. Damar E, Senocak C, Ozbek R et al. Does ureteral access sheath affect the outcomes of retrograde intrarenal

surgery: a prospective study. Minim Invasive Ther Allied Technol. 2022;1:777-81. https://doi.org/10.1080/13645706.2021.1941117

34. Aykac A, Baran O, Sari S. Ureteral access sheath application without fluoroscopy in retrograde intrarenal surgery. J Coll Physicians Surg Pak. 2020;30:503-7. https://doi.org/10.29271/jcpsp.2020.05.503

35. Kaler KS, Lama DJ, Safiullah S et al. Ureteral access sheath deployment: how much force is too much? Initial studies with a novel ureteral Access sheath force sensor in the porcine ureter. J Endourol. 2019;33:712-8. https://doi.org/10.1089/end.2019.0211

36. Kuntz NJ, Neisius A, Tsivian M et al. Balloon dilation of the ureter: a contemporary review of outcomes and complications. J Urol. 2015;194:413-7. https://doi.org/10.1016/j.juro.2015.02.2917

37. Aghamir SM, Alizadeh F, Meysamie A, Assefi Rad S, Edrisi L. Sterile water versus isotonic saline solution as irrigation fluid in percutaneous nephrolithotomy. Urol J. 2009;6:249-53.

38. Chen SS, Lin AT, Chen KK, Chang LS. Hemolysis in transurethral resection of the prostate using distilled water as the irrigant. J Chin Med Assoc. 2006;69:270-5. https://doi.org/10.1016/S1726-4901(09)70255-2 larger than 2 cm. Springerplus. 2016;5:1707. https://doi.org/10.1186/s40064-016-3383-y

39. Lama DJ, Owyong M, Parkhomenko E, Patel RM, Landman J, Clayman RV. Fluid dynamic analysis of hand-pump infuser and UROMAT endoscopic automatic system for irrigation through a flexible ureteroscope. J Endourol. 2018;32:431-6. https://doi.org/10.1089/end.2017.0811

40. Doersch KM, Hart KD, Elmekresh A, Milburn PA, Machen GL, El Tayeb MM. Comparison of utilization of pressurized automated versus manual hand irrigation during ureteroscopy in the absence of ureteral access sheath. Proc (Bayl Univ Med Cent). 2018;31:432-5. https://doi.org/10.1080/08998280.2018.1482518

41. Meng C, Peng L, Li J, Li Y, Li J, Wu J. Comparison between single-use flexible ureteroscope and reusable flexible ureteroscope for upper urinary calculi: a systematic review and meta-analysis. Front Surg. 2021;8:691170. https://doi.org/10.3389/fsurg.2021.691170

42. Li Y, Chen J, Zhu Z et al. Comparison of single-use and reusable flexible ureteroscope for renal stone management: a pooled analysis of 772 patients. Transl Androl Urol. 2021;10:483-93. https://doi.org/10.21037/tau-20-1009

43. Ma YC, Jian ZY, Jin X, Li H, Wang KJ. Stone removing efficiency and safety comparison between single use ureteroscope and reusable ureteroscope: a systematic review and meta-analysis. Transl Androl Urol. 2021;10:1627-36. https://doi.org/10.21037/tau-20-1399

44. Mager R, Kurosch M, Hofner T, Frees S, Haferkamp A, Neisius A. Clinical outcomes and costs of reusable and single-use flexible ureterorenoscopes: a prospective cohort study. Urolithiasis. 2018;46:587-93. https://doi.org/10.1007/s00240-018-1042-1

45. Ventimiglia E, Somani BK, Traxer O. Flexible ureteroscopy: reuse? Or is single use the new direction? Curr Opin Urol. 2020;30:113-9. https://doi.org/10.1097/MOU.0000000000000700

46. Talso M, Goumas IK, Kamphuis GM et al. Reusable flexible ureterorenoscopes are more cost-effective than single-use scopes: results of a systematic review from PETRA Uro-group. Transl Androl Urol. 2019;8:S418-25. https://doi.org/10.21037/tau.2019.06.13

47. Ozimek T, Schneider MH, Hupe MC et al. Retrospective cost analysis of a single-center reusable flexible ureterorenoscopy program: a comparative cost simulation of disposable fURS as an alternative. J Endourol. 2017;31:1226-30. https://doi.org/10.1089/end.2017.0427

48. Somani BK, Talso M, Bres-Niewada E. Current role of single-use flexible ureteroscopes in the management of upper tract stone disease. Cent European J Urol. 2019;72:183-4. https://doi.org/10.5173/ceju.2019.1937

49. Davis NF, McGrath S, Quinlan M, Jack G, Lawrentschuk N, Bolton DM. Carbon footprint in flexible ureteroscopy: a comparative study on the environmental impact of reusable and single-use ureteroscopes. J Endourol. 2018;32:214-7. https://doi.org/10.1089/end.2018.0001

50. Bahaee J, Plott J, Ghani KR. Single-use flexible ureteroscopes: how to choose and what is around the corner? Curr Opin Urol. 2021;31:87-94. https://doi.org/10.1097/MOU.0000000000000852

51. Temiz MZ, Colakerol A, Ertas K, Tuken M, Yuruk E. Fiberoptic versus digital: a comparison of durability and cost effectiveness of the two flexible ureteroscopes. Urol Int. 2019;102:181-6 https://doi.org/10.1159/000494385

52. Dragos LB, Somani BK, Sener ET et al. Which flexible ureteroscopes (digital vs. fiber-optic) can easily reach the difficult lower pole calices and have better end-tip deflection: in vitro study on K-Box. A PETRA evaluation. J Endourol. 2017;31:630-7. https://doi.org/10.1089/end.2017.0109

53. Proietti S, Dragos L, Molina W, Doizi S, Giusti G, Traxer O. Comparison of new single-use digital flexible ureteroscope versus nondisposable fiber optic and digital ureteroscope in a cadaveric model. J Endourol. 2016;30:655-9. https://doi.org/10.1089/end.2016.0051

54. Multescu R, Geavlete B, Georgescu D, Geavlete P. Conventional fiberoptic flexible ureteroscope versus fourth generation digital flexible ureteroscope: a critical comparison. J Endourol. 2010;24:17-21. https://doi.org/10.1089/end.2009.0390

55. Lusch A, Okhunov Z, del Junco M et al. Comparison of optics and performance of single channel and a novel dual-channel fiberoptic ureteroscope. Urology. 2015;85:268-72. https://doi.org/10.1016/j.urology.2014.09.032

56. Haberman K, Ortiz-Alvarado O, Chotikawanich E, Monga M. A dualchannel flexible ureteroscope: evaluation of deflection, flow, illumination, and optics. J Endourol. 2011;25:1411-4. https://doi.org/10.1089/end.2010.0642

57. Ng YH, Somani BK, Dennison A, Kata SG, Nabi G, Brown S. Irrigant flow and intrarenal pressure during flexible ureteroscopy: the effect of different access sheaths, working channel instruments, and hydrostatic pressure. J Endourol. 2010;24:1915-20. https://doi.org/10.1089/end.2010.0188

58. Zelenko N, Coll D, Rosenfeld AT, Smith RC. Normal ureter size on unenhanced helical CT. AJR Am J Roentgenol 2004; 182: 1039–41, https://doi.org/10.2214/ajr.182.4.1821039

59. Tokas T, Herrmann TRW, Skolarikos A, Nagele U, Training and Research in Urological Surgery and Technology (T.R.U.S.T.)-Group. Pressure matters: intrarenal pressures during normal and pathological conditions, and impact of increased values to renal physiology. World J Urol. 2019;37:125-31. https://doi.org/10.1007/s00345-018-2378-4

60. Sener TE, Cloutier J, Villa L et al. Can we provide low intrarenal pressures with good irrigation flow by decreasing the size of ureteral access sheaths? J Endourol. 2016;30:49-55. https://doi.org/10.1089/end.2015.0387

61. Saglam R, Muslumanoglu AY, Tokatlı Z et al. A new robot for flexible ureteroscopy: development and early clinical results (IDEAL stage 1-2b). Eur Urol. 2014;66:1092-100. https://doi.org/10.1016/j.eururo.2014.06.047

62. Geavlete P, Saglam R, Georgescu D et al. Robotic flexible ureteroscopy versus classic flexible ureteroscopy in renal stones: the initial Romanian experience. Chirurgia (Bucur). 2016;111:326-9.

63. Suntharasivam T, Mukherjee A, Luk A, Aboumarzouk O, Somani B, Rai BP. The role of robotic surgery in the management of renal tract calculi. Transl Androl Urol. 2019;8:S457-60. https://doi.org/10.21037/tau.2019.04.06

64. Rassweiler J, Fiedler M, Charalampogiannis N, Kabakci AS, Saglam R, Klein JT. Robot-assisted flexible ureteroscopy: an update. Urolithiasis. 2018;46:69-77. https://doi.org/10.1007/s00240-017-1024-8

65. Sari S, Cakici MC, Kartal IG et al. Comparison of the efficiency, safety and pain scores of holmium laser devices working with 20 watt and 30 watt using in retrograde intrarenal surgery: one center prospective study. Arch Ital Urol Androl. 2020;92. https://doi.org/10.4081/aiua.2020.2.149

66. Karakoyunlu N, Cakıcı MC, Sarı S et al. Efficacy of various laser devices on lithotripsy in retrograde intrarenal surgery used to treat 1-2 cm kidney stones: a prospective randomized study. Int J Clin Pract 2021;75:e14216. https://doi.org/10.1111/ijcp.14216

67. Pietropaolo A, Hughes T, Mani M, Somani B. Outcomes of ureteroscopy and laser stone fragmentation (URSL) for kidney stone disease (KSD): comparative cohort study using MOSES technology 60 W laser system versus regular holmium 20 W laser. J Clin Med. 2021;0:2742. https://doi.org/10.3390/jcm10132742

68. Mekayten M, Lorber A, Katafigiotis I et al. Will stone density stop being a key factor in endourology? The impact of stone density on laser time using Lumenis laser p120w and standard 20 W laser: a comparative study. J Endourol. 2019;33:585-9. https://doi.org/10.1089/end.2019.0181

69. Aldoukhi AH, Roberts WW, Hall TL, Ghani KR. Holmium laser lithotripsy in the new stone age: dust or bust? Front Surg 2017; 4: 57, https://doi.org/10.3389/fsurg.2017.00057

70. Chen S, Fu N, Cui W, Zhao Z, Luo X. Comparison of stone dusting efficiency when using different energy settings of holmium: YAG laser for flexible ureteroscopic lithotripsy in the treatment of upper urinary tract calculi. Urol J. 2019;17:224-7. https://doi.org/10.22037/uj.v0i0.4955

71. Traxer O, Keller EX. Thulium fiber laser: the new player for kidney stone treatment? A comparison with holmium: YAG laser. World J Urol. 2020;38:1883-94.

72. Traxer O, Corrales M. Managing urolithiasis with thulium fiber laser: updated real-life results-a systematic review. J Clin Med. 2021;10:3390. https://doi.org/10.1007/s00345-019-02654-5

73. Martov AG, Ergakov DV, Guseynov M, Andronov AS, Plekhanova OA. Clinical comparison of super pulse thulium fiber laser and high-power holmium laser for ureteral stone management. J Endourol. 2021;35:795-800. https://doi.org/10.1089/end.2020.0581

74. Jones P, Beisland C, Ulvik Ø. Current status of thulium fibre laser lithotripsy: an up-to-date review. BJU Int. 2021;128:531-8. https://doi.org/10.1111/bju.15551

75. Enikeev D, Taratkin M, Klimov R et al. Superpulsed thulium fiber laser for stone dusting: in search of a perfect ablation regimen-a prospective single-center study. J Endourol. 2020;34:1175-9. https://doi.org/10.1089/end.2020.0519

76. Matlaga BR, Chew B, Eisner B et al. Ureteroscopic laser lithotripsy: a review of dusting vs fragmentation with extraction. J Endourol. 2018;32:1-6. https://doi.org/10.1089/end.2017.0641

77. Weiss B, Shah O. Evaluation of dusting versus basketing – can new technologies improve stone-free rates? Nat Rev Urol. 2016;13:726-33. https://doi.org/10.1038/nrurol.2016.172

78. Wenzel M, Bultitude M, Salem J. Dusting, fragmenting, popcorning or dustmenting? Curr Opin Urol. 2019;29:108-12. https://doi.org/10.1097/MOU.0000000000000580

79. Huang J, Xie D, Xiong R et al. The application of suctioning flexible ureteroscopy with intelligent pressure control in treating upper urinary tract calculi on patients with a solitary kidney. Urology. 2018;111:44-7. https://doi.org/10.1016/j.urology.2017.07.042

80. Deng X, Song L, Xie D et al. A novel flexible ureteroscopy with intelligent control of intrarenal pressure: an initial experience of 93 cases. J Endourol. 2016;30:1067-72. https://doi.org/10.1089/end.2015.0770

81. Zeng G, Wang D, Zhang T, Wan SP. Modified access sheath for continuous flow Ureteroscopic lithotripsy: a preliminary report of a novel concept and technique. J Endourol. 2016;30:992-6. https://doi.org/10.1089/end.2016.0411

82. Tepeler A, Resorlu B, Sahin T et al. Categorization of intraoperative ureteroscopy complications using modified Satava classification system. World J Urol. 2014;32:131-6. https://doi.org/10.1007/s00345-013-1054-y

83. Traxer O, Thomas A. Prospective evaluation and classification of ureteral wall injuries resulting from insertion of a ureteral access sheath during retrograde intrarenal surgery. J Urol. 2013;189:580-4. https://doi.org/10.1016/j.juro.2012.08.197

84. Shigemura K, Yasufuku T, Yamanaka K, Yamahsita M, Arakawa S, Fujisawa M. How long should double J stent be kept in after ureteroscopic lithotripsy? Urol Res. 2012;40:373-6. https://doi.org/10.1007/s00240-011-0426-2

85. Ozyuvali E, Resorlu B, Oguz U et al. Is routine ureteral stenting really necessary after retrograde intrarenal surgery? Arch Ital Urol Androl. 2015;87:72-5. https://doi.org/10.4081/aiua.2015.1.72

86. Fischer KM, Louie M, Mucksavage P. Ureteral stent discomfort and its management. Curr Urol Rep. 2018;19:64. https://doi.org/10.1007/s11934-018-0818-8

87. Dellis A, Joshi HB, Timoney AG, Keeley FX. Relief of stent related symptoms: review of engineering and pharmacological solutions. J Urol. 2010;184:1267-72. https://doi.org/10.1016/j.juro.2010.06.043

88 Oh JJ, Lee S, Cho SY et al. Effects of naftopidil on double-J stentrelated discomfort: a multicenter, randomized, double-blinded, placebocontrolled study. Sci Rep. 2017;7:4154. https://doi.org/10.1038/s41598-017-04505-y

89. Lamb AD, Vowler SL, Johnston R, Dunn N, Wiseman OJ. Metaanalysis showing the beneficial effect of a-blockers on ureteric stent discomfort. BJU Int. 2011;108:1894-902. https://doi.org/10.1111/j.1464-410X.2011.10170.x

90. Fulgham PF, Assimos DG, Pearle MS, Preminger GM. Clinical effectiveness protocols for imaging in the management of ureteral calculous disease: AUA technology assessment. J Urol. 2013;189:1203-13. https://doi.org/10.1016/j.juro.2012.10.031

91. Ulvik Ø, Harneshaug JR, Gjengstø P. What do we mean by "stone free," and how accurate are urologists in predicting stone-free status following ureteroscopy? J Endourol. 2021;35:961-6. https://doi.org/10.1089/end.2020.0933

92. Omar M, Chaparala H, Monga M, Sivalingam S. Contemporary imaging practice patterns following ureteroscopy for stone disease. J Endourol. 2015;29:1122-5. https://doi.org/10.1089/end.2015.0088

93. Ito K, Takahashi T, Somiya S, Kanno T, Higashi Y, Yamada H. Predictors of repeat surgery and stone-related events after flexible ureteroscopy for renal stones. Urology. 2021;154:96-102. https://doi.org/10.1016/j.urology.2021.02.025

94. Grosso AA, Sessa F, Campi R et al. Intraoperative and postoperative surgical complications after ureteroscopy, retrograde intrarenal surgery, and percutaneous nephrolithotomy: a systematic review. Minerva Urol Nephrol. 2021;73:309-32. https://doi.org/10.23736/S2724-6051.21.04294-4

95. Ozden C, Oztekin CV, Pasali S et al. Analysis of clinical factors associated with intraoperative and postoperative complications of retrograde intrarenal surgery. J Pak Med Assoc. 2021;71:1666-70. https://doi.org/10.47391/JPMA.449

96. Akilov FA, Giyasov SI, Mukhtarov ST, Nasirov FR, Alidjanov JF. Applicability of the Clavien-Dindo grading system for assessing the postoperative complications of endoscopic surgery for nephrolithiasis: a critical review. Turk J Urol. 2013;39:153-60. https://doi.org/10.5152/tud.2013.032

97. Xu Y, Min Z, Wan SP, Nie H, Duan G. Complications of retrograde intrarenal surgery classified by the modified Clavien grading system. Urolithiasis. 2018;46:197-202. https://doi.org/10.1007/s00240-017-0961-6

98. Ibrahim AK. Reporting ureteroscopy complications using the modified clavien classification system. Urol Ann. 2015;7:53-7. https://doi.org/10.4103/0974-7796.148611

99. Kramolowsky EV. Ureteral perforation during ureterorenoscopy: treatment and management. J Urol. 1987;138:36-8. https://doi.org/10.1016/s0022-5347(17)42979-x

100. Bonkat G, Cai T, Veeratterapillay R et al. Management of urosepsis in 2018. Eur Urol Focus. 2019;5:5-9. https://doi.org/10.1016/j.euf.2018.11.003

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PREPARATION OF MANUSCRIPT
YAZININ GÖNDERİMİ

Makaleler yalnızca online olarak https://dergipark.org.tr/pub/endouroloji adresinden gönderilebilir. Başka bir yolla gönderilen yazılar değerlendirilmeye alınmayacaktır.
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
- Bilgilendirilmiş Onam Formu
- ICMJE Çıkar Çatışması Formu
- 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.
Özgün Araştırma makaleleri klinik veya temel araştırma sonuçlarını içermeli, eleştirel okuyucular için kabul edilebilir olacak kadar iyi belgelenmelidir. En fazla 4000 kelime olmalı ve sırasıyla aşağıdaki başlıkları içermelidir;

- Başlık (hem Türkçe hem İngilizce)
- Özet (hem Türkçe hem İngilizce)
- Anahtar Kelimeler (hem Türkçe hem İngilizce)
- Giriş
- Gereç ve yöntemler
- Bulgular

- Tartışma
- Sonuçlar
- Şekillerin ve tabloların başlıkları (gerekirse)
- Kaynaklar

Olgu sunumları en fazla 2000 kelime olmalı ve sırasıyla aşağıdaki başlıkları içermelidir;

- Başlık (hem Türkçe hem İngilizce)
- Özet (hem Türkçe hem İngilizce)
- Anahtar Kelimeler (hem Türkçe hem İngilizce)
- Giriş
- Olgu sunumu
- Tartışma ve Sonuç
- Şekillerin ve tabloların başlıkları (gerekirse)
- Kaynaklar

Derlemeler yapılandırılmış olmalı, en fazla 5000 kelimeden oluşmalı ve sırasıyla aşağıdaki başlıkları içermelidir;

- Başlık (hem Türkçe hem İngilizce)
- Özet (hem Türkçe hem İngilizce)
- Anahtar Kelimeler (hem Türkçe hem İngilizce)
- Ana metin
- Sonuç
- Şekillerin ve tabloların başlıkları (gerekirse)
- Kaynaklar

Sistematik derlemeler için yazarla PRISMA yönergelerine uymalıdır; http://www.prisma-statement.org/documents/PRISMA%202009%20checklist.pdf

Editöre Mektuplar en fazla 1000 kelime olmalı ve aşağıdaki alt başlıkları içermelidir;

- Başlık
- Anahtar kelimeler
- Ana metin
- Şekillerin ve tabloların başlıkları (gerekirse)
- Kaynaklar

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.

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.
Original Research Articles should be maximum of 4000 words and include subheadings below;

- Title (both in Turkish and English)
- Abstract (both in Turkish and English)
- Keywords (both in Turkish and English)
- Introduction
- Material and Methods
- Results
- Discussion
- Conclusions
- Figures and Tables Legend (if necessary)
- References

Case Reports should be maximum of 2000 words and include subheadings below;

- Title (both in Turkish and English)
- Abstract (both in Turkish and English)
- Keywords (both in Turkish and English)
- Introduction
- Case Presentation
- Discussion and Conclusion
- Figures and Tables Legend (if necessary)
- References

Literature Reviews should be maximum of 5000 words and include subheadings below;

- Title (both in Turkish and English)
- Abstract (both in Turkish and English)
- Keywords (both in Turkish and English)
- Main text
- Conclusion
- Figures and Tables Legend (if necessary)
- References

Letters to the editor should be maximum of 1000 words and should include subheadings below;

- Title
- Keywords
- Main text

- Figures and Tables Legend (if necessary)
- References

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

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 corresponding. 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.

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.*

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