





Comparison of Intrarenal Retrograde Surgery Results Between Different Age Groups

Farklı Yaş Gruplarında İntrenal Retrograde Cerrahi Sonuçlarının Karşılaştırılması

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Abstract

Objective: In this study, we aimed to investigate whether there is a difference in the reliability and efficacy of the method according to age in patients divided into 3 different age groups who underwent retrograde intra renal surgery (RIRS) due to kidney stones.

Materials and Methods: Patients who underwent RIRS for kidney or ureteral stone disease at the Urology Clinic of Health Sciences University Umraniye Health Application and Research Hospital between May 2017 and January 2021 were retrospectively screened, and those aged 20-80 years were included in the study. The demographic and clinical data of the patients and stone-related data were recorded. Patients aged 20-40 years were classified as Group 1, those aged 41-60 years as Group 2, and those aged 61-80 years as Group 3.

Results: After the inclusion and exclusion criteria were applied, the sample consisted of a total of 320 patients, of whom 121 (37.8%) were in Group 1, 133 (41.5%) were in Group 2, and 66 (20.6%) were in Group 3. The mean operative times and stone-free rates were similar between the groups. However, the mean hospital stay was significantly longer in Groups 3 compared to Groups 1 and 2. The minor complication rates were 2.4% in Group 1, 3% in Group 2, and 13.6% in Group 3, indicating a significantly higher value in Group 3 compared to the remaining two groups ($p=0.03$). The major complication rates of Groups 1, 2, and 3 were 0.8%, 0.7%, and 7.5%, respectively. Accordingly, Group 3 had a significantly higher rate than Groups 1 and 2 ($p=0.04$).

Conclusion: RIRS can be performed on the elderly with success rates comparable to other age groups. However, the elderly, who represent a higher-risk patient population with more comorbidities, have increased rates of minor and major complications both in the perioperative and postoperative periods.

Keywords: retrograde intra-renal surgery, age, geriatric, complications

Öz

Amaç: Bu çalışmada böbrek taşı nedeniyle retrograde intrarenal cerrahi (RIRS) uygulanan 3 farklı yaş grubuna ayrılmış hastalarda yöntemin güvenilirliği ve etkinliğinde yaşa göre farklılık olup olmadığını araştırmayı amaçladık.

Gereçler ve Yöntemler: Mayıs 2017-Ocak 2021 yılları arasında Sağlık Bilimleri Üniversitesi Umraniye Sağlık Uygulama ve Araştırma Hastanesi Üroloji Kliniği'nde böbrek ya da üreteral taş hastalığı sebebiyle RIRS uygulanan hastalar geriye dönük olarak tarandı. Çalışmaya 20-80 yaş aralığında hastalar dahil edildi. Hastalara ait demografik, klinik verilerin yanı sıra taşa ait veriler kaydedildi. 20-40 yaş aralığındaki hastalar Grup 1, 41-60 yaş aralığındaki hastalar Grup 2, 61-80 yaş aralığındaki hastalar Grup 3 olarak sınıflandırıldı.

Bulgular: Dahil edilme ve hariç tutulma kriterleri uygulandıktan sonra Grup 1'de 121 (%37.8), Grup 2'de 133 (%41.5) ve Grup 3'te 66 (%20.6) olmak üzere toplam 320 hasta çalışmaya dahil edildi. Ortalama ameliyat süreleri ve taşsızlık oranları gruplar arasında benzerdi. Ancak ortalama hastanede kalış süresi Grup 3'te Grup 1 ve Grup 2'ye göre anlamlı olarak daha uzundu. Minör komplikasyon oranları Grup 1'de %2.4, Grup 2'de %3 ve Grup 3'te %13.6 oranında tespit edildi ve Grup 3'te Grup 1 ve 2'ye oranla anlamlı olarak yüksek saptandı ($p=0.03$). Major komplikasyon oranları Grup 1'de %0.8, Grup 2'de %0.7 ve Grup 3'te %7.5 oranında saptandı. Buna göre Grup 3, Grup 1 ve 2'den anlamlı olarak daha yüksek bir orana sahipti ($p=0.04$).

Sonuç: İleri yaş grubunda RIRS diğer yaş gruplarındaki hastalarla benzer başarı oranları ile uygulanabilmektedir. Bununla birlikte, daha fazla komorbiditesi olan daha yüksek riskli bir hasta popülasyonunu temsil eden yaşlılar hem perioperatif hem de postoperatif dönemlerde artmış minör ve majör komplikasyon oranlarına sahiptir.

Anahtar kelimeler: retrograde intrarenal cerrahi, yaş, cerrahi, komplikasyon

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Introduction

The world population is aging, and it is estimated that the number of people over 60 years will exceed 2 billion in the next 30 years [1]. Age-related cardiovascular, respiratory, and nervous system changes, coupled with comorbidities, can lead to an increased incidence of surgical complications and medical problems [2,3]. This complicates the treatment of urinary system stone disease in the elderly patient population. Considering that the lifetime risk of urinary system stone disease is 10%, it seems that safe and effective methods with low complication rates will increasingly gain popularity in the geriatric population with the increasing human lifespan [4].

Retrograde intrarenal surgery (RIRS), an alternative method to shock wave lithotripsy (SWL) and percutaneous nephrolithotomy (PNL) in the treatment of stones located in the renal pelvis and kidney, offers better lithotripsy efficacy and shorter operation times with the advances in technology. Because of its advantages, RIRS is considered an effective and safe method for the elderly patient population [5]. This method results in a lower pain score and shorter recovery time without the need for an incision; therefore, it seems to be a suitable option for elderly and risky patient populations.

In this study, we divided patients with kidney stones who underwent RIRS into three different age categories to investigate whether there was a difference in the safety and efficacy of this method according to age.

Materials and Methods

Following the approval of the local ethics committee (approval date and no: 22.12.2022/416), patients who underwent RIRS for the treatment of kidney or ureteral stone disease at the Urology Clinic of Health Sciences University Umraniye Health Application and Research Hospital between May 2017 and January 2021 were retrospectively screened, and those aged 20-80 years were included in the study. Patients with solitary kidneys or chronic renal failure, cases in which fragmentation with semi-rigid ureteroscopy was performed or the treatment could not be completed with RIRS, patients with ureteral or renal abnormalities, and those with calyceal diverticula were not included in the study. Pregnant women and patients with bleeding diathesis, neurogenic lower urinary tract dysfunction, or a history of immunosuppressive disease were also excluded. Patients with a positive urine culture test in the preoperative period were treated with appropriate antibiotic therapy for at least seven days according to susceptibility tests. The treatment of these patients was continued until a sterile urine culture was obtained. Further excluded from the sample were patients who had a history of nephrostomy/double-J catheterization due to acute pyelonephritis in the preoperative period, those who underwent surgery under anti-biotherapy due to the inability to sterilize urine cultures, and those with incomplete data.

The patient's demographic and clinical data [age, gender, and body mass index (BMI), American Society of Anesthesiologists (ASA) score, stone side, the presence of shock wave lithotripsy (SWL) history and the number of SWL sessions applied, and preoperative stent requirement], and stone characteristics, such as localization, number, and density, were recorded. Contrast-

enhanced computed tomography (CT) was performed on all patients preoperatively.

All operations were performed by endourologists who had completed the RIRS learning curve. As the surgical technique, the patient was placed in the lithotomy position under general anesthesia. At the beginning of the operation, a single dose of intravenous prophylactic antibiotic therapy (cefazolin 1 g, intravenous) was administered to all patients. A 0.038-inch hydrophilic guide wire was inserted into the renal pelvis under rigid ureterorenoscopy (standard 8.0/9.8F Karl Storz). A ureteral access sheath (UAS) (Cook Medical Inc., USA) was inserted over the guide wire, and a flexible ureterorenoscopy (Storz Flex-X2, Tuttlingen, Germany) was placed over the UAS. Lithotripsy was undertaken using a 200-mm Holmium: YAG laser (Coherent Power Suite, 60 watts, Lumenis, Israel) with an energy level of 0.6-1 J and a frequency range of 5-10 Hz. Ureteral double-J (DJ) catheters were routinely placed postoperatively.

Direct urinary system radiography was performed on the first postoperative day to evaluate the presence of residual stones or the placement of the double-J catheter. Stone-free status, defined as the absence of any calculus or the absence of calculus over 2 mm, was assessed using non-contrast CT performed during the first month postoperatively. In patients with stone-free status, the ureteral catheters were withdrawn at one month postoperatively.

The complications were evaluated according to the Clavien-Dindo classification. Patients aged 20-40 were classified as Group 1, those aged 41-60 years as Group 2, and those aged 61-80 years as Group 3.

Statistical Analysis

The three age groups were compared in terms of demographic data, stone characteristics, and operative and postoperative data. Normally distributed numerical data were presented as mean and standard deviation. Categorical variables were expressed as frequency (percentage). Normally distributed numerical data were compared using the one-way analysis of variance test. The Bonferroni correction was used for post-hoc analyses. The chi-square test was conducted to compare categorical variables. A p-value of <0.05 was considered statistically significant.

Results

After the inclusion and exclusion criteria were applied, the sample consisted of a total of 320 patients, of whom 121 (37.8%) were in Group 1, 133 (41.5%) were in Group 2, and 66 (20.6%) were in Group 3. There was no significant difference between the three groups in terms of gender distribution or body mass index (BMI). However, significant differences were observed between the mean ASA scores and comorbidities of the three groups ($p=0.01$) (**Table 1**).

The presence of SWL history and stone characteristics (size, side, localization, and density) did not significantly differ between the three groups. The mean operation times and stone-free rates were also similar. However, the mean hospital stay was found to be significantly longer in Group 3 compared to Group 1 and Group 2 (**Table 2**).

Complications were observed in a total of 23 (7.1%) patients. The rates of minor complication were 2.4% in Group 1, 3% in Group

2, and 13.6% in Group 3, and the major complication rates were determined to be 0.8%, 0.7%, and 7.5%, respectively. Accordingly, Group 3 had significantly higher rates of both minor ($p=0.03$) and major ($p=0.04$) complications compared to Groups 1 and 2.

Patients who developed hematuria, mucosal injury, and perirenal hematoma were followed up conservatively, those who developed a fever in the postoperative period were treated with appropriate antibiotic therapy, and those with hematuria and

decreased hemoglobin due to perirenal hematoma were treated with erythrocyte replacement therapy. Patients presenting with ureteral stenosis during the long-term follow-up underwent double-J catheterization, followed by ureteroureterostomy in the case of failure. Patients who developed urosepsis, acute coronary syndrome, or pulmonary embolism were managed according to the results of consultation with appropriate branches. Mortality was observed at a rate of 1.5% in Group 3 (**Table 3**).

Table 1. Patients' demographic data

Parameters	Group 1 (n=121)	Group 2 (n=133)	Group 3 (n=66)	P
Age (year)	29.1 ± 5.5	47.2 ± 4.4	67.3 ± 7	-
Gender				0.533
Male	70 (57.8)	73 (54.8)	35 (53)	
Female	51 (42.1)	60 (45.1)	31 (46.9)	
BMI (kg/m ²)	28.1 ± 3.9	29.1 ± 4.3	28.9 ± 5.5	0.232
ASA	1.6 ± 0.4	2.1 ± 0.3	2.6 ± 0.2	0.01 1 vs 2 vs 3
Comorbidities				p<0.001
DM	8 (6.1)	15 (11.2)	30 (45.4)	1 vs 2 vs 3
HT	12 (9.9)	22 (16.5)	38 (57.5)	1 vs 2 vs 3
IHD	2 (1.6)	6 (4.5)	8 (12.1)	1-2 vs 3
COPD	0 (0)	1 (0.7)	3 (4.5)	similar
Antiaggregant use	1 (0.8)	3 (2.2)	21 (31.8)	1-2 vs 3

BMI: body mass index; ASA: American Society of Anaesthesiologists; DM: diabetes mellitus; HT: hypertension; IHD: ischemic heart disease; COPD: chronic obstructive pulmonary disease

Table 2. Stone characteristics and intraoperative and postoperative datas

Parameters	Group 1 (n=121)	Group 2 (n=133)	Group 3 (n=66)	P
Previous SWL (n; %)	64 (52.8)	71 (53.3)	30 (45.4)	0.121
Stone size (mm)	17.1 ± 3.2	18.2 ± 4.5	18 ± 3.8	0.339
Stone Side				0.07
Right	65 (53.1)	70 (52.6)	30 (45.4)	
Left	56 (46.2)	63 (47.3)	36 (54.5)	
Stone location				0.103
Pelvis	74 (61.1)	70 (51.6)	41 (62.1)	
Lower pole	22 (18.1)	30 (22.5)	13 (19.6)	
Middle pole	15 (12.3)	21 (15.7)	7 (10.6)	
Multicaliceal	10 (8.2)	12 (9)	5 (7.5)	
Stone density (HU)	1071 ± 87.1	1129 ± 100.2	1055.2 ± 96	0.132
Operation time	80.1 ± 10.2	83.2 ± 13.2	79.8 ± 9.8	0.497
Stone free rate	103 (85.1)	111 (83.4)	54 (81.1)	0.232
Length of stay (hour)	21.4 ± 2.5	23.9 ± 5.4	36.2 ± 7.2	0.04 1-2 vs 3

SWL: shock wave lithotripsy; HU: Hounsfield unite

Table 3. Complications chart

Complications	Group 1 (n=121)	Group 2 (n=133)	Group 3 (n=66)	P
Minor	3 (2.4%)	4 (3%)	9 (13.6%)	0.03 1/2 vs 3
Grade 1				
Hematuria	0 (0)	1 (1%)	2 (3%)	
Mucosal injury	1 (0.8%)	1 (1%)	2 (3%)	
Perirenal hematoma	0 (0)	1 (1%)	1 (1.5%)	
Grade 2				
Fever	2 (1.6%)	1 (1%)	3 (4.5%)	
ERT	0 (0)	0 (0)	1 (1.5%)	
Major	1 (0.8%)	1 (0.7%)	5 (7.5%)	0.04 1/2 vs 3
Grade 3				
Stricture	0 (0)	1 (0.7%)	1 (1.5%)	
Grade 4				
Urosepsis	1 (0.8%)	0 (0)	1 (1.5%)	
ACS	0 (0)	0 (0)	1 (1.5%)	
Pulmonary emboli	0 (0)	0 (0)	1 (1.5%)	
Grade 5				
Death	0 (0)	0 (0)	1 (1.5%)	

ERT: erythrocyte replacement therapy; ACS: acute coronary syndrome

Discussion

In the literature, there are ongoing discussions concerning urinary system stone disease in the advanced age group. In the geriatric population, age-related changes in kidney functions, cardiopulmonary system capacity, and the effects of medications used due to comorbidities can predispose these patients to surgical complications and result in changes in their medical conditions [2,6]. Since comorbidities such as diabetes mellitus, coronary artery disease, and hypertension are more common in this patient group compared to the younger patient population, the treatment modality to be applied must be more minimally invasive and effective [5].

The current treatment options that are accepted as minimally invasive in the treatment of large kidney stones include SWL, PNL, and RIRS [7]. Although PNL is accepted as safe and effective, it can result in serious complications, such as blood loss and organ injuries [2,6,8]. In a study evaluating over 1,000 patients, Unsal et al., reported that the mean complication rate was 29.3%, and the success rate was 83.7%. It has been determined that postoperative complications are associated with older age and the presence of comorbidities [8]. In another study, Resorlu et al., reported the surgical complication rate to be 25% and the medical complication rate to be 13% after PNL in the geriatric patient group [2]. The authors of both studies concluded that elderly high-risk patients should be informed about RIRS and follow-up options due to their relatively high surgical and medical complication rates. In another study conducted by Gulpinar et al., the surgical complication rate was determined to be 6.4% and the medical complication rate to be 1% among the RIRS operations performed in the elderly patient group [5]. In the current study, the rates of minor and major complications were 13.6% and 7.5%, respectively, in our oldest age group (61-80 years). We found the overall complication rate in this group to be 21.2%. In our opinion, the high rate of

complications in the advanced age group prolongs the length of stay in the hospital, while at the same time increasing the cost, it also poses a risk in terms of nosocomial infections.

The effects of SWL treatment on the geriatric patient population remain controversial. Although SWL has been reported to be effective and safe in this patient population [9], stone fragmentation has been reported to provide less favorable results than in younger patients [10]. With its higher success rate than SWL and lower morbidity rate than PNL, RIRS seems to be a preferable method in the geriatric patient population [11].

The main limitation of our study concerns its retrospective nature. In addition, the exclusion of patients with a history of renal surgery and those with renal abnormalities to obtain homogeneous groups limits the generalizability of our findings. In addition, the small number of patients is an additional limitation. There is a need for prospective randomized studies on this subject.

Conclusion

RIRS can be performed on the elderly with success rates comparable to other age groups. However, the elderly, who represent a higher-risk patient population with more comorbidities, have increased rates of minor and major complications both in the perioperative and postoperative periods.

Ethics Committee Approval: The study protocol was reviewed and approved by the University of Health Sciences, Umraniye Training and Research Hospital (Approval date and number: 22.12.2022/416).

Informed Consent: An informed consent was obtained from all the patients.

Publication: The results of the study were not published in full or in part in form of abstracts.

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