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Original Research / Özgün Araştırma

Percutaneous Nephrolithotomy is not Frightening in Elderly Patients: A Single Center Outcomes

Perkütan Nefrolitotomi Yaşlı Hastalarda Korkutucu Değildir: Tek Merkez Sonuçları

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Özet

Amaç: PNL operasyonu uygulanan 70 yaş üstü hastaların postoperatif sonuçlarını değerlendirmek ve daha gençı hastalar ile karşılaştırmak.

Gereç ve Yöntemler: Kurumumuzda 2016-2019 yılları arasında 2 cm'den büyük böbrek taşı için konvansiyonel PNL operasyonu uygulanan 508 hastanın verisini retrospektif olarak değerlendirdik. Hastalar yaşlarına göre iki gruba ayrıldı. 70 yaş ve üstü hastalar grup 2, 70 yaşından küçük hastalar grup 1 olarak ayrıldı. Gruplar arasında hastaların komorbiditeleri, ASA skorları, vücut kitle indeksleri (VKİ), taş boyutu gibi demografik verileri ve ameliyat süresi, floroskopi süresi, komplikasyon oranı, hastanede kalış süresi ve taşsızlık oranı gibi perioperatif ve postoperatif değerleri karşılaştırıldı.

Bulgular: Grup 1'de 476 hasta, Grup 2'de 32 hasta mevcuttu. Ortalama yaş, yaşlı hasta grubunda 73 (70-86), genç hasta grubunda 48 (18-69) idi. Gruplar arasında multipl taş oranı, operasyon süresi, floroskopi süresi, hastanede kalış süresi, taşsızlık oranı ve komplikasyon oranları açısından fark yoktu. Ameliyat öncesi taş büyüklüğü, staghorn taş oranı ve transfüzyon oranı yaşlı hastalarda genç gruba göre anlamlı olarak yüksekti (sırasıyla; p = 0.027, 0.009, 0.003).

Sonuç: PNL, büyük böbrek taşına sahip yaşlı hastalarda kabul edilebilir sonuçlara sahiptir ve güvenle uygulanabilir.

Anahtar Kelimeler: Böbrek taşı, güvenli, nefrolitotomi, perkütan, yaşlı.

Abstract

Objective: To evaluate the operative and postoperative outcomes in patients >70 years of age who underwent PNL and to compare them with a younger group.

Material and Methods: We retrospectively evaluated 508 patient data who underwent conventional PNL for >2 cm kidney stones in our institution between 2016 and 2019. The patients were divided in to two group according to their age. Group 1 consisted with patient whose age is younger than 70 years and Group 2 consisted with patient whose age is equal or higher than 70 years. Patients' comorbidities, ASA scores, body mass indices (BMI), stone size and perioperative values such as surgery time, fluoroscopy time, complication rates, length of hospital stay and stone-free rates were compared between the groups.

Results: 476 patients were identified in Group 1 (younger), and 32 patients were in Group 2 (elderly). The mean age in elderly patients was 73 years (range 70-86) and 48 years (range 18-69) in younger group. There is no difference in multiple stone rate, operation time, fluoroscopy time, length of hospital stay, the levels of stone free rate and complication rates between groups. Preoperative stone size, staghorn stone rate, and transfusion rate was significantly higher in elderly patients than younger group (respectively; p = 0.027, 0.009, 0.003).

Conclusion: PNL had acceptable results for large kidney stones and was safe in elderly patients.

Keywords: Elderly, kidney stone; nephrolithotomy; percutaneous; safety

INTRODUCTION

One of the most common diseases of the urinary tract is nephrolithiasis, and its prevalence has been rising for the past few decades due to an increase in the incidence of conditions such as metabolic syndrome, obesity, diabetes mellitus, and hypertension (1). A low complication and a high stone-free rate are the main goals of nephrolithiasis treatment. The surgical treatment recommendations include percutaneous nephrolithotomy (PNL) as the first choice for kidney stones >2 cm, while extracorporeal shockwave lithotripsy (ESWL) or endo-urology (flexible ureterorenoscpy and PNL) are recommended for stones 1–2 cm (2).

Following the first tests of PNL by Fernstrom and Johnson (3), this technique has advanced and became the standard treatment for larger kidney stones as it carries lower morbidity, shorter hospitalization, and acceptable stone-free rates compared with traditional surgical methods. Therefore, the requirement for open and laparoscopic surgery has decreased (4).

However, serious complications of PNL, such as bleeding, fever, pneumothorax, colon injury, sepsis, and the risks of anesthesia, must be considered by both the surgeon and the patient (5). In elderly patients, the complication rate and length of hospital stay are even greater than those of younger individuals, which raises the question of whether PNL is safe for elderly patients (6).

The aim of this retrospective study was to evaluate the operative and postoperative outcomes in patients >70 years of age who underwent PNL and to compare them with a younger group to determine if differences were present.

MATERIAL AND METHODS

We retrospectively evaluated 508 patient data who underwent conventional PNL for >2 cm kidney stones in our institution between 2016 and 2019. The patients were divided in to two group according to their age. Group 1 consisted with patient whose age is younger than 70 years and Group 2 consisted with patient whose age is equal or higher than 70 years.

Patients' comorbidities, ASA scores, body mass indices (BMI), stone size and perioperative values such as surgery time, fluoroscopy time, complication rates, length of hospital stay and stone-free rates were compared between the groups. Radiography of kidneys, ureters and bladder, urinary ultrasonography, intravenous urography and/or computerized tomography were obtained for diagnose. Stone dimension was calculated by measuring the longest axis of stone on image. Total length was calculated for multiple stones.

All of the operations were performed in a single center under general anesthesia. First, ureteral catheter was inserted in the lithotomy position, after that the patients were turned in to a prone position. The pyelocalyceal system was approached with the insertion of an 18-gauge Chiba needle under fluoroscopic guidance. Tract dilation was achieved with Amplatz dilators after placement of a safety guide-wire in place. At the end of dilation, a 30 F renal sheath was placed, and rigid nephroscopy was performed. A pneumatic lithotripter was used for stone fragmentation. The stone fragments were mechanically extracted, and a 16 F re-entry nephrostomy catheter was placed at the end of the operation. Stone status after one session PNL was evaluated by computerized tomography at the postoperative first month and described as; stone free (SF), clinically insignificant residual fragments (CIRF, residual fragments smaller than 4 mm), and clinically significant residual fragments (CSRF, residual fragments larger than 4 mm or symptomatic fragments).

The patients who have not any postoperative radiologic evaluation were excluded from the study. This study was carried out with the approval of the Sakarya university ethics committee (approval No:71522473/050.01.04/302).

Statistical Analysis

The statistical analysis was performed using IBM SPSS Statistics for Windows, (Version 21.0; IBM Corp., Armonk, NY, USA). The Kolmogorov-Smirnov test was used to evaluate the appropriateness of the data to a normal distribution. The continuous variables without normal distributions were shown by the median and minimum-maximum (min-max). The categorical variables were shown as the number of cases (n) and percentage (%). Mann-Whitney U test was used to compare continuous data and chi-square test and Fish-

er's exact test were used to compare categorical data of the 2 groups. A p value < 0.05 was considered statistically significant.

RESULTS

476 patients were identified in Group 1 (younger), and 32 patients were in Group 2 (elderly). The mean age in elderly patients was 73 years (range 70-86) and 48 years (range 18-69) in younger group. Elderly patients were more likely to have greater ASA scores and charlson comorbidity index, with statistically significiant difference between two groups (Table 1). In group 1 stone density was observed greater than group 2, 1112 HU and 994 HU respectively (p: 0.016). Conversely, preoperative stone size and staghorn stone rate were significantly higher in group 2 (p:0.027, 0.009 respectively). There is no difference in multiple stone rate, operation time, fluoroscopy time and length of hospital stay between groups (Table 2). The levels of stone free rate, CIRF and CSRF were 66.2%, 8.2%, 25.6%, respectively in group 1 and 71.9%, 3.1% and 25%, respectively in group 2, no significiant difference was observed (p: 0.569). Complications were assessed in two groups and Clavien grade ≥3 complication rates were 2.5% and 3.1%, respectively in group 1 and 2 (p: 0.575). However, no difference in decrease of hematocrit levels between groups, but transfusion rate was significantly higher in elderly patients than younger group (p: 0.003). Transfusion rate was 28.1% in group 2 and 9.0% in group 1.

Table 1. The demographics of the patients stratified according to the age

		Group 1 (age<70) (n=476)	**Group 2 (age≥70) (n=32)**	**P**
Age (yr) (min-max)		48 (18-69)	73 (70-86)	**0.000***
BMI (kg/m^2) (min-max)		26.45 (17.7-46.2)	28.4 (17.7-49.9)	0.072*
Sex (n)(%)	Female	154 (32.4)	18 (56.3)	**0.006****
	Male	322 (67.6)	14 (43.7)	
CCI (min-max)		0 (0-7)	3 (2-6)	**0.000***
ASA score (n)(%)	<3	311 (65.3)	3 (9.4)	**0.000****
	≥3	165 (34.7)	29 (90.6)	
Side (n)(%)	Right	216 (45.4)	13 (40.6)	0.601**
	Left	260 (54.6)	19 (59.4)	
Stone size (mm)(min-max)		28.4 (7-79)	34.25 (16.3-75)	**0.027***
Multipl stone (n)(%)		268 (56.3)	19 (59.4)	0.734**
Staghorn stone (n)(%)		200 (42)	21 (65.6)	**0.009****
Stone density (HU) (min-max)		1112 (354-1638)	994 (439-1446)	**0.016***

BMI:Body Mass Index; CCI:Charlson Comorbidity Index; HU:Hounsfield Unit

**:Mann-Whitney U test; **:Chi-square test*

Table 2. Comparison of perioperative and postoperative outcomes of the groups

		Group 1 (age<70) (n=253)	Group 2 (age≥70) (n=30)	P
Operation time (min)(min-max)		70 (15-180)	65 (30-110)	0.186*
Fluoroscopy time (sec)(min-max)		120 (15-720)	110 (25-360)	0.734*
Postoperative stone-free status (n)(%)	Stone-free	315 (66.2)	23 (71.9)	
	CIRF	39 (8.2)	1 (3.1)	0.569**
	Residual stone	122 (25.6)	8 (25)	
Htc decline (min-max)		4.3 (0-20)	3.75 (0-11.9)	0.419*
Transfusion rate (n)(%)		43 (9.0)	9 (28.1)	**0.003*** **
Clavien ≥3 complication (n)(%)		12 (2.5)	1 (3.1)	0.575***
Hospitalization time (day)(min-max)		3 (1-13)	4 (2-22)	0.164*

CIRF: Clinically Insignificant Residual Fragment; Htc:Hematocrit
:Mann-Whitney U test; **:Chi-square test; *:Fisher-Exact Test*

DISCUSSION

Patients with kidney stone disease have significantly lower quality of life (QOL) scores compared to the general population; advanced age and a higher body-mass index are related with a worse QOL and decreased physical well-being (7). In addition, elderly patients are at greater risk for morbidity and mortality after surgery because of their high incidence of surgery stress and lower functional capacity. Therefore, an evaluation of risk factors and individuals before surgery is vital to prevent complications (8). These factors raise the question for urologists of whether PNL is safe for elderly patients.

PNL is primarily recommended for large (>2 cm) kidney stones and offers the advantages of being less invasive, requiring a shorter hospitalization time, and producing a faster recovery than open and laparoscopic techniques (9). However, serious complications, such as bleeding requiring a blood transfusion (11.2%–17.5%), fever (21%–32.1%), pneumothorax (0%–4%), colon injury (<1%), and sepsis (0.25%–1.5%), should be taken into consideration (10). These complications will be more threatening for elderly patients. In this study, we assessed the safety and efficacy of conventional PNL in elderly patients.

Buldu et al. (11) investigated whether aging impacted surgical outcomes in PNL and did not find a statistically significant difference in the mean duration of surgery, postoperative hematocrit drop, or the complication and success rates between younger and elderly groups. Similarly, in our study, the stone-free, clinically insignificant residual fragment , and clinically significant residual fragment rates were 66.2%, 8.2%, and 25.6%, respectively, in Group 1 and 71.9%, 3.1%, and 25%, respectively, in Group 2; no significant difference was observed (p: 0.569). Complications were assessed in the two groups, and 2.5% and 3.1% of patients had a Clavien grade complication rate ≥3 in Group 1 and Group 2, respectively (p: 0.575). However, no differences were found in the hematocrit levels or operation times between these two groups. Besiroglu et al. (12) also compared the PNL success and complication rates in four groups that were stratified according to age (40–49 years, 50–59 years, 60–69 years, and >70 years), and they found the major complication (Clavien grade 3–4) rates were 5%, 3.6%, 5.4%, and 2.2%, respective-

ly; however, there were no statistically significant differences between the four groups. They demonstrated that PNL can be safely recommended for large kidney stones in elderly patients. Their results were similar to our study findings; 2.5% and 3.1% of patients in Group 1 and Group 2, respectively, demonstrated Clavien complication rates that were ≥ grade 3 (p: 0.575).

The main goal of PNL treatment should be a high stone-free rate with a low complication rate. In a series of 3310 patients, Okeke et al. (6) compared the data of 334 elderly and 2976 younger patients who underwent PNL. They reported a 78.7% stone-free rate in the elderly group and a 79.1% rate in the younger group, which was statistically insignificant (p: 0.892). We also found no statistically significant difference between Group 1 and Group 2.

However, blood transfusion rates were reportedly higher in elderly patients compared with younger patients following PNL (13). Abedali et al. (14) reported that the transfusion rate was 10.2% in patients >80 years who underwent PNL and statistically higher compared with younger groups (p <0.001). Besiroglu et al. (12) demonstrated a 13.3% transfusion rate in their >70-year-old group, and there was no statistically significant difference between their younger groups (p: 0.15). This rate was 30% and 9.1% for the elderly and younger groups, respectively (p: 0.003) in our study. Our transfusion rate appears higher when compared to the findings of other manuscripts, but our lower patient number was the factor that led to our high rate.

Kuzgunbay et al. (15) evaluated the results of 300 PNL procedures, and Nakamon et al. (16) examined 446 patients who had undergone PNL; there were no statistically significant differences in the length of hospital stay when both elderly and younger patients were compared in these two series. However, other reports have found that elderly patients had a longer hospital stay compared with younger patients (11). Our results indicated that the average length of stay was three days in Group 1 and four days in Group 2, which was not statistically significant (p: 0.164).

There were several limitations of this study. First, it was a retrospective study, and we could not obtain information regarding any change in glomerular filtration data that may have been affected by the PNL surgery. Our sample size was also small, and we had only a single session stone-free rate. We were unable to determine the stone-free rates after additional interventions, such as ESWL or retrograde intrarenal surgery after PNL.

CONCLUSION

Due to the increase in the elderly population, the number of surgeries required by elderly patients is also rising, which will lead to an increase in complication risks. PNL had acceptable results for large kidney stones and was safe in elderly patients. These results should provide relief for patients and urologists before surgery and aid in deciding upon the best treatment method.

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