E-ISSN: 2148-0532

ENDOÜROLOJİ BÜLTENİ
ENDOUROLOGY BULLETIN

Period: Triannual Founded: 2008 Publisher: Endourology Society Volume 15 / Number 1

Published by
Endourology Society

www.endouroloji.org.tr

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ENDOURUROLOGY BULLETIN

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CONTENTS
İÇİNDEKİLER

Original Research
Özgün Araştırma

Indexed in Index Copernicus, EuroPub, Scilit, Asos Index and Turkiye Atıf Dizini.

Original Article
Özgün Araştırma

Endourol Bull. 2023;15(1):1-8. doi: 10.54233/endouroloji.1140588

Supine percutaneous nephrolithotomy in impacted proximal ureteral stones larger than 15 millimeters; Comparison of flexible ureterorenoscopy and retroperitoneal laparoscopic ureterolithotomy

15 milimetreden büyük impakte proksimal üreter taşlarında supin perkütan nefrolitotomi; Fleksible üreterorenoskopi ve retroperitoneal laparoskopik üreterolitotominin karşılaştırılması

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ÖZET

Amaç: Çapı 15 mm'den büyük gömülü proksimal üreter taşlarının tedavisinde sırtüstü mini-perkütan nefrolitotomi (SMPCNL), retroperitoneal laparoskopik üreterolitotomi (RPUL) ve fleksibl üreterorenoskopinin (FURS) etkinlik ve güvenliğini karşılaştırmayı amaçladık.

Gereç ve Yöntemler: Ağustos 2015-Eylül 2020 tarihleri arasında kurumumuzda proksimal üreter taşı nedeniyle SMPCNL, RPUL ve FURS uygulanan hastaların verileri gözden geçirildi. Toplanan veriler yaş, cinsiyet, vücut kitle indeksi (VKİ) ve hidronefroz derecesi, taş yoğunluğu, ameliyat süresi, hastanede kalış ve iyileşme süresi, komplikasyon oranları ve ameliyat süresi gibi taşsız ve demografik verileri içeriyordu.

Bulgular: Genel olarak 162 hasta dahil edildi. Bu hastaların 52'si (%32,1) Grup 1 (SMPCNL grubu), 53'ü (%32,7) Grup 2 (RPUL grubu), 57'si (%35,2) Grup 3'te (FURS grubu) idi. Ortalama ameliyat süreleri Grup 1'de 53±8.2 dakika, Grup 2'de 63,2±6,6 dakika ve Grup 3'te 73,7±7,5 dakika idi (p=0,000). Ortalama hastanede kalış süresi Grup 3'te diğer gruplara göre anlamlı olarak daha kısaydı (p=0.000). İlk değerlendirmede taşsızlık oranları RPUL, SMPCNL ve FURS gruplarında %100, %90.3 ve %87.7 idi. Bu oran FURS grubunda diğer gruplara göre anlamlı derecede düşüktü (p=0.02).

Sonuç: SMPCNL ve RPUL prosedürleri, proksimal üreter taşları 15 mm'den büyük hastaların tedavisinde FURS kadar güvenlidir.

Anahtar Kelimeler: *supin, perkütan nefrolitotomi, büyük impakte proksimal üreter taşları*

Cite As: *Kargı T, Ekşi M, Ayten A et al. Supine percutaneous nephrolithotomy in impacted proximal ureteral stones larger than 15 millimeters; Comparison of flexible ureterorenoscopy and retroperitoneal laparoscopic ureterolithotomy. Endourol Bull. 2023;15(1):1-8. doi: 10.54233/endouroloji.1140588*

This study was approved by the University of Health Sciences, Dr.Sadi Konuk Training and Research Hospital Ethical Committee (Approval Number: 2021-03-11, Date: 2021-02-01). All research was performed in accordance with relevant guidelines/regulations, and informed consent was obtained from all participants.

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Received : July 4, 2022 ***Accepted*** : November 29, 2022

ABSTRACT

Objective: We aimed to compare the efficacy and safety of supine mini-percutaneous nephrolithotomy (SMPCNL), retroperitoneal laparoscopic ureterolithotomy (RPUL), and flexible ureterorenoscopy (FURS) in the treatment of impacted proximal ureteral stones larger than 15 mm in diameter.

Material and Methods: Data of the patients who underwent SMPCNL, RPUL, and FURS in our institution for proximal ureteral stones between August 2015 and September 2020 were reviewed. Collected data included age, gender, body mass index (BMI) and hydronephrosis grade, stone density, duration of surgery, hospital stay and recovery period, stone-free and demographic data such as complication rates and duration of surgery.

Results: Overall, 162 patients were included. Of these patients, 52 (32.1%) were in Group 1 (SMPCNL group), 53 (32.7%) were in Group 2 (RPUL group), and 57 (35.2%)) were in Group 3 (FURS group). Mean operative times were 53±8.2 minutes in Group 1, 63.2±6.6 minutes in Group 2, and 73.7±7.5 minutes in Group 3 (p=0.000). The mean hospital stay was significantly shorter in Group 3 compared to the other groups (p=0.000). The stone-free rates at the initial evaluation were 100%, 90.3%, and 87.7% in the RPUL, SMPCNL, and FURS groups. This rate was significantly lower in the FURS group compared to the other groups (p=0.02).

Conclusion: SMPCNL and RPUL procedures are as safe as FURS in treating patients with proximal ureteral stones larger than 15 mm.

Keywords: *supine, percutaneous nephrolithotomy, large impacted proximal ureteral stones*

INTRODUCTION

The optimal treatment strategy for proximal ureteral stones is a matter of debate. (1, 2, 3, 4). This debate is more prominent in the treatment of impacted proximal ureteral stones greater than 15 mm in diameter. (5). These stones can lead to hydronephrosis, pyonephrosis, pyelonephritis, and functional deterioration of the ipsilateral kidney (5). Therefore, they should be treated immediately for relief of urinary tract obstruction. The European Association of Urology (EAU) guidelines recommend extracorporeal shock wave lithotripsy (ESWL) and ureterorenoscopy (URS) as first-line methods in the treatment of the proximal ureteral stones less than 10mm (6). However, ESWL is not preferred as a first-line treatment in patients with relatively larger proximal ureteral stones, since stone-free rates decrease as stone diameters increase. (1, 7, 8). In addition, rigid or semirigid ureteroscopy performed in patients with proximal ureteral stones is not as successful as those performed in the treatment of distal ureteral stones. (1, 9, 10). The technological developments led to the use of flexible ureterorenoscopy (FURS), which provided relatively higher stone-free rates with lower complication rates (1, 10). However, relatively more invasive surgical methods such as antegrade mini-percutaneous nephrolithotomy (MPCNL) and retroperitoneal laparoscopic ureterolithotomy (RPUL) are still considered as alternatives (2, 3, 4, 11, 12). It was reported that the mean duration of mini-percutaneous nephrolithotomy surgery could be shortened by implementing the supine approach (i.e., SMPCNL), and the complication rates of RPUL could be reduced by increasing experience (3,11, 12). To our knowledge, there is no study evaluating the results of SMPCNL, RPUL and FURS in the literature. Our study aimed to compare these techniques in terms of efficacy and safety in the treatment of impacted proximal ureteral stones larger than 15 mm.

MATERIAL AND METHODS

Patient Selection

This study was approved by the Ethics Evaluation Committee of Istanbul Health Sciences University Bakırköy Dr Sadi Konuk Training and Research Hospital (Approval No: 2021-02-11). All patients gave both verbal and written consent to be included in the study. The target population of this study consisted of patients who underwent surgical treatment for proximal ureteral stones between August 2015 and September 2020 in the Urology Clinic of Istanbul Health Sciences University, Bakırköy Dr Sadi Konuk Training and

Research Hospital. The data of these patients were analyzed retrospectively. Patients with multiple stones, a history of ipsilateral kidney or ureter surgery, bleeding diathesis, systemic comorbidity, and stones ≤15 mm were excluded from the study. Patients with incomplete data were also omitted. After consenting, the surgeon gave the final decision regarding the surgical treatment method in collaboration with the patient. All patients underwent a contrast-enhanced imaging method (i.e., computerized tomography or intravenous pyelography) during diagnostic management. Patients were categorized as per the surgical method used: SMPCNL, RPUL, and FURS. All patient data were derived from electronic patient data. The three groups were compared concerning demographic data, including age, gender, body mass index and hydronephrosis grade, duration of surgery, duration of hospital stay and convalescence, stone-free, and complication rates (Table 1). The longest axis of the stone was considered as the stone size. All patients had undergone urine cultures preoperatively, and antibiotherapy was given to those with positive results. All patients had negative urine cultures on the day of surgery. Complications were classified based on the modified Clavien-Dindo classification system (16). Clavien grade I and II complications were considered minor, while Clavien III, IV, and V were considered major complications (Table 2).

Table 1. Preoperative, Demographics, Operative and Postoperative Data

Parameters (mean ± SD)	*Total (n=162)*	*Group 1 (n=52)*	*Group 2 (n=53)*	*Group 3 (n=57)*	*p*
Age (years)	41,5 ± 11,5	42,4 ± 12,6	40 ± 10,8	42,1 ± 11,3	0,530*
Gender (n ; %)					0,637″
Male	97 (59,9)	32 (61,5)	29 (54,7)	36 (63,2)	
Female	65 (40,1)	20 (38,5)	24 (45,3)	21 (36,8)	
BMI (kg/m²)	26,3 ± 2,1	26,6 ± 1,9	25,9 ± 2,2	26,5 ± 2,1	0,158*
Stone Size (mm)	18 ± 2	17,7 ± 2,2	18,6 ± 2,1	17,7 ± 1,6	0,052*
Hounsfield Unite (HU)	1002,8 ± 188	1035,7 ± 222,3	980 ± 173,5	994 ± 164,8	0,288*
Surgical time (min)	63,6 ± 11,2	53 ± 8,2	63,2 ± 6,6	73,7 ± 7,5	**<0,001* Group 1 vs Group 2-3**
Complications (n ; %)					
Minor	28 (17,2)	9 (17,3)	6 (11,3)	13 (22,8)	0,282″
Major	5 (3)	1 (1,1)	2 (3,7)	2 (3,5)	0,821″
DJS Placement (n ; %)	51 (31,4)	5 (9,61)	16 (30,1)	32 (56,1)	**<0,001″ Group 2 vs Group 1-3**
LOS (days)	2,4 ± 1,1	3,2 ± 0,6	3,1 ± 0,4	1,1 ± 0,7	**<0,001* Group 3 vs Group 1-2**
RDA (days)	7,3 ± 1	7,2 ± 0,8	7,7 ± 1,4	7 ± 0,5	**0,001! Group 2 vs Group 1-3**
Success rate (n ; %)	150 (92,6)	47 (90,3)	53 (100)	50 (87,7)	**0,02″ Group 3 vs Group 1-2**
Axillary procedures (ESWL)	3 (1,8)	1 (1,9)	0 (0)	2 (3,5)	0,343″
Success rate (3. month) (n ; %)	155 (95,6)	50 (96,1)	53 (100)	52 (91,2)	0,060″

BMI: *Body Mass Index* ***Hg:*** *Hemoglobin* ***LOS:*** *Length of stay* ***RDA:*** *Return to Daily Activities* ***RF:*** *Residual Fragment*

** One-way ANOVA " Chi-Square test ! Kruskal Wallis Test*

Table 2. Complications according to the Clavien grading system

(n ; %)	sMPNL (Group 1)	L-RU (Group 2)	F-URS (Group 3)
Grade I			
Mucosal injury	2(3,8)	-	4(7)
Ureteral perforation	-	-	1(1,7)
Renal colic	4(7,6)	2(3,7)	5(8,7)
Bleeding	1(1,9)	-	-
Ileus	-	1(1,8)	-
Abdominal distention	-	1(1,8)	-
Subcutaneous emphysema	-	1(1,8)	-
Grade II			
Fever	2(3,8)	1(1,8)	3(5,2)
Grade IIIa			
Urinary leakage	1(1,9)	1(1,8)	-
Grade IIIb			
Ureteral stricture	-	1(1,8)	1(1,7)
Grade IV			
Sepsis	-	1(1,8)	1(1,7)
Grade V			
Minor complications	9(17,3)	6(11,3)	13(22,8)
Major complications	1(1,9)	2(3,7)	2(3,5)
Total complications	10(19,2)	8(15)	15(26,3)

Statistical Analysis

Statistical analysis was done with SPSS v20.0. The normal distribution of the data was investigated with the Kolmogorov-Smirnov test and the data were expressed as mean±standard deviation. Chi-square test and Fisher Exact test were used to compare categorical variables, Student's t-test and analysis of variance (ANOVA) were used to compare continuous variables. For data that did not show normal distribution, comparisons between groups were made using the nonparametric Kruskal-Wallis test. The Bonferroni test was applied to determine intergroup differences. $p < 0,05$ was considered to be significant. The G-Power 3.1 program was used for the sample size of the study. According to the power analysis, the total number of patients was determined as 160.

SMPCNL

Modified Galdakao Valdivia position was given, and upper or middle pole access was performed by fluoroscopy or ultrasound guidance either supracostally or subcostally under the posterior axillary line (13). The ureter was catheterized, and calyceal dilatation was achieved by using plastic dilatators. A 20F Amplatz sheath was placed, and a 7,6F semirigid ureteroscope (Karl Storz) was advanced through the sheath. The stone was fragmented with a pneumatic lithotripter (ELMED, Vibrolith) and the pieces were extracted with stone forceps. A 14F nephrostomy catheter was placed and advanced toward the renal pelvis before the completion of the procedure. A double J stent was placed according to the surgeon's preference. Nephrostomy catheters were removed 3 days after the operation and stents were removed 21 days after the operation.

RPUL

Patients were given a lateral decubitus position. An incision was made between the 12th rib and spina ischiadica, and a balloon dilatator was introduced to develop the retroperitoneal space. Subsequently, 5/10 mm ports were inserted 5 cm superomedially and inferomedially. The ureter was identified on the psoas

muscle. The location of the stone was found by ureteral bulging and confirmed using an atraumatic endograsper. The stone was extracted by a stone grasper after opening the adjacent ureter by cold-incision. A double J stent was placed according to the surgeon's preference. The ureteral incision was sutured by 4/0 Vicryl. A drain was inserted into the surgical field. The surgical drain was removed once the daily drainage was below 50 cc/day. The Double J stent was removed at the end of the third postoperative week.

FURS

The patient was given a lithotomy position under general anesthesia. A hydrophilic guidewire was introduced toward the ipsilateral ureter by cystoscopy and semirigid ureteroscopy. A ureteral access sheath (9.5/11.5F or 12/14F) was advanced over the guidewire. Subsequently, the flexible ureteroscope (7.5F Storz Flex-X2) was introduced through the sheath, and the stone was fragmented by dusting technique using 200 µ holmium laser (0,8–1,5 J and 8–12 Hz). All stone fragments were not routinely removed; however, at least one fragment was retrieved by a tipless nitinol basket for stone analysis. A double J stent was placed according to the surgeon's preference. It was removed after the completion of the third postoperative week.

Postoperative Assessments

All patients underwent imaging within two days after surgery to assess residual stones. Direct urinary system radiography was preferred for opaque stones and non-contrast computed tomography was preferred for non-opaque stones. Patients were considered stone-free if there were no stone fragments or clinically insignificant residual stone fragments (i.e., <4 mm). Those who were not stone-free were re-evaluated three months after surgery by kidney-ureter-bladder graphy or an unenhanced computerized tomography. The same success criteria were used during this assessment.

RESULTS

In total, the data of 468 patients were reviewed. After applying the exclusion criteria, 162 patients were included in this study. Among these patients, 52 (32.1%) were assigned to Group 1 (i.e., SMPCNL group), while 53 (32.7%) were in Group 2 (i.e., RPUL group) and 57 (35.2%) were in Group 3 (i.e., FURS group). Ninety-seven (59.9%) patients were male, while 65 (40.1%) were female. There was no significant difference between the groups regarding age, gender distribution, and body mass index (Table 1). Mean patient age was 42,4±12,6 in Group 1, 40±10,8 in Group 2, and 42,1±11,3 in Group 3. The mean stone size was 17,7±2,2 mm in Group 1, 18,6±2,1 mm in Group 2, and 17,7± 1,6 mm in Group 3. Groups were also similar regarding stone densities. However, there was a significant difference between the groups concerning the duration of surgery. Mean surgical times were 53±8,2 minutes in Group 1, while they were 63,2±6,6 minutes in Group 2 and 73,7±7,5 minutes in Group 3 (p=0,000). In one case of the RPUL group (i.e., Group 2), the stone migrated to the kidney during surgery. It was grasped by a basket catheter advanced through the flexible ureteroscope introduced into the trocar. There was no significant difference between the groups regarding minor and major complication rates (Table 1). A significant hemoglobin drop (i.e., 2.9 g/L) occurred in one case of the SMPCNL group; however, this patient was treated conservatively without blood transfusion. There was no mortality in the entire cohort. The details regarding complications encountered in all groups are displayed in Table 2. The mean duration of hospital stay was 3,2±0,6 days in Group 1, 3,1±0,4 days in Group 2, and 1,1±0,7 days in Group 3. It was significantly shorter in Group 3 than in the other groups (p<0,0001). The convalescence duration was 7,2±0,8 days in the SMPCNL group, 7,7±1,4 days in the RPUL group, and 7±0,5 days in the FURS group. It was significantly longer in the RPUL group than in the others (p<0,001). In the initial radiological assessment, stone-free rates were calculated as 100%, 90,3%, and 87,7% in RPUL, SMPCNL, and FURS groups. This rate was significantly lower in the FURS group than in the other groups (p=0,02). Five patients in the SMPCNL group and 7 patients in the FURS group were not stone-free in the initial assessment. One of the 5 patients in the SMPCNL group and 2 of the 7 patients in the FURS group underwent extracorporeal shock wave lithotripsy (ESWL) as adjunct treatments. The radiological re-assess-

ments performed 3 months after surgery revealed that 50 (96.1%) patients in Group 1, 53 (100%) patients in Group 2 and 52 (91.2%) patients in Group 3 were stone-free (p=0,06).

Complications were classified based on the modified Clavien-Dindo classification system (16). Clavien grade I and II complications were considered minor, while Clavien III, IV, and V were considered major complications. (Table 2)

DISCUSSION

The optimal treatment of large impacted proximal ureteral stones is controversial (1-4). However, it is widely accepted that the ideal treatment method should be non-invasive and effective. Undoubtedly, ESWL is the least invasive method to treat these stones (3). The European Association of Urology (EAU) 2020 guidelines recommended ESWL or ureteroscopy as the first-line treatment method for proximal ureteral stones smaller than 10 mm in diameter (6). However, it was reported that, in patients who underwent ESWL, the stone-free rates decreased with increasing stone sizes. Therefore, the adjunct treatment rates increased in these cases. White et al. reported their 5-year experience with ESWL and noted that the stone-free rates were 69,3% and 59,8% in patients with proximal ureteral stones larger than 1 cm and smaller than 1 cm, respectively (8). Kartal et al. compared the success rates of ESWL, semirigid URS, and FURS in patients with proximal ureteral stones larger than 1 cm (1). These authors reported that ESWL led to stone-free rates of 58,6% and 79% in the 15th day and 3rd-month assessments, and adjunct treatment was needed in 25,9% of these patients. These findings imply that ESWL is not an ideal treatment option in patients with proximal ureteral stones larger than 1 cm.

The retrograde ureteroscopic method is frequently preferred in treating proximal ureteral stones (1,9,10). The use of natural orifices is this method's main advantage. However, its success rate in proximal ureteral stones is not as high as in the treatment of distal ureteral stones (1,9,10). Yencilek and colleagues analyzed the efficacy of semirigid URS in patients with stones in different ureteral locations (9). They concluded that the success rates were 98% and 71% in distal and proximal ureteral stones, respectively. In impacted proximal ureteral stones, stones are usually large, close to the renal pelvis, and associated with hydronephrosis (4). Therefore, there is a relatively high risk of stone fragment migration toward the renal collecting system during ureteroscopic fragmentation. In line with this, residual stone and adjunct treatment rates are also somewhat higher in this patient group. The recent technological developments increased the popularity of FURS which had a relatively low complication and high stone-free rate. Galal et al. compared rigid and flexible URS success rates in patients with proximal ureteral stones (10). They reported that the success rates were 68% and 91% in the initial assessment and 79,5% and 94% after 3-month postoperative follow-up. It was also reported that FURS had a low complication rate and was associated with a short duration of hospital stay (1, 11). Antegrade mini-percutaneous nephrolithotomy (MPCNL) and RPUL are more invasive than FURS, but they are recommended as alternative treatment methods since they have significantly high success rates (2, 3, 4, 11, 12). Topaloglu et al. reported stone-free rates of 100% with antegrade PCNL and RPUL in the treatment of proximal ureteral stones (3). Of note, the surgical times were significantly shortened by the supine approach in mini-percutaneous nephrolithotomy, and the complication rates were reduced with increasing experience in RPUL cases (3,11,12). Therefore, these methods are comparable to each other. The antegrade approach can be performed in both prone and supine positions; however, the surgical time is significantly shorter in the supine approach since there is no need for patient re-positioning (14,15). Several studies reported that antegrade percutaneous nephrolithotomy performed for treating proximal ureteral stones in the prone position was associated with long surgical times (2, 4).

On the other hand, Yi-Zang et al. analyzed the surgical times in treating single large proximal ureteral stones (11). They noted that mean surgical times were 49 and 67 minutes in supine mini-percutaneous nephrolithotomy and FURS procedures, and the former was significantly faster than the latter (11). Finally, Stavros et al. compared the antegrade and retrograde procedures in the treatment of large proximal ureteral stones (2). They denoted that most complications were grade 1, and there was no significant difference between the two groups concerning complication rates (p=0,745).

Laparoscopic ureterolithotomy can be performed using transperitoneal and retroperitoneal approaches (12). It was reported that RPUL was associated with relatively less postoperative pain and faster postoperative recovery. Although RPUL has disadvantages such as narrow working space and difficulty in identifying the ureter, preservation of the peritoneum and protection of the peritoneal space from contamination with urine are its advantages (3). Yunyang et al. analyzed the safety and efficacy of URS, MPCNL, and RPUL in treating proximal ureteral stones, and they noted that no major complications were encountered in their cohort (4). These authors concluded that RPUL was an effective and safe treatment method provided that it was performed by urologists with fine laparoscopic skills. Several reports stated that antegrade and laparoscopic approaches were associated with longer hospital stays and convalescence times than the retrograde approaches (11, 12). Our study detected the highest stone-free rate in the RPUL group (p=0,02). The stone-free rates were calculated as 96,1%, 100%, and 91,2% in SMPCNL, RPUL, and FURS groups during the 3rd-month assessment. Most of the complications were grade 1. There was no significant difference between the groups regarding minor and major complication rates. The SMPCNL group was associated with the shortest surgical time, while the longest surgical time was detected in the FURS group. The shortest duration of hospital stay was observed in the FURS group. The longest convalescence time was detected in the RPUL group.

This study has some limitations that must be considered while evaluating its findings. First, it is a retrospective, single-center study. Second, the treatment decisions were based on patient preferences. Third, the patient follow-up time was relatively short, and long-term complications could not be assessed. Therefore, our findings should be confirmed by prospective randomized trials with relatively more extended follow-up periods.

Despite these weaknesses, our study is the first to compare SMPCNL, RPUL, and FURS in treating single impacted proximal ureteral stones larger than 15 mm in diameter.

CONCLUSION

Our data showed that FURS was associated with a relatively shorter hospital stay and faster recovery. Since there was no significant difference between the three patient groups regarding minor and major complication rates, we postulate that SMPCNL and RPUL were as safe as FURS in the treatment of the patients with proximal ureteral stones larger than 15 mm in diameter. Reduction in the surgical times of mini-percutaneous nephrolithotomy by supine approach and drop in the complication rates of RPUL by increasing experience made SMPCNL and RPUL as reasonable and more effective alternatives to FURS in the treatment of these patients.

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

Financial Disclosure: The authors declared that this study has received no financial support.

Ethical Approval: The study was approved by the Ethics Committee of University of Health Sciences, Dr.Sadi Konuk Training and Research Hospital (Approval No: 2021/03-11, Date: 2021/02/01). The study protocol conformed to the ethical guidelines of the Helsinki Declaration.

Author Contributions: Conception and design; Ekşi M, Data acquisition; Ayten A, Data analysis and interpretation; Evren İ, Drafting the manuscript; Karadağ S, Critical revision of the manuscript for scientific and factual content; Bitkin A, Şahin S, Taşçı Aİ, Statistical analysis; Ekşi M; Polat H, Supervision; Bitkin A, Şahin S, Kargı T; Karadağ S; Taşçı Aİ.

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Original Article
Özgün Araştırma

Endourol Bull. 2023;15(1):9-15. doi: 10.54233/endouroloji.1188796

Comparison of retrograde intrarenal surgery and percutaneous nephrolithotomy results for 20-30 mm kidney stones: A matched-pair analysis

20-30 mm böbrek taşları için uygulanan retrograd intarenal cerrahi ve perkütan nefrolitotomi sonuçlarının karşılaştırılması: Eşleşmiş çift analizi

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ÖZET

Amaç: 20-30 mm böbrek taşlarında retrograd intrarenal cerrahi ve perkütan nefrolitotomi sonuçlarını karşılaştırmayı amaçladık.

Gereç ve Yöntemler: Ocak 2013 ile Temmuz 2022 tarihleri arasında 20-30 mm böbrek taşı nedeniyle retrograd intrarenal cerrahi ve perkütan nefrolitotomi uygulanan 324 hastanın demografik, radyolojik, klinik ve cerrahi ile ilgili verileri retrospektif olarak incelendi. Tüm hastalar yapılan cerrahiye göre retrograd intrarenal cerrahi grubu ve perkütan nefrolitotomi grubu olarak iki gruba ayrıldı. Yaş, taş sayısı, taş yerleşimi, taş boyutu ve taş yoğunluğu açısından iki grup eşleştirildikten sonra 122 hasta (retrograd intrarenal grupta 61 hasta ve perkütan nefrolitotomi grubunda 61 hasta, 1:1 oranında) çalışmaya dahil edildi.

Bulgular: Retrograd intrarenal cerrahi grubu (%78.7) ve perkütan nefrolitotomi grubu (%80.2) başarı oranları benzerdi (p=0.823). Enfektif ve enfektif olmayan komplikasyonlar açısından iki grup arasında fark yoktu (sırasıyla, p=0.752 ve p=0.61). Ameliyat süresi ve hastanede yatış süresi açısından iki grup arasında istatistiksel olarak anlamlı fark vardı. Retrograd intrarenal cerrahi grubunda ortanca ameliyat süresi 70 (30-100) dakika ve ortanca hastanede kalış süresi 1 (1-28) gün, perkütan nefrolitotomi grubunda ise ortanca ameliyat süresi 90 (50-160) dakika ve ortanca hastanede kalış süresi 4 (2-10) gün idi (p<0.001).

Sonuç: 20-30 mm böbrek taşlarının cerrahi tedavisinde retrograd intrarenal cerrahi, benzer başarı ve komplikasyon oranları, daha kısa operasyon süresi ve hastanede kalış süresi ile iyi bir alternatiftir.

Anahtar Kelimeler: *perkütan nefrolitotomi, retrograd intrarenal cerrahi, taş, ürolitiyazis*

Cite As: *Şenel S, Polat ME, Ceviz K et al. Comparison of retrograde intrarenal surgery and percutaneous nephrolithotomy results for 20-30 mm kidney stones: a matched-pair analysis. Endourol Bull. 2023;15(1):9-15. doi: 10.54233/endouroloji.1188796*

This study was approved by the Ankara City Hospital Ethics Committee of Clinical Researches (Approval Number: E2-22-2398, Date: 2022-10-12). All research was performed in accordance with relevant guidelines/regulations, and informed consent was obtained from all participants.

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Received : October 13, 2022 ***Accepted*** : November 21, 2022

ABSTRACT

Objective: To compare the results of retrograde intrarenal surgery and percutaneous nephrolithotomy for 20-30 mm kidney stones.

Material and Methods: The demographic, radiologic, clinic and surgery related data of 324 patients who underwent retrograde intrarenal surgery and percutaneous nephrolithotomy for 20-30 mm kidney stones between January 2013 and July 2022 were retrospectively analyzed. All patients were divided into two groups as retrograde intrarenal surgery group and percutaneous nephrolithotomy group according to the surgery performed. After matching two groups in terms of age, number of stones, location of stones, stone size and stone density, 122 patients were included in the study (61 patients in retrograde intrarenal group and 61 patients in percutaneous nephrolithotomy group as 1:1).

Results: The success rate of retrograde intrarenal surgery group (78.7%) and percutaneous nephrolithotomy group (80.2%) were similar (p=0.823). There was no difference between two groups in terms of infective and non-infective complications (respectively, p=0.752 and p=0.61). There were statistically significant difference between the two groups in duration of operation and hospitalization. The median operation time was 70 (30-100) minutes and the median hospital stay was 1 (1-28) days in the RIRS group, while the median operation time was 90 (50-160) minutes and the median hospital stay was 4 (2-10) days in the PNL group (p<0.001).

Conclusion: Retrograde intrarenal surgery is a good alternative in the surgical treatment of 20-30 mm kidney stones with similar success and complication rates and also shorter operation time and hospitalization time.

Keywords: *percutaneous nephrolithotomy, retrograde intrarenal surgery, stone, urolithiasis*

INTRODUCTION

Urinary system stone disease is very common and its increasing incidence and prevalence confer to an exponentially growing burden in terms of therapeutic procedures and financial resources (1). Operative management of stones comprises the main therapeutic option of stone disease and its evolvement through the last decades is taking place at a rapid pace. Following this involvement, indications, and limitations relating to each stone disease category have changed tremendously during the last years.

Regarding renal stones, they represent a demanding subset of stone disease cases, which in the past was managed mainly through open surgical extraction of the stone burden, while nowadays minimally invasive extraction is taking place through endourological approaches. Large renal stones (>2 cm) are mostly characterized by increased stone volume, therefore their complete removal is considered challenging. According to the European guidelines for urolithiasis, percutaneous nephrolithotomy (PNL) is still the standard option for kidney stones of the above category, while retrograde intrarenal surgery (RIRS) through flexible ureteroscopy (fURS) is kept as an alternative for cases with a contraindication for PNL, such as patients under anticoagulant therapy (2). The rationale of the above strategy is related to a tendency for a lower stone-free rate (SFR) after RIRS. Similarly, the guidelines of the American Urological Association (AUA) recommend PNL as the first option for removal of kidney stones >2 cm, while ineligible for PNL should be managed by staged RIRS (3).

From the historical perspective, fURS was performed for the first time in 1964 to diagnose disorders of the upper urinary tract (4). Regarding the management of renal stones, the first series of cases operated through fURS were reported in the late 1990s, which was after the successful application of holmium laser through ureteroscopes with a suitable working channel (4). Continuously growing experience and improved equipment allowed the successful performance of stone removal even in cases with renal stones >2 cm, yet only in the last years fURS was officially recognized as an effective alternative to the standard option of PNL.

Currently, a number of technological innovations are driving the performance of modern RIRS. These innovations include the increase of power of stone disintegrating systems, the application of improved

optics, the introduction of new laser energy types, the improved application of irrigation during the procedures, and the use of single-use equipment (5). The above innovations have allowed the more efficient removal of the stone burden from renal cavities with lower intrarenal pressure, which is crucial for the reduction of complications. Future directions for the fURS and RIRS include the improved control of temperature in the renal cavities during the procedures, the application of artificial intelligence for optimal adjustment of procedural parameters, and the multiple-axis tip deflection (5). These developments are expected to contribute to the further extension of fURS indications and to improve the results and the safety profile of the respective procedures.

Given the continuously increasing popularity of RIRS, many urologists support the opinion, that the role of PNL in the removal of renal stones will be diminished in the future, which also refers to stones >2 cm. Indeed, RIRS has demonstrated promising results and a review by Breda et al. summoned the studies reporting results of RIRS for renal stones >2.5 cm and concluded that an SFR of 89.3% was feasible with an average of 1.6 procedures per case and low complication rate (6). However, comparable results of RIRS to PNL are achievable frequently through staged procedures in high-volume centers, which suggests that RIRS is not yet equivalent to PNL (7). Moreover, technological developments are also contributing to the optimization of PNL procedures, with the miniaturization of the respective scopes and access sheaths, which makes PNL less invasive and safer in terms of complication rate (7).

As a conclusion, the evolvement of the above surgical approaches increases the overlap in the indication range of each modality, so that the selection can be made also with subjective criteria, e.g. the surgeon's preference. Based on the current characteristics of performing the above approaches in our clinic, the aim of this study was to compare the results and safety profile of RIRS to PNL in removing renal stones with a maximal diameter of 2-3 cm. According to our opinion, this size category represents the first ''grey zone'', where the newest clinical data may drive to a change of the official recommendations in favor of RIRS.

MATERIAL AND METHODS

Patient

The local ethics committee approved the study (Approval number: E2-22-2398).

The results of 324 patients who had operated with RIRS and PNL to treat 20-30 mm kidney stones in urology depatrment between January 2013 and July 2022 were retrospectively analyzed. RIRS group consisted of the patients who preferred RIRS because it was a less invasive surgery despite the presence of 2-3 cm kidney stones in our study.

The surgical method (RIRS, PNL), age, gender, body mass index [BMI], stone side, number of stones, stone location, stone size, stone density, history of urinary tract infection, history of previous stone surgery, duration of operation, presence of residual stones, infective complications and non-infective complications were evaluated. Two groups were formed as RIRS group and PNL group according to the surgery performed. Then, the two groups were matched 1:1 with respect to age, stone number, stone location, stone size and stone density. Thus, it was possible to match 61 patients in the RIRS group and 61 patients in the PNL group, and 122 patients were included in the study. These two groups were compared in terms of the data mentioned above. Only single session RIRS and PNL results were included in the study.

Kidney stones of all patients was diagnosed by preoperative non-contrast computed tomography. Stone size was defined as the measurement of the longest diameter of the stone in millimeters. If there is more than one stone, the stone sizes was summed up.

At least 7 days treatment with antibotics to the urinary tract infection were applied. None of the patients were operated without sterile urine culture. 2 g cefazoline were given 1 hour before surgery for the prophylaxis.

Surgical Technique

RIRS was applied to all patients under general anesthesia and in the lithotomy position. The genital area was cleaned with 10% povidone iodine solution and covered sterile. Before RIRS, 9.5 F rigid ureter-

orenoscope (URS) was used for the ureterorenoscopy and dilatation. In sufficiently dilated ureters, access sheath was directed to collecting system. Then, 7.5 F flexible (URS) was used for to reach the stone through the access channel. DJ stent was placed in patients with ureteral stenosis and the operation was postponed for 2 weeks.

Pecutaneous nephrolithotomy was performed in the prone or supine position. The choice of method in PNL was made by the surgeon according to the surgeon's experience. An 18-G needle was inserted through the appropriate calyx by using fluoroscopy. After the dilatations of tract with facial dilators, through 30-Ch Amplatz sheath, 26 Fr nephroscope was used. For the fragmentation of the stones pneumatic lithotriter was used and the fragments were collected with forceps.

In supine PNL, the patient raised about 30° same side of the stone in supine position. All other procedures were as mentioned above.

A 22 Fr nephrostomy catheter was placed in the kidney. The catheter was removed if the urine was clear on the third day after the operation and there was no extravasation in the controle pyelogram. The duration of the operation was accepted as the time from the entry of the rigid ureterorenoscope through the urethra to the insertion of the catheter for RIRS. For PNL, it was calculated as the time to insertion of the nephrostomy tube. The length of hospital stay was evaluated as 1 day of surgery. At the first month control abcence of residual stone in imaging methods, was accepted as succesful operation.

Statistical Analysis

SPSS 22 software package program was used for statistical analyzes and to code the data Shapiro-Wilk tests were used for distribution of data. For the non categorical parameters comparision Mann-Whitney U test was used. Chi-square test was used for categorical variables. The p value below 0.05 were considered statistically significant.

RESULTS

The median age of 122 patients included in the study was 43 (20-71) years. The rate of male patients were 67.2%. The median stone size was 25 (20-30) mm, and the median stone density was 1288 (569-1714) HU. There was no significant difference between two groups in terms of age, stone number, stone location, stone size and stone density ($p>0.05$). In addition, the groups were similar in terms of gender, BMI, stone side, stone surgery history and urinary tract infection history ($p>0.05$).

The success rate was 78.7% in the retrograde intrarenal surgery group and it was 80.2% in the PNL group ($p=0.823$). Infective complications developed in 6 (9.8%) patients in the RIRS group and in 5 (8.2%) patients in the PNL group. These complications were fever in 4 patients, urinary tract infection in 1 patient and sepsis in 1 patient in the RIRS group, while fever in 3 patients and urinary tract infection in 2 patients in the PNL group. Infective complications were similar between two groups ($p=0.752$). There were non-infective complications in 8 (13.1%) patients in the RIRS group and in 10 (16.4%) patients in the PNL group. These complications were minimal mucosal injuriy in 3 patients, mucosal injury requiring stent in 2 patients, bleeding requiring transfusion in 1 patient, transient creatinine elevation in 1 patient, and stent migration in 1 patient for the RIRS group. In the PNL group, urinary extravasation requiring stenting occured in 4 patients, bleeding requiring transfusion in 3 patients, transient creatinine elevation in 2 patients, and perinephric abscess complications in 1 patient. The two groups were similar in terms of non-infective complications ($p=0.61$).

Duration of operation and hospitalization were different between two groups. The median operation time was 70 (30-100) minutes and the median hospital stay was 1 (1-28) days in the RIRS group, while the median operation time was 90 (50-160) minutes and the median hospital stay was 4 (2-10) days in the PNL group ($p<0.001$) (Table 1).

Table 1. Comparative analysis of demographic, clinical and perioperative results of patients who underwent retrograde intrarenal surgery and percutaneous nephrolithotomy for 20-30 mm kidney stones

	Total (n=122)	*RIRS (n=61, 50%)*	*PNL (n=61, 50%)*	*p*
Age (years) (median [min-max])	43 (20-71)	44 (20-71)	43 (21-69)	0.802[m]
Gender				0.7[c]
Male, n (%)	82 (67.2)	42 (68.9)	40 (65.6)	
Female, n (%)	40 (32.8)	19 (31.1)	21 (34.4)	
BMI (kg/m²) (median [min-max])	25.9 (20.5-34.7)	25.9 (21.5-34.5)	25.7 (20.5-34.7)	0.518[m]
Stone size (mm) (median [min-max])	25 (20-30)	25 (20-30)	25 (20-28)	0.932[m]
Stone density (HU) (median [min-max])	1288 (569-1714)	1327 (569-1714)	1278 (620-1668)	0.971[m]
Number of stones				
Single, n (%)	64 (51.8)	31 (50.8)	33 (54.1)	0.365[c]
Multiple, n (%)	58 (48.2)	30 (49.2)	28 (45.9)	
Stone location				
Pelvis, n (%)	32 (26.2)	15 (24.6)	17 (27.9)	
Upper calyx, n (%)	16 (13.1)	9 (14.8)	7 (11.5)	
Middle calyx, n (%)	12 (9.8)	5 (8.2)	7 (11.5)	0.938[c]
Lower calyx, n (%)	13 (10.7)	7 (11.4)	6 (9.8)	
Multicalyx, n (%)	49 (40.2)	25 (41)	24 (39.3)	
Stone side				
Right, n (%)	51 (41.8)	30 (49.2)	21 (34.4)	0.099[c]
Left, n (%)	71 (58.2)	31 (50.8)	40 (65.6)	
History of previous stone surgery				0.586[c]
Yes, n (%)	58 (47.5)	31 (50.8)	27 (44.3)	
No, n (%)	64 (52.5)	30 (49.2)	34 (55.7)	
History of previous urinary tract infection				0.752[c]
Yes, n (%)	11 (9)	5 (8.2)	6 (9.8)	
No, n (%)	111 (91)	56 (91.8)	55 (90.2)	
Duration of operation (min) (median [min-max])	75 (30-160)	70 (30-100)	90 (50-160)	**<0.001[m]**
Success rate, n (%)	97 (79.5)	48 (78.7)	49 (80.3)	0.823[c]
Infective complication, n (%)	11 (9)	6 (9.8)	5 (8.2)	0.752[c]
Non- Infective complication, n (%)	18 (14.8)	8 (13.1)	10 (16.4)	0.61[c]
Hospital stay (days) (median [min-max])	3 (1-28)	1 (1-28)	4 (2-10)	**<0.001[m]**

***SD:** Standart Deviation, **BMI:** Body Mass Index, **HU:** Houndsfield Unit, min: minute,*
***m:** Mann Whitney U Test, **c:** Chi-squareTest*

DISCUSSION

Renal stones >2 cm represent a significant challenge in achieving complete stone burden removal under maximal safety for the patient. In this clinical setting, improved RIRS equipment seems to compensate for the diminished stone burden evacuation capability compared to PNL. In the current study, we included two patient groups with relatively large total stone volumes, which were comparable in terms of factors affecting the results of stone removal surgery, in order to reduce any bias from these factors. The modalities used for the stone removal achieved high success rates, with PNL resulting to complete stone extraction in 80.2% of the patients, which was slightly higher, but not statistically significant compared to the respective rate of RIRS. Infective complications manifested also at an almost similar rate in the com-

paring patient groups. Non-infective complications were slightly but not significantly higher in the PNL group. More interestingly, RIRS procedures were characterized by shorter duration, a difference that was statistically significant and confirms the increased efficiency of the modern fURS armamentarium. Another significant difference was observed in the hospital stay duration, where patients managed with RIRS were able to be dismissed at an earlier time point than PNL patients.

Regarding the publications on the comparison of the above modalities in the treatment of renal stones >2 cm, the reported data are heterogeneous. In 2014, Zheng et al. found a significant difference in bleeding events in favor of RIRS, while SFR and fever events were not different compared to PNL (8). On the contrary, a meta-analysis by Kang et al. proved the advantage of PNL in terms of stone extraction (9). In 2017, a meta-analysis by Zhu et al. demonstrated a significantly lower SFR, shorter hospital stay, and longer operation duration for RIRS in cases with renal stones >2 cm (10). The most recent meta-analysis found during literature search, which compared mini PNL (mPNL) to RIRS for renal stones 2-3 cm, showed an advantage of mPNL over RIRS in terms of SFR, need for an auxiliary procedure, while blood loss, fluoroscopy time and hospital stay were significantly different in favor of RIRS (11). A very recent prospective randomized controlled trial on the same topic demonstrated no significant difference in any of the comparing parameters, while stone clearance was only slightly higher in the PNL group (12).

In our opinion, RIRS has expanded its indications due to technological advances, but it is still strongly subject to the effect of stone size, which is also documented by respective studies (13). This fact does not exclude the possibility, that RIRS can demonstrate equivalent results with PNL, even in the challenging stone size category of >2 cm. The continuously improving performance of RIRS combined with its inherent tendency for the rare manifestation of complications is reflected in the modern operative practice for renal stones. More specifically, the number of RIRS procedures and their percentage in the whole of surgical procedures for renal stones are steadily increasing, while the respective parameters for PNL procedures are increasing to a minor degree, or remain stable, representing 5% of stone treatments (14, 15).

There are some limitations in our study. This is a retrospective study of a single center. In addition, the results of one session of the relevant surgery were given in the study. If more than one session was applied, the results might differ.

The above changes in trends of nephrolithiasis management are expected to be officially introduced in the respective guidelines. Since the first zone for the establishment of equivalence of RIRS is represented by the stone size category of 2-3 cm, we chose exactly this case subset to examine the performance of RIRS and PNL in terms of SFR and complication rate. Another advantage of the current study is the matching process of the comparing groups, which contributed to the objectivity of the respective comparisons. As in any clinical question, prospective studies have to be conducted to support the change in the operative practice of renal stone treatment with maximally unbiased data.

CONCLUSION

In the surgical treatment of 20-30 mm kidney stones, RIRS can be applied as an alternative to PNL with similar success and acceptable complication rates. In addition, it can provide advantages of shorter operation time and hospitalization time.

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

Financial Disclosure: The authors declared that this study has received no financial support.

Ethical Approval: The study was approved by the Ankara City Hospital Ethics Committee of Clinical Researches (Approval Number: E2-22-2398, Date: 2022-10-12). The study protocol conformed to the ethical guidelines of the Helsinki Declaration.

Author Contributions: Conception and design; Şenel S, Ceviz K, Özden C, Data acquisition; Polat ME, Uzun E, Data analysis and interpretation; Uzun E, Özden C, Drafting the manuscript; Şenel S, Koudonas A, Critical revision of the manuscript for scientific and factual content; Polat ME, Koudonas A, Statistical analysis; Şenel S, Uzun E, Supervision; Polat ME, Kasap E, Demirel HC.

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Original Article
Özgün Araştırma

Endourol Bull. 2023;15(1):16-22. doi: 10.54233/endouroloji.1202615

Comparison of preoperative nomograms predicting lymph node invasion in patients underwent radical prostatectomy

Radikal prostatektomi yapılan hastalarda lenf nodu invazyonunu öngören preoperatif nomogramların karşılaştırılması

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ÖZET

Amaç: Prostat kanserinin cerrahi tedavisinde radikal prostatektomiye bazı durumlarda pelvik lenf nodu diseksiyonu (PLND) da eklenmektedir. Hangi hastada PLND yapılması gerektiğini öngören bazı nomogramlar geliştirilmiştir. Çalışmamızda MSKCC, Briganti ve Partin nomogramlarının etkinliğini değerlendirmeyi amaçladık.

Gereç ve Yöntemler: Retrospektif olarak çalışmaya Eylül 2020 ile Ekim 2022 tarihleri arasında radikal prostatektomi ve PLND yapılmış prostat kanseri hastaları dahil edildi. Çalışmaya toplamda 94 hasta dahil edildi. Hastaların demografik verileri ve prostat spesifik antijen (PSA), klinik evre, gleason skoru, biyopsi özellikleri gibi verileri kullanılarak Briganti, MSKCC ve Partin nomogramına göre lenf nodu invazyonu oranları hesaplandı.

Bulgular: Radikal prostatektomi yapılan 94 hasta çalışmaya dahil edildi. Hastaların 15'inde lenf nodu invazyonu bildirilirken, 79 hastada saptanmadı. Hastaların Briganti, Partin ve MSKCC nomogramlarının eğri altında kalan alan değerleri sırasıyla 0,922, 0,825 ve 0,929 idi. Her 3 nomogramın doğruluk oranı istatistiksel olarak anlamlı şekilde başarılı idi.

Sonuç: MSKCC ve Briganti nomogramlarının lenf nodu invazyonunu öngörmedeki duyarlılığı Partine göre biraz daha yüksek bulunmuştur. Ancak Briganti, Partin'e ve MSKCC nomogramları prostat kanseri hastalarında lenf nodu invazyonunu öngörmede güvenle kullanılabilir.

Anahtar Kelimeler: Partin, MSKCC, Briganti, prostat kanseri

Cite As: *Can O, Topal C, Danış E et al. Comparison of preoperative nomograms predicting lymph node invasion in patients underwent radical prostatectomy. Endourol Bull. 2023;15(1):16-22. doi: 10.54233/endouroloji.1202615*

This study was approved by the Ethics Committee of Başakşehir Çam and Sakura City Hospital (Approval Number: KAEK-2022-11-356, Date: 2022-01-08). All research was performed in accordance with relevant guidelines/regulations, and informed consent was obtained from all participants.

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Received : November 12, 2022 ***Accepted*** : January 17, 2023

ABSTRACT

Objective: In some cases, pelvic lymph node dissection (PLND) is added to radical prostatectomy in the surgical treatment of prostate cancer. Some nomograms have been developed to predict which patient should undergo PLND. In our study, we aimed to evaluate the effectiveness of MSKCC, Briganti and Partin nomograms.

Material and Methods: Retrospectively, prostate cancer patients who underwent radical prostatectomy and PLND between September 2020 and October 2022 were included in the study. A total of 94 patients were included in the study. The rates of lymph node invasion were calculated according to the Briganti, MSKCC, and Partin nomograms using the demographic data of the patients and data such as prostate-specific antigen (PSA), clinical stage, gleason score, and biopsy characteristics.

Results: Ninety four patients who had radical prostatectomy were included in the study. While lymph node invasion was reported in 15 of the patients, it was not detected in 79 patients. The area under the curve (AUC)'s of the patients' Briganti, Partin, and MSKCC nomograms were 0.922, 0.825, and 0.929, respectively. The accuracy rate of all 3 nomograms was statistically significant.

Conclusion: The sensitivity of MSKCC and Briganti nomograms in predicting lymph node invasion was found to be slightly higher than Partin nomogram. However, Briganti, Partin, and MSKCC nomograms can be used safely to predict lymph node invasion in prostate cancer patients.

Keywords: Partin, MSKCC, Briganti, prostate cancer

AMAÇ

Prostat kanseri erkeklerde görülen en sık ikinci kanser türüdür (1). Cerrahi tedavisinde prostat seminal veziküllerle beraber çıkarılmaktadır. Güncel pratiğimizde, orta ve yüksek riskli prostat kanserinin cerrahi tedavisinde radikal prostatektomi ile beraber pelvik lenf nodu diseksiyonu (PLND) yapılmaktadır. PLND'nun tedavi edici özelliği üzerine net konsensus henüz oluşmasa da hastalığın evrelemesi, adjuvan tedaviler düzenlenmesi ve prognostik açıdan son derece önemlidir (2-4). Hangi hastalara PLND yapılacağı ile ilgili Briganti, Partin ve Memorial Sloan Kettering Cancer Canter (MSKCC) gibi bazı preoperatif nomogramlar geliştirilmiştir (5-7). Bu nomogramlarda hastaların prostat spesifik antijen (PSA) değeri, gleason skoru ve evresi gibi bazı klinik değişkenlere göre lenf nodu invazyonu öngörülmeye çalışılmıştır.

PLND sonrası lenfosel veya lenfödem gibi önceden öngörülemeyen komplikasyonlar gelişebilmektedir. Bazen bu komplikasyonları yönetmek de oldukça zordur. Bu nedenle PLND'nin doğru hastalarda uygulanması hastaya avantaj sağlarken aksi durumda morbiditenin artmasına neden olabilmektedir. Bu çalışmada MSKCC, Briganti ve Partin nomogramlarının prostat kanseri hastalarında lenf nodu invazyonunu öngörebilme özeliklerini araştırmayı amaçlanmıştır.

GEREÇ VE YÖNTEMLER

Eylül 2020 ile Ekim 2022 arasında prostat kanseri nedeniyle radikal prostatektomi ve genişletilmiş PLND yapılan tüm hastalar retrospektif olarak değerlendirildi. Değerlendirme sonucu D'Amico sınıflamasına göre orta ve yüksek riskli grupta olan 94 hasta çalışmaya dahil edildi. Çalışmamız için Başakşehir Çam ve Sakura Şehir Hastanesi Klinik Araştırmalar Etik Kurulu'ndan (2022.11.356) etik kurul onayı alınmıştır.

Hastaların demografik özellikleri, preoperatif PSA, primer ve sekonder gleason skorları, prostat rektal muayene bulguları, biyopsi özellikleri gibi bilgileri retrospektif olarak kaydedildi. Bahsedilen verilerden eksiği olan hastalar çalışma dışı bırakıldı. Hastaların tümüne aynı cerrah tarafından robot yardımlı radikal prostatektomi ve genişletilmiş PLND uygulanmıştır.

Hastaların preoperatif verileri kullanılarak Briganti 2012, Partin 2016 ve Memorial Sloan Kettering Cancer Canter (MSKCC) nomogramları üzerinden lenf nodu invazyonu öngörüleri ayrı ayrı hesaplanmıştır. Bu nomogramlardan elde edilen skorlar ile final patolojiler karşılaştırılmıştır.

Veriler Statistical Package for Social Sciences (SPSS) sürüm 22.0TM (IBM Corporation, Los Angeles, CA, ABD) ile analiz edildi. Nomogramların lenf nodu invazyonunu öngörme doğrulukları işlem karakteristiği eğrisi (ROC) ve eğri altında kalan alan (AUC) hesaplamalarıyla ölçülmüştür. Değerlendirilen nomogramlarda en yüksek Youden indeksini sağlayan değer kestirim değeri olarak hesaplanmıştır. Gruplar arasındaki istatistiksel değerlendirme bağımsız t testi ile yapılmıştır.

BULGULAR

Çalışmaya toplamda 94 hasta dahil edilmiştir. Hastaların lenf nodu invazyonu durumuna göre demografik verileri ve nomogram skorları Tablo 1'de sunulmuştur. Ortalama yaşları LN (+) grupta 64,1±5 iken LN (-) grupta 64,4±5,8 olarak hesaplandı. Ortalama vücut kitle indeksi LN (+) grupta 26,6±1,5 kg/m2, LN (-) grupta 26,7±3,1 kg/m2 idi. Hastaların ortalama PSA değerleri LN (+) ve LN (-) grupta sırasıyla 25,7±16,9 ve 19,7±34,3 ng/ml ölçülmüştür. Ortalama prostat volümleri LN (+) grupta 47,9±14,3 cc iken LN (-) grupta 54,2±18,4 cc olarak hesaplanmıştır. Hastaların preoperatif klinik evrelemesinde 59 hasta T1c, 28 hasta T2a, 4 hasta T2b ve 3 hasta da T2c olarak değerlendirilmiştir. Hastaların ortalama Partin skoru LN (+) grupta 13±5,2 iken LN (-) grupta 6,3±5,2 olarak bulunmuştur. Briganti skoru LN (+) ve LN (-) grupta sırasıyla 23,5±17,2 ve 7,1±7,8 olarak hesaplanmıştır. MSKCC skoru LN (+) grupta 32,9±14,4 olarak bulunurken LN (-) grupta 9,7±6,5 olarak hesaplanmıştır.

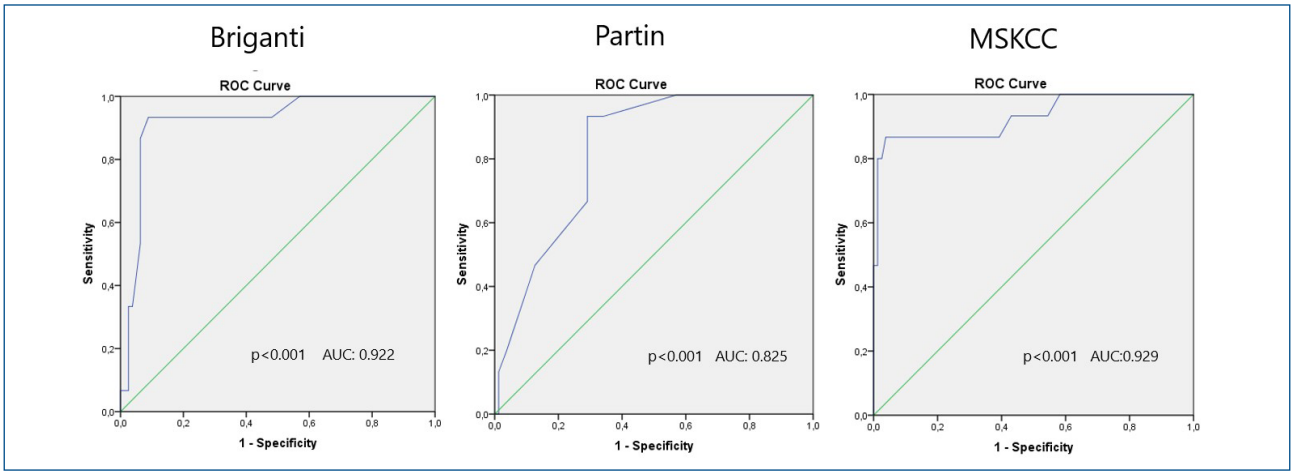
Lenf nodu diseksiyonu yapılan bu 94 hastanın 15'inde lenf nodu invazyonu olduğu raporlanırken 79 hastada lenf nodu karsinomu saptanmamıştır.

Hastaların preoperatif verileri ile hesaplanan Briganti, Partin ve MSKCC nomogramlarının AUC değerleri, eşik değerleri ve ROC eğrileri Şekil 1 ve Tablo 2'de sunulmuştur. Briganti nomogramının ROC eğrisine göre p değeri istatistiksel olarak anlamlı idi. Eğri altında kalan alan ise 0,922 olarak hesaplanmıştır. Benzer şekilde Partin nomogramında p<0,001 iken eğri altında kalan alan 0,825 bulunmuştur. MSKCC nomogramında ise p<0,001 iken eğri altında kalan alan 0,929 olarak hesaplanmıştır. Çalışmamızda lenf nodu invazyonunu öngörmede Briganti, Partin ve MSKCC nomogramları için sırasıyla hesaplanan skor kestirim değerleri 11,5, 10,5 ve 16,5 olarak bulunmuştur.

Tablo 1. Hastaların lenf nodu invazyonu durumuna göre demografik verileri ve nomogram skorları

	LN (+) n=15	LN (-) n=79	p değeri
Yaş	64,1±5	64,4±5,8	0,808
Vücut Kitle İndeksi (kg/m²)	26,6±1,5	26,7±3,1	0,839
PSA (ng/ml)	25,7±16,9	19,7±34,3	0,316
Prostat Volümü (cc)	47.9±14,3	54.2±18,4	0,149
Preoperatif Klinik Evre	T1c 2 T2a 10 T2b 2 T2c 1	T1c 57 T2a 18 T2b 2 T2c 2	0,001
Briganti nomogram (%)	23,5±17,2	7,1±7,8	<0,001
Partin Nomogram (%)	13±5,2	6,3±5,2	<0,001
MSKCC nomogram (%)	32,9±14,4	9,7±6,5	<0,001

Şekil 1. Nomogramların ROC eğrileri



Tablo 2. Nomogramların AUC değerleri ile kestirim değerleri

	Eğri Altında Kalan Alan (%95 Güven Aralığı)	Kestirim değeri	p değeri	Duyarlılık (%)	Özgüllük (%)
Briganti	0,922 (0,848 - 0,996)	11,5	p<0,001	93.3	91,1
MSKCC	0,929 (0,842 - 0,998)	16,5	p<0,001	86,7	86,1
Partin	0,825 (0,735 - 0,915)	10,5	p<0,001	66,7	70,9

TARTIŞMA

Prostat kanseri hastalarında lenf nodu invazyonu kanserin karakteristiği ile ilgilidir. Lenf nodu invazyonu daha yüksek PSA, daha yüksek gleason skoru, lokal-ileri evre hastalık ve sistemik hastalıkla bağlantılıdır (8). Lenf nodu invazyonu olmasının prostat kanserinde önemli prognostik faktörlerden birisi olduğu ve sağkalıma majör etkisinin olduğu gösterilmiştir (9). Henüz net olarak ortaya konmasa da PLND'nin potansiyel tedavi edici bir etkisi de olabilir. Genişletilmiş PLND prosedürü zaman alan ve lenfosel, hemoraji gibi bazı komplikasyonlara yol açabilen bir işlemdir. Böyle morbiditesi yüksek bir cerrahinin hangi hastada yapılması gerektiği konusu bu yüzden önemlidir.

Radikal prostatektomi hastalarında PLND yapıp yapmamamıza lenf nodu invazyonunu öngören bazı nomogramlara göre karar verilmektedir. Lenf nodu invazyonunu öngören altın standarda yakın bir nomogramda yüksek AUC değerleri ile yüksek bir doğruluk beklenir. Öyle ki nomogram gerçek riski değerlendirerek hastalarda fazladan cerrahinin getirdiği morbiditeyi önlerken yapılması gereken cerrahiyi de atlatmamalıdır (10). Ancak hala bunu öngören net bir nomogram geliştirilememiştir.

Partin 2016 nomogramı klinik evre (T1c, T2a, T2b-c), serum PSA (0-4, 4,1-6, 6,1-10, >10) ve biyopsi gleason skoru (6, 3+4, 4+3 ya da 8-10) gibi preoperatif verileri baz alan bir nomogramdır (11). Briganti 2012 nomogramı ise PSA değeri, klinik evre (T1, T2, T3), primer gleason skoru, sekonder gleason skoru ve pozitif biyopsilerin oranı ile hesaplanmaktadır (5). MSKCC nomogramında kullanılan veriler ise hastanın yaşı, biyopsi öncesi PSA değeri, primer ve sekonder gleason skoru, klinik evre (T1a-b-c, T2a-b-c, T3a-b-c) ve biyopsinin tümör yüzdesi olarak sıralanabilir (6). Çalışmamızda lenf nodu invazyonu öngörüleri karşılaştırılan bu 3 nomogramda PSA, klinik evre, primer ve sekonder gleason skoru verileri ortaktır. Briganti skorunda ek olarak pozitif biyopsi oranı da hesaplamaya katılırken MSKCC nomogramında hem pozitif biyopsi oranı hem de hastanın yaşı hesaplamaya katılmaktadır. Briganti, Cagiannos ve Partin nomogramlarının karşılaştırıldığı bir çalışmada tüm nomogramlar lenf nodu invazyonunu öngörmede faydalı olduğu gösterilirken Briganti skorunun AUC değerinin en yüksek olduğu bulunmuştur (12). Yine yakın zamanda yayınlanan bir meta-analizde Briganti, Partin ve MSKCC nomogramlarının benzer doğrulukta olduğu gösterilmiştir (13). Başka bir

çalışmada ise Briganti 2012 ve MSKCC nomogramlarının Briganti 2019'dan daha iyi performans gösterdiği gösterilmiştir (14). Güncel Briganti nomogramının bahsedilen düşük performansı parametrelerden birisi olan multiparametrik manyetik rezonans görüntüleme (mpMRG)' nin indeks lezyonu atlaması ile ilgili olabilir. Biz de çalışmamızda Briganti 2012, Partin 2016 ve MSKCC nomogramlarının lenf nodu invazyonunu öngörmede istatistiksel olarak anlamlı şekilde faydalı olduğunu gösterdik. ROC eğrileri altında kalan alanlara göre yapılan karşılaştırmada en duyarlı olanın MSKCC nomogramı sonrasında da Briganti nomogramı olduğu görülmüştür. Sadece PSA, klinik evre, primer ve sekonder gleason skoru gibi bazal değişken veriler ile hesaplanan Partin nomogramının AUC değerinin en az olduğu görülmüştür. Burada nomogram hesaplama denklemine daha çok değişken verinin girilmesi ile doğruluğa daha çok yaklaştığını gösterilmiştir.

Genellikle %5 eşik değeri gözetilerek PLND kararı verilmektedir. Ayrıca Avrupa üroloji kılavuzlarına göre de lenf nodu metastazı riski >%5 olan hastalara genişletilmiş PLND önerilmektedir (2). Briganti nomogramı 2012 versiyonunda da lenf nodu invazyonu için %5 sınır olarak belirtilirken 2019 versiyonda %7 olarak belirtilmiştir (15). Nomogramların karşılaştırıldığı farklı bir çalışmada Briganti için %14, Cagiannos için %4 ve Partin nomogramı için %1 gibi eşik değerler bildirilmiştir. Çalışmamızda lenf nodu invazyonunu öngörmede bulunan eşik değerler Briganti, Partin ve MSKCC nomogramları için sırasıyla 11,5, 10,5 ve 16,5'tir. Kestirim değerlerinin farklı olmasında çalışılan hasta popülasyonlarının, uygulanan cerrahinin ve cerrahın deneyimi gibi birçok faktöre bağlı değişebileceğini düşünüyoruz.

Birkaç dekat önce PLND farklı bir seansta ya da radikal prostatektomi ile eş zamanlı yapılmaktaydı. Lenf nodu pozitifliği saptanması durumunda radikal prostatektomi işlemi iptal edilirdi (16-18). Önceki yıllarda lenf nodu invazyonu oranı daha yüksek saptanır iken PSA testinin rutin bir tarama testi haline gelmesinden sonra hastalıklar daha erken evrelerde yakalanmaya başlamış ve lenf nodu invazyonu insidansı azalmıştır. Yapılan bazı güncel çalışmalarda genişletilmiş PLND sonrası lenf nodu invazyonu oranı %4-%26 civarı bulunmuştur (8,19-22). Yaptığımız çalışmada da literatüre uyumlu olarak yaklaşık %15 kadar bulunmuştur.

Bazı merkezlerde nispeten düşük riskli olduğu düşünülen vakalarda sınırlı PLND uygulansa da çıkarılan lenf nodu sayısı ile lenf nodu invazyonu arasında korelasyon olduğu düşünülmektedir. Yapılan çalışmalarda sınırlı PLND yapılan hastalara kıyasla genişletilmiş PLND yapılan hastalarda lenf nodu invazyonunun anlamlı şekilde daha fazla olduğu gösterilmiştir (8,19,20,23). Bu nedenle çalışmamızda hastalara eksternal iliak, hipogastrik, obturator bölgedeki lenf nodlarını içerecek şekilde genişletilmiş PLND uygulanmıştır.

Çalışmamızın limitasyonlarından ilki sınırlı sayıda hastadan oluşmasıdır. Çalışmamızda hastalarda gelişen komplikasyonlar kayıt edilmemiştir. Diğer bir sınırlama ise Briganti nomogramının en güncel formu olan 2019 versiyonunu da hesaplayarak çalışmamızdaki diğer nomogramlar ile karşılaştırılmamasıdır.

SONUÇ

Prostat kanserinde lenf nodu invazyonunu öngören valide edilmiş nomogramların kullanılması hasta ve klinisyen için son derece önemlidir. Çalışmamız göstermiştir ki MSKCC ve Briganti nomogramları lenf nodu invazyonunu öngörmede daha duyarlı olmakla birlikte nomogramların hepsi etkilidir.

Finansal Destek: Yazarlar bu çalışma için mali destek almadıklarını beyan etmişlerdir.

Çıkar Çatışması: Yazarlar çıkar çatışması olmadığını beyan ederler.

Etik Kurul: Bu çalışma için Başakşehir Çam ve Sakura Eğitim ve Araştırma Hastanesi Klinik Araştırmalar Etik Kurulu' ndan onay alınmıştır (Karar No: KAEK/2022-11-356, Tarih: 2022/01/08). Çalışma protokolünde, Helsinki Bildirgesi etik kuralları takip edilmiştir.

Yazar Katkıları: Konsept ve dizayn; Can O; Topal C; Bozkurt M; Keskin ET; Şimşek A; Canat L, Veri toplama; Topal C; Danış E; Keskin ET, Veri Analizi ve Yorumlama; Can O; Topal C; Bozkurt M; Keskin ET; Şimşek A; Canat L, Makalenin yazılması; Can O; Makalenin içeriğinin gözden geçirilmesi; Danış E; Bozkurt M; Keskin ET; Şimşek A; Canat L, İstatistiksel analiz; Can O; Keskin ET, Denetleme; Bozkurt M; Danış E; Topal C; Keskin ET; Şimşek A; Canat L.

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Original Article
Özgün Araştırma

Endourol Bull. 2023;15(1):23-29. doi: 10.54233/endouroloji.1217490

The Rezum procedure in benign prostate hyperplasia: Initial experience at a single center in Turkey

Benign prostat büyümesinde Rezum prosedürü: Türkiye'den tek merkezli ilk deneyimlerimiz

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ÖZET

Amaç: Bu çalışmada üriner ve cinsel sonuçlar dahil olmak üzere Rezum prosedürü ile ilgili ilk deneyimlerimizi sunmayı amaçladık.

Gereç ve Yöntemler: Bu retrospektif çalışmaya Haziran 2021 ile Ağustos 2022 arasında Rezum işlemi uygulanan toplam 24 hasta dahil edildi. Her prosedür için prostatın lateral ve varsa medyan loblarına 2 ila 12 enjeksiyon uygulandı. Başlangıç ve takip verileri analiz edildi. Ayrıca prostat medyan lobu olan ve olmayan hastaların sonuçları da karşılaştırıldı.

Bulgular: Ortalama takip süresi 7,5 aydı. Uluslararası Prostat Semptom Skoru tüm hastalarda ortalama 15 puan azalırken (p<0,001), maksimum idrar akışı benzer değerlere sahip üç hasta dışında tüm hastalarda arttı (ortalama 5 mL/s) (p<0,001). İşeme sonrası rezidüel idrarda azalma ise ortalama 55 mL idi (p<0,001). Medyan lobu olan ve olmayan hastalar arasında hiçbir değişken için anlamlı fark yoktu. Hiçbir hastada herhangi bir cinsel kötüleşme ya da majör bir komplikasyon gözlenmedi. Minör komplikasyon olarak, iki hastada makrohematüri, dördünde non-steroidal antiinflamatuar ilaç tedavisi gerektiren dizüri ve iki hastada idrar retansiyonu nedeniyle tekrar kateterizasyon saptandı.

Sonuç: Rezum işlemi prostat medyan loblu hastalarda dahi cinsel fonksiyonları koruyan etkili ve pratik bir prosedürdür.

Anahtar Kelimeler: alt üriner sistem semptomları, minimal invaziv cerrahi, prostat büyümesi, Rezum

Cite As: *Kılıç M and Balbay MD. The rezum procedure in benign prostate hyperplasia: Initial experience at a single center in Turkey. Endourol Bull. 2023;15(1):23-29. doi: 10.54233/endouroloji.1217490*

This study was approved by the Ethics Committee of Koç University (Approval Number: 2022.286.IRB1.117, Date: 2022-09-07). All research was performed in accordance with relevant guidelines/regulations, and informed consent was obtained from all participants.

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Received: February 12, 2022 ***Accepted:*** January 20, 2023

ABSTRACT

Objective: In this study, we aimed to present our initial experiences with the Rezum procedure, including voiding and sexual outcomes.

Material and Methods: A total of 24 patients who underwent the Rezum procedure between June 2021 and August 2022 were included in this retrospective study. For each procedure, 2 to 12 injections were applied to the median and lateral prostate lobes. We analyzed the baseline and follow-up data and compared the outcomes of patients with and without the median lobe of the prostate.

Results: The mean follow-up time was 7.5 months. The International Prostate Symptom Score decreased in all patients by 15 points on average ($p<0.001$), while the maximum urinary flow increased by 5 mL/s on average in all patients except three who had similar values ($p<0.001$). The post-void residual decrease was 55 mL ($p<0.001$). In terms of the variables examined, there was no significant difference between patients who had a median lobe and those who had not. Neither any sexual worsening nor any major complications were observed. As for minor complications, two patients had macrohematuria, four had dysuria that required non-steroidal anti-inflammatory drug therapy, and two required re-catheterization due to urinary retention.

Conclusion: The Rezum procedure is an effective and practical method, even in patients who have median lobes of the prostate, and preserves sexual functions.

Keywords: lower urinary tract symptoms, minimally invasive surgery, prostatic hyperplasia, Rezum

INTRODUCTION

Benign prostatic hyperplasia (BPH) is one of the most common diseases in men over the age of 40, with an incidence that increases with age. About 50% of men over the age of 50 and up to 80% of men over the age of 80 encounter lower urinary tract symptoms (LUTS) due to BPH (1, 2). The increase in the incidences of LUTS in the last decade has brought along different treatment modalities. LUTS due to BPH affects the quality of life of patients. While the medical approach is preferred in the first stage in patients who require treatment, surgery is recommended for those who do not want or cannot benefit from medical treatment (3). Among the surgical options, transurethral resection of the prostate (TURP) has been the gold standard for many years (4). In recent years, the armamentarium including minimally invasive approaches (MIA) has been expanding, including options that may differ in terms of invasiveness, effectiveness, side effects, and cost.

Rezum is an ablative MIA procedure, which has been getting popularity since its approval by the FDA in 2015 (4-6). In this method, water vaporization is applied using radiofrequency to create thermal energy (The Rezūm System; Boston Scientific Corp., Marlborough, MA, USA). In the studies conducted so far, advantages such as short procedure time, not affecting sexual functions, and not requiring anesthesia have been reported. In this study, we aimed to share the initial experiences of our center with the Rezum method, which has gained particular popularity in Turkey in the last few years.

MATERIAL AND METHODS

Surgical Procedure

The Rezum method transmits thermal energy to the prostate tissue through the convective water vapor produced by radio frequency, thereby creating the ablation of the prostate tissue. Depending on the prostate anatomy of the patient, thermal energy is transmitted to the lateral and median lobes of the prostate in varying numbers of injections. The technical details of the procedure have previously been described (7, 8).

In the current study, all patients were informed about the Rezum procedure before the operation and were informed that Rezum is less invasive compared to alternative treatment methods, with less possibility of complications such as retrograde ejaculation and erectile dysfunction. The patients were also told that

the possibility of additional treatment methods may be required after the Rezum operation, especially for patients with a prostate size of 80 grams and above.

The operations were performed by three different surgeons. All procedures were performed under general anesthesia. Depending on the prostate characteristics, 2 to 12 injections were applied to the median and lateral lobes of the prostate. The urethral catheters were removed after five to seven days. Alpha-blocker (alfuzosin) was prescribed to the patients for one month after surgery.

After the approval of the ethics committee (2022, 286.IRB1.117), the data of 25 patients who underwent Rezum surgery between June 2021 and August 2022 were analyzed retrospectively.

Data Analysis

Twenty-five patients, who were aged 40-80 and had at least three months of follow-up data, were included in the study. One patient who was lost to the first-month follow-up was excluded from the study; thus, the data of the remaining 24 patients were analyzed. Patient characteristics including prostate-specific antigen (PSA), uroflowmetry, post-void residual (PVR), prostate volume (PV) measurement by urinary ultrasound, International Prostate Symptom Score (IPSS), International Index of Erectile Function (IIEF-5), and ejaculation status were recorded preoperatively. The number of injections applied, the duration of the operation, and the size of the median lobe and bladder neck during the operation were noted. In the postoperative period, the length of hospital stay, the time of removal of the urethral catheter, and the need for re-catheterization were determined. The IPSS and IIEF-5, uroflowmetry, PVR, and ejaculation parameters were reevaluated in the postoperative controls. The data from the final visits (mean: 7.5 months, range: 3 to 12 months) were used in the study.

Statistical Methods

Statistical analyses were performed using IBM SPSS Statistics for Windows v.28.0 (IBM Corp., Armonk, NY, USA). The descriptive statistics were presented using the mean and standard deviation for the normally distributed variables and using the median (minimum-maximum) for the non-normally distributed variables. The evaluation of two independent groups was performed via a non-parametric comparison using the Mann-Whitney U test, while the changes between preop and postop measurements were evaluated using the Wilcoxon signed-rank test.

RESULTS

Patient characteristics are summarized in Table 1. One patient was under active follow-up with the diagnosis of ISUP Grade 1 prostate cancer. The prostate volume of three patients (13%) was over 80 ml. While only one patient had an indwelling Foley catheter, none of the patients had a history of prostate surgery. Six patients (25%) had retrograde ejaculation due to alpha-blockers used preoperatively. Seven patients used alpha-blockers before the operation, however, none of them needed alpha-blockers since they were discontinued at the end of the postoperative first month.

Table 2 shows the comparison between preoperative and postoperative data. The IPSS decreased in all patients by 15 points on average ($p<0.001$), while the maximum urinary flow (Qmax) increased in all patients by 5 mL/s on average except for three who had similar values ($p<0.001$). The average post-void residual decrease was 55 mL ($p<0.001$).

The comparison of the patients who had the median lobe and those who had not is given in Table 3. The mean IPSS, Qmax, PVR, and IIEF changes were similar in both groups (p-value; 0.211, 0.468, 0.309, and 0.522, respectively). Postoperatively, two patients had macrohematuria and four had dysuria requiring NSAIDs after catheter removal. Two patients required re-catheterization due to urinary retention; both patients' symptoms improved following catheter removal after re-catheterization. Urinary tract infection was not observed in any patient. None of the patients had retrograde ejaculation after discontinuation of the alpha-blocker treatment.

Table 1. Patient characteristics and perioperative data.

Variables	
Age, years	63.0±8.7
BMI, kg/m^2	27.8±3.1
PSA, ng/ml	3.1±1.7
Prostate volume, ml	64.2±29.6
Number of patients with a median lobe, n (%)	11 (46)
IPSS	21 (16-29)
Q max, mL/s	8 (3-20)
PVR, ml	88 (20-350)
Number of patients using alpha-blockers, n (%)	7 (29)
IIEF-5	19 (10-25)
Mean duration of operation, minutes	25±5
Mean number of injections	4.1±2.5
Mean length of hospital stay, days	1.4±0.7
Time of urinary catheter removal, days	6.7±1.0
Follow-up time, months	7.5 (3-12)

BMI: *body mass index,* ***IIEF-5:*** *International Index of Erectile Function,* ***IPSS:*** *International Prostate Symptom Score,* ***PSA:*** *prostate-specific antigen,* ***PVR:*** *Post-void residual urine* ***Q max:*** *Maximum flow rate.*
Data are given as mean±SD for the normally distributed data and as median (range) for the non-normally distributed data.

Table 2. Comparison of the baseline and follow-up findings including urinary and sexual functions.

	Preoperative median (range)	Postoperative median (range)	*p**
IPSS	21 (16-29)	6 (2-16)	<0.001
Q max, mL/s	9 (3-20)	14 (6-22)	<0.001
PVR, mL	88 (20-350)	33 (0-170)	<0.001
IIEF-5	19 (10-25)	21 (14-25)	0.014

IIEF-5: *International Index of Erectile Function,* ***IPSS:*** *International Prostate Symptom Score,* ***PVR:*** *Post-void residual urine,* ***Q max:*** *Maximum flow rate, *Wilcoxon Signed Rank test*

Table 3. Comparison of the patients who had a median lobe and those who had not.

	Without median lobe (n=13)			With median lobe (n=11)			*p*
	Preoperative median (range)	Postoperative median (range)	Change	Preoperative median (range)	Postoperative median (range)	Change	
IPSS	19.5 (17-25)	6 (2-16)	13.5	22.5 (16-29)	6.5 (3-8)	16	0.211
Qmax, mL/s	11 (3-17)	15.5 (6-21)	4.5	8 (5-20)	13 (9-22)	5	0.468
PVR, mL	80 (0-300)	35 (0-170)	45	95 (20-350)	33 (0-120)	62	0.309
IIEF-5	19.5 (14-23)	20 (15-25)	0.5	19 (10-25)	21 (14-25)	2	0.522

IIEF-5: *International Index of Erectile Function,* ***IPSS:*** *International Prostate Symptom Score,* ***PVR:*** *Post-void residual urine,* ***Q max:*** *Maximum flow rate*

DISCUSSION

Rezum is one of the minimally invasive methods with increased interest in Turkey as well as in the world in recent years. The procedure has begun to be performed in our center for 1.5 years now. Therefore, in this study, we presented the short-term results of our Rezum experience. Although the number of studies on the Rezum procedure across the world is increasing, the studies have reported follow-up results of five years at the longest so far (9). In our study, we observed significant improvements in the LUTS and micturition findings of the patients. The IPSS decreased in all patients by 67.7% on average, while the Q max increased by 47%. The decrease in PVR was 67%. Only two patients required temporary re-catheterization. Nevertheless, all patients' symptoms improved after a mean follow-up period of 7.5 months. None of our patients needed to continue using alpha-blockers.

The effectiveness of Rezum in voiding functions has been demonstrated by previous studies. Whiting et al. presented the results of 461 patients from two centers. In this study where the mean follow-up period was 16.7 months, the researchers observed a 77% improvement in the IPSS at the third-month follow-up. This improvement was observed to be permanent at the 12th-month follow-up. While the increase in Qmax three months after the intervention was 62%, this rate increased to 85% in the 12th month. On the other hand, PVR decreased by 45% on average in the third postoperative month and was found to be similar in the 12th month (10). In their prospective, randomized controlled trial involving 188 patients with a prostate volume of 30-80 g, McVary et al. shared their outcomes (11). The patients were initially divided according to the severity of the symptoms those who had an IPSS of 13 to 18 (moderate LUTS) and those with an IPSS ≥19 (severe LUTS). Both moderate and severe LUTSs were shown to improve significantly within three months of treatment. While a 50% decrease was observed in the IPSS, patients' Qmax increased by 50%. The authors reported that the improvements in the findings were permanent throughout the four-year follow-up period. In addition, in the study of Bole et al., the effectiveness of Rezum was investigated in patients with a prostate volume below 80 g and above 80 g and the authors noted similar improvement rates in both symptom scores and Qmax and PVR parameters (12). We also observed significant improvement in three of our patients who had a prostate volume greater than 80 ml.

Currently, one of the questions asked regarding the Rezum procedure is the continuity of symptomatic improvement and the need for reoperation. In Whiting et al.'s study, 4.6% of the patients required retreatment (10). The most common causes of reoperation were the presence of the median lobe, bladder neck stenosis, and asymmetric prostate cavity in a few patients. The researchers performed a secondary treatment after a short period of 11 months on average. In the aforementioned McVary et al.'s study, although there was a permanent improvement in the voiding parameters at the end of four years, additional surgical intervention was required for 4.4% of the cohort. Although all of these patients had their median lobe, they were untreated. In our study, the mean follow-up period was 7.5 months, and none of our patients required reoperation during this relatively short period. The presence of the median lobe, which is assumed to be the cause of reoperation, was evaluated in our study. According to our results, there was no significant difference in none of the parameters evaluated among the patients who had a median lobe and those who had not. We believe that the extra injections to the median lobe in addition to the lateral lobe played an important role in this occurrence.

The outcomes regarding sexual functions are one of the most important concerns of patients who undergo prostate surgery. In previous studies, Rezum has been shown to protect sexual functions (13-15). The IIEF-5 in McVary et al.'s randomized controlled trial was preserved after surgery, while improvement was observed in the ejaculation symptoms (9). In our study, among the patients with a normal preoperative ejaculation function, ejaculation was preserved in all patients except one. In patients with ejaculation problems due to alpha-blocker use, the postoperative ejaculation problem was improved by the withdrawal of the alpha-blocker. The high retrograde ejaculation rates of surgical treatments such as holmium laser enucleation of the prostate (HoLEP), laser vaporization methods, and TURP make Rezum stand out in this respect. Surprisingly, in our study, the mean IIEF-5 was preserved, and even slightly increased. In most of

the previous studies, no changes in erectile functions after surgical treatment for BPH were reported, as a matter of fact, erectile functions have improved in some (16).

Although Rezum is a surgical intervention, the absence of prostatic tissue removal on the screen that satisfies the surgeon at the end of the procedure is instinctively a situation that might make surgeons curious and uncomfortable regarding clinical response. Despite the FDA approval for the treatment and the increasing number of reliable publications encouraging us to employ this treatment modality, we prefer to see our results to have absolute confidence in this method and then share them in our publications.

Our study had some limitations. First, the study was conducted retrospectively and the number of patients was small. Second, our cohort lacked a control group. Third, the surgical procedures were performed by three different surgeons. Finally, the follow-up period was short, and the follow-up data belonged to different periods between the third and 12th months postoperatively.

CONCLUSION

As a result, the Rezum procedure is an effective method, even in patients who preserve their median lobes, and can be recommended for select patients by taking their expectations into account. As shown in our study, the Rezum procedure offers acceptable outcomes with its short duration, easy applicability, and ability to preserve sexual functions. However, the outcomes of the procedure still need to be supported with long-term results and further randomized trials.

Informed Consent: The authors declare that informed consent was obtained from all participants in the study.

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

Financial Disclosure: This study did not receive any grant from any sector.

Author Contributions: Concept and design: MK, MDB; Data acquisition: MK; Data analysis and interpretation: MK, MDB; Drafting the manuscript: MK, MDB; Critical revision of the manuscript for scientific and factual content: MK, MDB; Statistical analysis: MK; Supervision: MDB.

Ethical Approval: The study was approved by the Koç University School of Medicine Ethics Committee of Clinical Researches (Approval Number: 2022.286.IRB1.117, Date: 2022-09-07). The study protocol conformed to the ethical guidelines of the Helsinki Declaration.

Acknowledgments: We thank Dr. Serdar Madendere and Fadimana Bozkurt Tekkalan for their technical support and express our gratitude to Dr. Arzu Baygül Eden for her support in statistical analyses.

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Original Article
Özgün Araştırma

Endourol Bull. 2023;15(1):30-37. doi: 10.54233/endouroloji.1195139

The effect of intravesical stent length and Propiverine on ureteral stent related symptoms - Prospective controlled trial

Üreteral stent ilişkili semptomlara intravezikal stent uzunluğunun ve Propiverin'in etkisi- Prospektif kontrollü çalışma

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ÖZET

Amaç: Üreteral double J stentler taş hastalıklarında sıklıkla kullanılmaktadır. Stent normal lokalizasyonunda iken stent ilişkili rahatsız edici sempomlara neden olabilmektedir. Bu problem için çeşitli medikal ajanlar ve stent ilişkili çözümler araştırılmıştır. Ancak hala kesin bir ilaç bulunamamıştır. Biz stent ilişkili semptomlar üzerinde propiverinin etkisini araştırmayı amaçladık.

Gereç ve Yöntemler: Çalışmaya haziran 2020 ile mayıs 2022 tarihleri arasında üreteroskopik taş cerrahisi yapılan hastalar dahil edildi. Kontrol grubu tedavi almaz iken tedavi grubu operasyonun 1. haftasından sonra günlük 45 mg propiverin aldı. 1. ve 3. haftanın sonunda stent ilişkili semptomlar üreteral stent semptom anketi (USSQ) ile değerlendirildi. Ek olarak tüm hastaların 3. Hafta sonunda stent alınması sırasında intravezikal stent kısımları cetvel ile ölçüldü.

Bulgular: Çalışmada toplamda 177 hasta değerlendirildi. Bunlardan 87si kontrol grubunu oluştururken 90 hasta tedavi grubunu oluşturdu. USSQ skorlarına göre, üriner semptom skorları, vücut ağrı skorları, genel sağlık skorları, iş performansı skorları, cinsel sağlık skorları, ek problemler skoru ve global hayat kalitesi skoru tedavi gruplarında azalmış bulundu ($p<0,001$ tüm alanlarda). Tüm hastalarda intravezikal stent uzunluğu 1. hafta sonundaki üriner semptom skoru ile pozitif korele olarak bulundu.

Sonuç: Stent ilişkili semptomlar intravezikal stent boyu daha uzun olanlarda daha fazladır. Propiverin stent ilişkili semptomları başarılı şekilde rahatlatmaktadır.

Anahtar Kelimeler: Propiverin, Stent ilişkili semptom, Double J stent, USSQ

Cite As: *Can O, Erkoç M, Danış E, et al. The effect of intravesical stent length and Propiverine on ureteral stent related symptoms - Prospective controlled trial. Endourol Bull. 2023;15(1):30-37. doi: 10.54233/endouroloji.1195139*

This study was approved by the Ethics Committee of Okmeydanı Training and Research Hospital (Approval Number: KAEK-2020-01-21/22, Date: 2020-01-21). All research was performed in accordance with relevant guidelines/regulations, and informed consent was obtained from all participants.

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Received : November 12, 2022 ***Accepted*** : January 17, 2023

ABSTRACT

Objective: Ureteral double J stents are widely utilized in urolithiasis. Disturbing stent-related symptoms may occur while the stent is in location. Various medical agents and stent-related solutions were examined for this problem. However, a definite drug has still not been found. We aimed to research the effect of propiverine on stent-related symptoms.

Material and Methods: Patients who underwent ureteroscopic stone surgery between June 2020 and May 2022 were included in the study. While the control group was untreated, the treatment group received 45 mg of propiverine daily after 1 week of the operation. Stent-related symptoms were assessed by ureteral stent symptom questionnaire (USSQ) at the end of 1st week and 3rd week of surgery. In addition, the intravesical stent parts of all patients were quantitatively measured with a ruler during stent removal at the end of 3 weeks.

Results: A total of 177 patients were assessed in the study. Eighty-seven patients were control and 90 patients of them were treatment group. According to USSQ, urinary symptoms scores, body pain scores, general health scores, work performance scores, sexual health scores, additional problem scores, and global quality of life (QoL) scores were found to decrease in the treatment group ($p<0.001$ All domains). Intravesical stent length was found positive correlation with the urinary symptom score (1st week) of all patients.

Conclusion: Stent-related symptoms are more likely in patients with longer intravesical stent length. Propiverine successfully relieves stent-related symptoms.

Keywords: Propiverine; Stent related symptom; Double J stent; USSQ

INTRODUCTION

Ureteral stents were first defined in 1967 and they are widely utilized for upper urinary tract dilatation, drainage of urine, and relief of obstruction (1). One of the most important usage areas is urolithiasis. However, these stents cause discomfort to the patient and reduce the quality of life by 45-80% (2). The exact mechanism of stent-related symptom is unknown. However, the consensus is that the symptoms are caused by mechanical irritation of the bladder and neck, trigone, and reflux of urine into the kidney (3). In addition, the length of the stent in the bladder may also be an important factor. Ureteral stent-related symptoms may include dysuria, frequency, flank pain, urgency, and haematuria through these possible mechanisms.

Although there are some attempts at stent material and design to reduce symptoms, there is still no optimal ureteral stent (4). Some pharmacotherapies such as alpha-blockers, anticholinergics, and special stents containing analgesics are used. There are some studies in the literature showing that antimuscarinics such as solifenacin and tolterodine have positive effects on stent-related symptoms (5,6).

To the best of our knowledge, the effect of propiverine has not yet been studied in ureteral stent symptoms. Propiverine is one of the most used antimuscarinic drugs for overactive bladder (7,8). According to a recent study, propiverine shows its effect with a mixed effect. It blocks muscarinic receptors in the detrusor muscle and alleviates muscle spasms by inhibition of calcium influx (9,10). This possible different mechanism encouraged us to evaluate the effect of propiverine on stent-related symptoms.

The ureteral stent symptom questionnaire (USSQ) has been developed to describe and categorize these symptoms (2). This validated form includes main 6 main domains about ureteral stent symptoms. Many studies of ureteral stent-related symptoms usually consist of small patient groups or unvalidated questionnaires. We designed a randomized controlled trial to evaluate the effect of propiverine on stent-related symptoms and quality of life using the USSQ. Also, we aimed to evaluate the effect of intravesical stent length on stent related symptoms.

MATERIAL AND METHODS

This prospective randomized controlled trial was carried out after approving the local ethical committee. (Approval No: 2020/20) Patients who underwent ureteroscopic lithotripsy with ureteral stent place-

ment between June 2020 and May 2022 were evaluated prospectively. Informed consent was obtained from the included patients.

Postoperative stone-free patients aged 18-50 years were included in to study. Patients with ureteral stent history, lower urinary tract symptoms (LUTS) related to benign prostate hyperplasia, urethral stricture, active urinary tract infection, anticholinergic drug use, pregnancy, and cognitive disorder were excluded from the study. Ureteral access sheath was not used in any patients.

Patients were randomized into two groups a control group and a treatment group, and simple randomization was used by flipping a coin while dividing the patients. All demographic and clinical data were enrolled postoperatively. The treatment group received 45 mg of propiverine once a day since the first week after surgery. They continued receiving 45 mg of propiverine for two more weeks. The control group did not receive treatment.

Patients received perioperative similar intravenous fluid and antibiotic treatments. 4.8 Fr Cook C-Flex® Double pigtail ureteral stents of 26 cm were placed in all patients. All stent tethers were removed before the placement of the stent to prevent tether-related irritation. Stent-related symptoms have increased after 1 week in patients with ureteral stent (11,12). Therefore, treatment and control groups were assessed at the end of the 1st and 3rd week after surgery with the Turkish version of USSQ (13).

Ureteral stents were removed at the end of the 3rd week after surgery. During stent removal, the intravesical stent portion was held from the level of ureteral orifice insertion by forceps. After stent removal, intravesical stent lengths were measured from this holding level. Intravesical stent lengths of all patients were measured with this technique (Figure 1).

Statistical results were analyzed using the Statistical Package for the Social Sciences version 21.0 (SPSS Inc, Chicago, IL, USA). The data were stated as mean ± standard error of the mean (SEM). The Shapiro–Wilk test was used to test the normal distribution of the variables. The Wilcoxon test was used to compare USSQ scores in the control and treatment groups. Independent samples t-test was used for assessment between groups. The Spearman correlation test was used to evaluate the correlation between urinary symptom score (1st week) and intravesical stent length in all patients. P value <0.05 was accepted as statistically significant.

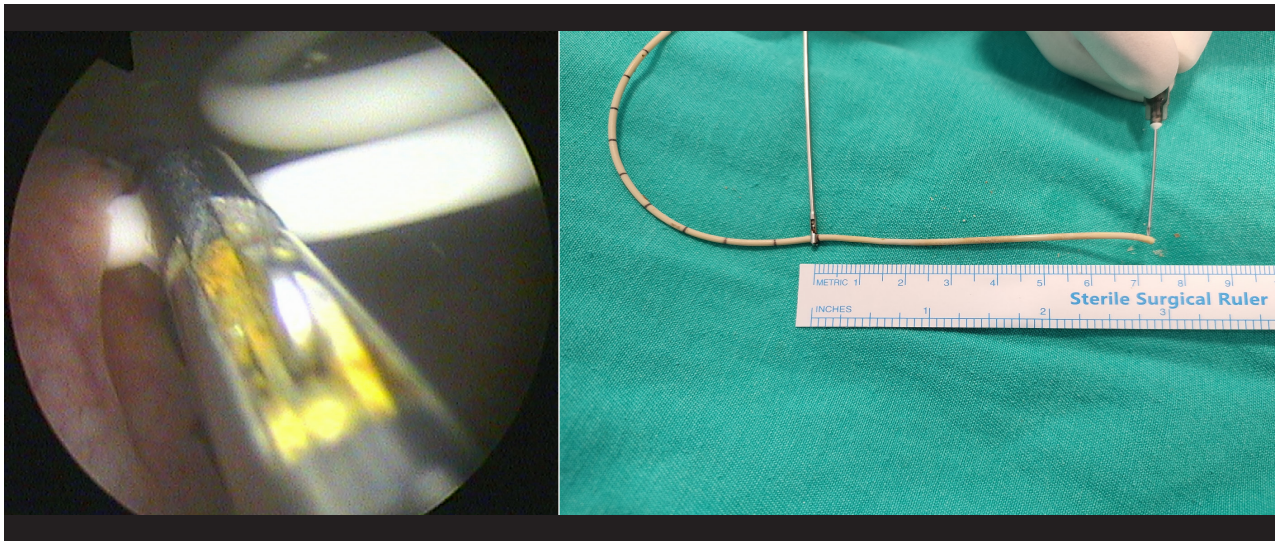

Figure 1: Measurement technique of intravesical stent length

RESULTS

A total of 177 patients were included in to present study. Ninety of them constituted the treatment group and 87 of them were the control group. Adverse events such as slight dry mouth developed in 6 patients in the treatment group but they did not discontinue the drug. The demographic and clinical data

of the groups were presented in Table 1. The mean age of the control and treatment groups were respectively 46.3±1.4 and 44.4±1.2 (p=0.31). The mean height of the control group was 170±0.8 and the treatment group was 169.1±0.8 (p=0.09). The mean body mass index (BMI) of the control and treatment groups were respectively 27.9±0.4 and 28.2±0.5 (p=0.67). There were 47 males and 43 females in the treatment group. While the control group consisted of 57 males and 30 females (p=0.07). The number of analgesics requirement patients was 51 of 87 patients in the control group. However, only 10 of 90 patients needed analgesics in the treatment group (p<0.001). This difference was statistically significant between groups. Intravesical stent lengths of the control and treatment group were respectively 7.9±0.1 cm and 8.2±0.1 cm (p=0.08). A correlation was found between the lengthening of the intravesical stent as the patient got shorter in all patients (p<0.001). There was no statistically significant difference between groups except for analgesic requirements. In addition, a positive correlation was found between urinary symptom score (1st week) and intravesical stent length (r=0.317; p<0.001). According to this result, intravesical stent length was correlated with stent-related symptoms.

USSQ scores of the control group were presented in Table 2. USSQ scores on the 7th day of surgery and before stent removal (3rd week) were respectively urinary symptoms scores 24.3±0.6 and 23.7±0.7 (p=0.07). The mean body pain scores were 13.9±0.3 and 14.1±0.3 (p=0.13); the mean general health scores were 10.9±0.2 and 11±0.3 (p=0.40); the mean work performance scores were 7.4±0.2 and 7.5±0.2 (p=0.21); the mean sexual health scores were 3.8±0.1 and 4±0.1 (p=0.06); the mean additional problem scores were 6.8±0.2 and 6.9±0.2 (p=0.79); the mean global QoL scores were 3.4±0.1 and 3.5±0.1 (p=0.18).

USSQ scores of the treatment group were presented in Table 3. USSQ scores on the 7th day of surgery and before stent removal (3rd week) were respectively urinary symptoms scores 24.9±0.7 and 21.1±0.6 (p<0.001). The mean body pain scores were 14.2±0.4 and 12.6±0.4 (p<0.001); the mean general health scores were 11.6±0.3 and 11±0.4 (p<0.001); the mean work performance scores were 8±0.2 and 7±0.3 (p<0.001); the mean sexual health scores were 5±0.2 and 4.5±0.1 (p<0.001); the mean additional problem scores were 7±0.2 and 6.3±0.2 (p<0.001); the mean global QoL scores were 4.4±0.1 and 3.5±0.1 (p<0.001).

There was no obvious difference between the groups in USSQ scores on the 7th day of surgery stent in situ. However, a significant decrease was observed in the treatment group.

Table 1. Demographic features of control and treatment groups

	Control n=87	Propiverine n=90	p value
Age (Mean±SEM)	46.3±1.4	44.4±1.2	0.31
Height (cm) (Mean±SEM)	170±0.8	169.1±0.8	0.09
BMI (kg/m²) (Mean±SEM)	27.9±0.4	28.2±0.5	0.67
Gender (Male/Female)	57/30	47/43	0.07
Side (Right/Left)	36/51	46/44	0.19
Comorbidities			
HT (n)	6	12	
DM (n)	6	6	0.06
Others (n)	3	9	
None (n)	72	63	
Analgesic requirement (Yes/No)	51/36	10/80	**<0.001**
Intravesical stent length (cm) (Mean±SEM)	7.9±0.1	8.2±0.1	0.08

SEM: *Standard Error of the Mean,* ***BMI:*** *Body Mass Index,* ***HT:*** *Hypertension,* ***DM:*** *Diabetes Mellitus*

Table 2. USSQ scores in the control group

USSQ	7th day of surgery stent in situ	Before stent removal	p value
Urinary symptoms score (mean ± SEM)	24.3±0.6	23.7±0.7	0.07
Body pain score (mean ± SEM)	13.9±0.3	14.1±0.3	0.13
General health score (mean ± SEM)	10.9±0.2	11±0.3	0.40
Work performance score (mean ± SEM)	7.4±0.2	7.5±0.2	0.21
Sexual health score (mean ± SEM)	3.8±0.1	4±0.1	0.06
Additional problems (mean ± SEM)	6.8±0.2	6.9±0.2	0.79
Global QoL (mean ± SEM)	3.4±0.1	3.5±0.1	0.18

SEM: *Standard Error of the Mean,* ***USSQ:*** *Ureteral stent symptom questionnaire,* ***QoL:*** *Quality of life*

Table 3. USSQ scores in the treatment group

USSQ	7th day of surgery stent in situ	Before stent removal	p value
Urinary symptoms score (mean ± SEM)	24.9±0.7	21.1±0.6	**<0.001**
Body pain score (mean ± SEM)	14.2±0.4	12.6±0.4	**<0.001**
General health score (mean ± SEM)	11.6±0.3	11±0.4	**<0.001**
Work performance score (mean ± SEM)	8±0.2	7±0.3	**<0.001**
Sexual health score (mean ± SEM)	5±0.2	4.5±0.1	**<0.001**
Additional problems (mean ± SEM)	7±0.2	6.3±0.2	**<0.001**
Global QoL (mean ± SEM)	4.4±0.1	3.5±0.1	**<0.001**

USSQ, *Ureteral stent symptom questionnaire,* ***SEM:*** *Standard Error of the Mean,* ***QoL,*** *Quality of life*

DISCUSSION

Ureteral stents may be used after ureteral intervention or to prevent upper urinary tract obstruction and urinary leakage. Thus, ureteral stents prevent complications such as kidney failure and death by protecting kidney function. Nevertheless, it may also cause annoying symptoms. According to previous studies, these symptoms have been reported as 76% residual urine feeling, 40-60% dysuria, irritative symptoms such as frequency and urgency, 20-30% haematuria, incontinence, suprapubic and flank pain (14,15).

The general opinion is that stent-related symptoms are the result of mechanical irritation of the bladder trigone, impaired ureteral peristalsis, stent position, bacterial colonization of the stent, and vesicoureteral reflux (16). Although various drugs have been studied to reduce stent-related symptoms, their definite superiority to each other still has not been demonstrated. We showed that Propiverine has beneficial effects on stent-related symptoms in the present study by using USSQ. Many studies have examined stent-related symptoms with the International Prostate Symptom Score (IPSS) questionnaire in the literature. While IPSS only questions lower urinary tract symptoms, USSQ is a more comprehensive questioning form that also includes quality of life. USSQ is the only validated scoring system for the evaluation of stent-related symptoms, and it is more appropriate to use it for the standardization of symptoms and contribute to the literature.

Even though routine ureteral stent placement is not recommended after uncomplicated ureteroscopy, it is widely used to reduce postoperative ureteral oedema, and prevent colic pain and hydronephrosis. A

recent systematic review reported that re-admissions to the hospital increased due to not using a ureteral stent after a ureteroscopy (17). Therefore, it may be reasonable that be in search to find the correct medical agent for stent-related symptoms. Alpha-blockers, antimuscarinics, and a combination of these were used to decrease stent-related symptoms in the literature. Although some studies reported inconsistent data, meta-analyses have demonstrated that alpha-blockers are beneficial in the treatment of stent-related symptoms (18,19). Urine reflux to the kidney and flank pain may develop as a result of bladder outlet resistance and increased pressure. Alpha-blockers may decrease pain and other symptoms by reducing bladder outlet resistance. Similarly, current studies in the combination of alpha-blockers and antimuscarinics have controversial results. A multicentre prospective randomized study showed that the combination of tamsulosin and solifenacin was superior to monotherapy in stent-related symptoms (20). Another study showed that there was no difference between USSQ scores of monotherapy and combination treatment (21). Combination therapy, such as alpha-blockers and anticholinergics, has been shown to be superior to monotherapy only for the first few days (22). Co-inhibition of alpha receptors and muscarinic receptors may have shown a synergistic effect in the improvement of bladder irritative symptoms within the first days.

The bladder detrusor has muscarinic receptors including M1-5 subtypes and these receptors are responsible for involuntary contractions of the bladder. Joshi et al. reported that ureteral stents may induce or worsen subclinical detrusor overactivity (23). Anticholinergic drugs are thought to relieve symptoms by reducing bladder overactivity and contractions by blocking muscarinic receptors. Solifenacin has been examined many times to alleviate stent-related symptoms due to the feature of a selective M3 receptor blocker. However, symptoms may persist through other receptors or mechanisms. In addition, the superiority of antimuscarinics over each other has not been proven yet (24). When considering the possible adverse effects of combination therapy due to using more than one drug, the different antimuscarinic molecules may be examined for stent-related symptoms. Propiverine shows its effect on both muscarinic receptor blockade and calcium blockade. Since haematuria may occur due to mechanical irritation of the stent to the bladder mucosa, its symptoms may be greatly affected by routine activities, occupations, and daily exercises. Haematuria may be associated with ureteral spasms in addition to physical activity. Activation of the muscarinic receptor causes an increase in the amplitude of ureteric contractions (25). During ureteral contraction, it may cause muscle spasms and pain with the stent inside. Due to the different action mechanisms of propiverine, stent-related symptoms may be alleviated effectively.

During the Double-J stent is in a normal position, the stent tips make 1 loop in the renal pelvis and bladder to prevent proximal or distal migration due to ureteral peristalsis or patient movements. As a result of mechanical friction of the stent to the bladder mucosa, acetylcholine is released, the muscarinic receptors are stimulated and the detrusor is contracted. Some studies have shown that ureteral stent position was associated with stent-related symptoms according to whether the intravesical stent crosses the midline of the bladder on X-ray images (12,26). Some studies with similar measure techniques showed that there was no relationship (27). However, we think that stent localization may change depending on the bladder fullness in this measurement method. Therefore, we measured the intravesical stent portions quantitatively. According to our results, intravesical stent length has a statistically significant effect on stent-related symptoms. In addition, shorter patients were found risky for more bothersome stent-related symptoms.

Patients who suffer from ureteral stent-related pain often use drugs such as non-steroidal anti-inflammatory drugs (NSAIDs). It may diminish pain by reducing ureteral contractility and inflammation. In addition, NSAIDs reduce renal prostaglandin levels and cause a decrease in renal blood flow. Thus, kidney and ureteral pressure decreases, and symptoms may be alleviated (28). However, against these beneficial effects, NSAIDs are not innocent drugs. In our daily practice, we see that the eGFR levels of patients who have undergone ureteral stone operation are mostly reduced, even though the other kidney is normal. Therefore, it is extremely important to reduce the use of analgesics, especially in risky patients. This study showed that Propiverine reduced the use of analgesics for stent-related symptoms.

Our study is not impeccable. Firstly, there was no placebo arm. Second, we did not define a cut-off value of intravesical stent length for stent-related symptom development.

CONCLUSION

Although stent-related symptoms are considered to be related to stent material, location and length, the optimal ureteral stent could not develop so far. A longer intravesical stent length portion is risky for stent-related symptoms. Propiverine reduces ureteral stent-related symptoms and the use of analgesics. Future studies with various antimuscarinic and placebo agents may better demonstrate this association.

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

Financial Disclosure: The authors declared that this study has received no financial support.

Author Contributions: Concept and design: Can O; Erkoç M; Bozkurt M; Otunctemur A; Canat L, Data acquisition: Erkoç M; Danış E; Data analysis and interpretation: Can O; Erkoç M; Bozkurt M; Otunctemur A; Canat L; Drafting the manuscript: Can O; Critical revision of the manuscript for scientific and factual content: Danış E; Bozkurt M; Statistical analysis: Can O; Erkoç M; Supervision: Bozkurt M; Danış E; Erkoç M; Otunctemur A; Canat L.

Ethical Approval: Okmeydanı Training and Research Hospital Local Ethical Committee approved the study in 21/01/2020. Approval no is 22.

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Author Guidelines
Yazarlara Bilgi

Yazarlar, Endoüroloji Bülteni'ne bir makale gönderirken makalelerinin telif hakkını dergiye vermeyi kabul etmiş sayılır. Eğer yazarın çalışmasının basılması reddedilirse, yazının telif hakkı yazarlara geri verilir.
Dergi, yazarların yayın haklarını kısıtlama olmaksızın saklamasını sağlar.
Yazarların kimlik bilgileri ve e-posta adresleri hiçbir şekilde başka amaçlar için kullanılmamaktadır.
Gönderilen yazıların daha önce yayınlanmamış olması veya başka bir dergide değerlendirme aşamasında olmaması gerekmektedir.
Gönderilen yazılar herhangi bir kongrede takdim edilmiş ise bu durum gönderilen makalede dipnot olarak bildirilmelidir.
Derginin Yayın Kurulu, tüm itirazları Yayın Etik Komitesi (COPE https://publicationethics.org/resources/flowcharts/handling-post-publication-critiques) kuralları çerçevesinde ele alır. Bu gibi durumlarda, yazarlar temyiz ve şikayetleri ile ilgili olarak yayın kuruluyla doğrudan iletişime geçmelidir. Gerektiğinde, dahili olarak çözülemeyen sorunları çözmek için bir ombudsman atanabilir. Editör, tüm temyiz ve şikayetler için karar verme sürecindeki nihai otoritedir.
erginin editoryal ve yayın süreçleri, International Council of Medical Journal Editors (ICMJE http://www.icmje.org/recommendations/browse/publishing-and-editorial-issues/) yönergelerine göre şekillendirilmektedir.
Endoüroloji Bülteni yayıncılıkta şeffaflık ve en iyi uygulama ilkelerine uygundur (DOAJ https://doaj.org/apply/transparency/).
Bir yazının yayın için kabul edilmesinde en önemli kriterler özgünlük, yüksek bilimsel kalite ve alıntı potansiyelinin varlığıdır. Dergide yayınlanmak üzere gönderilen yazılar, daha önce başka bir yerde yayınlanmamış ve yayınlanmak üzere gönderilmemiş olmalıdır. Bir kongrede tebliğ edilmiş ve özeti yayınlanmış çalışmalar organizasyonun adı, yeri ve tarihi belirtilmek şartı ile kabul edilebilir.
Deneysel, klinik, ilaç çalışmalarının ve bazı vaka raporlarının araştırma protokollerinin Etik Kurul tarafından uluslararası sözleşmelere uygun olarak onaylanması (Dünya Tıp Birliği Helsinki Deklarasyonu "İnsan Denekleri ile İlgili Tıbbi Araştırmalar İçin Etik İlkeler" https://www.wma.net/policies-post/wma-declaration-of-helsinki-ethical-principles-for-medical-research-involving-human-subjects/) gereklidir. Gerekli görülmesi halinde yazarlardan etik kurul raporu veya bu rapora eşdeğer olan resmi bir yazı istenebilir.

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

Dergimize gönderilen tüm yazılar intihal tespit etme programı (iThenticate) ile değerlendirilmektedir. Benzerlik oranının %20 ve altı olması önerilmektedir.
Derginin Yayın Kurulu, tüm itirazları Yayın Etik Komitesi (COPE) kuralları çerçevesinde ele alır. Bu gibi durumlarda, yazarlar temyiz ve şikayetleri ile ilgili olarak yayın kuruluyla doğrudan iletişime geçmelidir. Gerektiğinde, dahili olarak çözülemeyen sorunları çözmek için bir ombudsman (bağımsız denetçi) atanabilir. Baş Editör, tüm temyiz ve şikayetler için karar verme sürecindeki nihai otoritedir.
Yazarlar, Endoüroloji Bülteni' ne bir makale gönderirken makalelerinin telif hakkını dergiye vermeyi kabul etmiş sayılır. Eğer yazarın çalışmasının basılması reddedilirse, yazının telif hakkı yazarlara geri verilir.
Endoüroloji Bülteni' ne gönderilen her makale, adı geçen yazarların tümünün imzaladığı yazar katkı ve yayın hakları devir formu ile birlikte gönderilmelidir. (https://dergipark.org.tr/tr/journal/3154/file-manager/17373/download)
Şekiller, tablolar veya hem basılı hem de elektronik formatlardaki diğer materyaller de dahil olmak üzere başka kaynaklardan alınan içeriği kullanan yazarların telif hakkı sahibinden izin almaları gerekir. Bu hususdaki hukuki, mali ve cezai sorumluluk yazarlara aittir.
Endoüroloji Bülteni'nde yayınlanan yazılarda belirtilen ifadeler veya görüşler yazarlara aittir. Editörler, editörler kurulu ve yayıncı, bu yazılar için herhangi bir sorumluluk kabul etmemektedir. Yayınlanan içerikle ilgili nihai sorumluluk yazarlara aittir.

Author Guidelines

Authors' credentials and e-mail addresses are not used for other purposes.

The submitted articles should be previously unpublished and should not be under consideration by any other journal.

If whole or a part of the submitted articles are presented in any congress, this should be noted in the submitted article.

The journal's Editorial Board handles all appeal and complaint cases within the scope of Committee on Publication Ethics (COPE) guidelines. In such cases, authors should contact the editorial office directly regarding their appeals and complaints. When needed, an ombudsperson may be assigned to resolve cases that cannot be resolved internally. The Editor in Chief is the final authority in the decision-making process for all appeals and complaints.

The editorial and publication processes of the journal are shaped following the guidelines of the International Council of Medical Journal Editors (ICMJE).

The journal conforms to the Principles of Transparency and Best Practice in Scholarly Publishing (DOAJ).

Originality, high scientific quality, and citation potential are the most important criteria for a manuscript to be accepted for publication. Manuscripts submitted for evaluation should not have been previously presented or already published in an electronic or printed medium. Manuscripts presented in a meeting should be submitted with detailed information on the organization, including the name, date, and location of the organization.

An approval of research protocols by the Ethics Committee following international agreements (World Medical Association Declaration of Helsinki "Ethical Principles for Medical Research Involving Human Subjects") is required for experimental, clinical, and drug studies and some case reports. If required, ethics committee reports or an equivalent official document will be requested from the authors.

- For manuscripts concerning experimental research on humans, a statement should be included that shows that written informed consent of patients and volunteers was obtained following a detailed explanation of the procedures they may undergo.
- For studies carried out on animals, the measures taken to prevent pain and suffering of the animals should be stated clearly.
- Information on patient consent, the name of the ethics committee, and the ethics committee approval number should also be stated in the Materials and Methods section of the manuscript.
- It is the authors' responsibility to protect the patients' anonymity carefully. For photographs that may reveal the identity of the patients, releases signed by the patient or their legal representative should be enclosed.

All submissions are screened by a similarity detection software (iThenticate), and the limitation without similarity is 20%.

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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 Yayın Hakkı Devir 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:

- Author Contribution&Copyright Transfer 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.
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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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