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Is Percutaneous Nephrolithotomy Safe for Elderly Kidney Stone Patients?

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Abstract

Introduction: As a minimally invasive surgical method, PNL displayed a great development in techniques as well as equipments in the course of time. A conservative approach is no longer accepted in the elderly kidney stone patient population. Percutaneous nephrolithotomy is indicated as an effective and safe treatment in all age groups. In this study, we present percutaneous nephrolithotomy results obtained from kidney stone patients aged 65 years and over.

Materials and Methods: Based on the total PNL operations performed to 570 renal units in our clinic, age, gender, size, laterality and location of the kidney stone, body mass index and number of access were compared for the subjects who were divided into two groups as being over and under sixty-five years of age. Operative time, presence of complications, transfusion requirements, postoperative fever and stone-free rate were analyzed for the two groups.

Results: There was no difference between the two groups in terms of gender, body mass index, stone burden, number of accesses and stone laterality. There was no statistically significant difference between two groups with regard to stone free rate, preoperative complication rate and the need for transfusion. The majority of the complications were pain, bleeding, urinary leakage, and postoperative fever.

Conclusion: PNL is a technique used for many years with successful results in kidney stone disease. As a minimally invasive treatment, PNL is the gold standard approach for kidney stones, and an effective and reliable treatment modality for elderly patients too.

Keywords: Kidney stones; Complication; Transfusion; Percutaneous nephrolithotomy

Introduction

Urinary tract stones are considerably common today and in the past they used to be a problem leading to significant morbidity and requiring major surgery and a long recovery period. Percutaneous nephrolithotomy (PNL) for the treatment of kidney stones was first described in 1941 by Rupel and Brown as they removed the kidney stones through an operatively established nephrostomy tract. As a minimally invasive surgical method, PNL displayed a great development in techniques as well as equipments in the course of time, so today it has become a preferred method for the treatment of a large-volume kidney stones.

The elderly population in our country is increasing, as it is in the whole world. Nowadays, disease prevention, provision of diagnostic and treatment facilities at an early stage, dramatic reductions in the birth rate as well as infant-child and maternal mortality rates, improvements in education and increases in living standards in accordance with these developments result in an increase in the extending of human lifespan and the rate of the elderly population [1,2]. A conservative approach is no longer accepted in the elderly kidney stone patient population because of the high risk of urinary tract infections [3]. Percutaneous nephrolithotomy (PNL) is indicated as an effective and safe treatment in all age groups [4,5]. In this study, we present percutaneous nephrolithotomy results obtained from kidney stone patients aged 65 years and over, who are considered as "elderly population" by the World Health Organization (WHO).

Materials and Methods

Based on the total PNL operations performed to 570 renal units in our clinic between January 2011-May 2015, age, gender, size, laterality and location (calyx, pelvis, calyx + pelvis) of the kidney stone, body mass index and number of access were compared for the subjects who were divided into two groups as being over (Group I) and under (Group II) sixty-five years of age. Operative time, presence of complications, transfusion requirements, postoperative fever, stone-free rate after PNL and postoperative hospital stay were analyzed for the two groups.

Complete blood count, serum creatinine, sodium, potassium, liver function tests, urinalysis, urine culture and antibiogram and coagulation tests were performed pre-operatively. Postoperative complete blood count was repeated in patients with hemorrhage and serum creatinine test in patients with low urine output. Antiaggregant or anticoagulant medication was discontinued at least seven days

before the procedure. All patients were evaluated by computed tomography (CT) preoperatively.

Patients received anaesthesia in supine position, and then were changed into lithotomy position and an open-ended 6 F ureteral catheter was inserted by means of a 22 F cystoscope. We used fluoroscopic viewing to check whether the ureteral catheter was placed into the collector system or not. The ureteral catheter was fixed to the urethral 16 F Foley catheter by silk thread. The anestesists turned the patient into prone position while carefully protecting the head and the neck. The collecting system was viewed by giving retrograde contrast medium diluted 1:1 with saline.

After the 18 G needle entry, the guide wire was placed in the renal collecting system, preferably in the ureter and then not in all patients though, renal parenchymal tract was dilatated up to 30 F. The Bull's eye technique and the triangulation technique were used for the needle entry. Amplatz dilators are preferred in our clinic because they are safer and more effective. Whenever necessary, we attempted second and third entries or intercostal entry. Anaesthetists ensured safer intercostal entry by providing expiration in the patient. Blood transfusion was administered to the patients who developed peroperative hemorrhage, according to peroperative haematocrit result and hemodynamic evaluation of anaesthetists, and to those who deemed appropriate according to postoperative complete blood count control. During the operation, the ureteral catheter was removed at the earliest opportunity and the guide wire was advanced through the catheter. At the end of the operation, re-entry Malecot catheter was placed generally in such a way that it would rest on pelvis. Nephrostomy tubes were kept clamped in the patients with hemorrhage, until transferring them to bed. In general, urinary catheters of all patients were removed in the first day. Nephrostomy tubes of stable patients without hematuria were removed in the first day. Nephrostomy tubes of patients having perforation in the collecting system during the operation were removed after 2-4 days.

Results

Mean age of the patients was 53.4 ± 40.1 years. Of the patients included in the study, 245 (42.9%) were women and 325 (57.1%) were men. Mean patient age was 71.9 years (range 65-93 years) in group I, 49 years (range 14-64 years) in group II. Mean follow-up was 22.3 months (range 2-28 months). Additional problems such as hypertension, diabetes mellitus, coronary artery disease and chronic obstructive pulmonary disease were present in 68% (75/109) of the patients in group I and 41% (189) of those in group II. There was no difference between the two groups in terms of gender, body mass index, stone burden, number of accesses and stone laterality. Table 1 lists patient demographics and stone characteristics.

	Total	Group 1	Group 2	P value
Age (year)	53.4	71.9	49.07	<0.001
Gender (n)				0.016
Women	245	58	187	
Men	325	51	274	
PNL laterality (n)				0.051
Right	290	46	244	
Left	280	63	217	
Localization of the Stone (n)				0.112
Calyx	120	20	100	
Pelvis	170	33	137	
Calyx + Pelvis	280	59	221	
Size of the stone (mm^2)	681	673	685	0.894
Body Mass Index (kg/m^2)	28.6	28.4	28.7	0.919
Number of Access (n)				
One	507	103	404	0.093
Multiple	63	6	57	

Table 1: Patient demographics and stone characteristics.

In group I patients, residual stones were found in 22 (19.7%) and a total of 10 U blood transfusion was needed in 4 (3.7%). The average length of stay in the hospital was 2.8 (1-12) days and operation time was 54 minutes (30-145 min) (Table 2). In Group II, residual stones were found in 91 (24%) of patients, and a total of 31 U blood transfusion was needed in 17 (3.6%). The average length of hospital stay was 1.9 (1-17) days and the operation time was 64 minutes (35-160 min). There was no statistically significant difference between two groups with regard to stone free rate, preoperative complication rate and the need for transfusion (p = 0.098, p = 0.41, p = 0.71,

respectively) (Table 2). Statistically significant differences were detected between the groups with regard to postoperative complications, length of hospital stay and operation time (p = 0.04, p = 0.042, p = 0.005) (Table 2).

As shown in Table 3, the majority of the complications were pain, bleeding, urinary leakage after removal of the nephrostomy tube, and postoperative fever. Postoperative major infections, such as pyelonephritis, developed in 15 patients in group I and 26 patients in group II. A regional cellulitis developed on the needle access area in two patients in group I and five patients in group II. Second generation cephalosporin were administered to these patients. If the bleeding during the operation did not disturb the viewing, then the operation was not interrupted with a view to finish successfully as soon as possible. We haven't encountered any problem related with stone success in any patient of this group. Collector system perforations during the operation were not too serious. Most of these patients were noticed during control pyelography taken by opaque material given after placing a nephrostomy tube at the end of the operation. Nephrostomy tube was maintained between 2-4 days in patients with perforation in the collector system. Septic shock, damage of neighbouring organs, death and bowel perforation were not observed in any of our patients.

	Group 1	Group 2	P Value
Operation time (mean minute)	54	64	0.005
Transfusion Rate (n) (Unit)	4 (10 U)	17 (31 U)	0.71
Stone-free Rate (%)	79.8	80.2	0.098
Length of Hospital Stay (day)	2.8	1.9	0.042
Presence of Total Complications (%)	40.3	18.4	0.02
Peroperative complications (%) (n)	21.1 (23/109)	10.4 (48/461)	0.04
Postoperative complications (%) (n)	19.2 (21/109)	8 (37/461)	0.03

Table 2: Statistical comparison of the two groups.

	Group 1 (n)	Group 2 (n)
Peroperative Complications (n)	23	48
Bleeding	10	16
Perforation of the collective system	12	30
Access failure	1	2
Postoperative Complications (n)	21	37
Arteriovenous fistula	1	2
Ureteral stone	1	2
Long lasting urethral discharge	2	2
Cellulitis at the access site	2	5
Postoperative fever	15	26

Table 3: Type of complications by groups.

Discussion and Conclusion

A significant increase was determined in the number of elderly people with urinary tract stone disease in parallel to the growing elderly population as a result of considerable improvements in healthcare services. Epidemiological studies estimated the annual incidence of urinary stone disease in the elderly patients as 2% [6]. Gentle et al. have stated the ratio of men with stone disease as 65% in the elderly while 71% in the young population [7]. A study conducted in Turkey has indicated a higher ratio of women in the patient group while higher ratio of men in the control group [8]. In our study, 58 of 109 patients (53.2%) over 65 years of age were women, the number of women in the elderly patients (≥65 years) was higher, whereas in the control group 345 of 570 patients (58%) were men, and the number of men was higher. This may be interpreted as the patients who had the opportunity to be treated for kidney stone disease did not actually represent the entire patient population.

Prolonged surgical procedures can further increase the risk for the elderly. Various studies published previously have reported that PNL period normally take between 60-130 minutes [8,9]. In our study too, the mean operative time was 54.6 ± 43.8 minutes, which was consistent with the literature despite the presence of comorbid conditions.

Surgical intervention in elderly patients carries high risks for morbidity and mortality [10]. The most important factors that determine morbidity and mortality in elderly patients are comorbidities and the patient's performance status. Age alone is not a negative factor by itself [11-13]. Hoekstra et al. have stated that age is not a negative factor alone in patients with cancer and have correlated the risk of increased morbidity and mortality in the elderly population with the existing co-morbid diseases, malnutrition and immune system disorders [12]. Evers et al. have pointed out that the effects of age on different organs and systems do not generally affect normal functions [14]. As long as the elderly have no chronic diseases their organs can serve the basic needs of the body; however their functional reserve capacities would decline [14,15]. The elderly might not provide sufficient response in case of a stress. Surgery and anaesthesia are also sources of stress. There are publications reporting the importance of advanced age among the factors affecting postoperative morbidity and mortality [16]. In our study too, we determined postoperative complications, particularly fever, at a higher incidence in the elderly group compared to the younger group. We correlated this fact to the co-morbidities which are more common in the elderly group when compared to the younger patients. Immune system failure due to malnutrition may also be the underlying reason for such a high rate of postoperative complications. The rate of malnutrition is 5% in healthy individuals in the community, while it is 15% in elderly individuals and 30-65% in the elderly that are hospitalized [17]. These high rates reveal the importance of nutritional status in the elderly. Nutritional disorders affect morbidity and mortality by leading to impairment of the various organ functions, immune system and wound healing.

A recent study by Okeke et al. revealed longer length of hospital stay for elderly patients than younger patients [18]. We determined a statistically significant difference between the average values of length of hospital stay in our study too. The reason may be linked to the need to regulate the disturbed balance of the comorbid disease in the postoperative period.

Since kidney is a highly vascular structure, some bleeding can be seen from the renal parenchyma during each PNL procedure, up to a certain extent. Venous bleeding is generally characterized by a clear

viewing under irrigation, which deteriorates due to bleeding when irrigation is interrupted or slowed down. Arterial bleeding is light in color, gushes out swiftly and it is intermittent. The incidence of serious arterial bleeding after PNL is reported to occur between 0.5-1% in large series [19]. In our study, blood transfusion rate was not statistically significantly different between the groups although a slightly higher percentage was present in the elderly group than it was in the control group. We believe this may be related to the homogeneous distribution of the groups in terms of stone size.

Complete stone-free success was achieved in 80% of our patients without any additional treatment. The CROES study published in 2013 indicated a similar rate of complete stone removal for elderly patients and for younger patients and noted only a slight increase in complications although comorbidities significantly increased [20]. We observed no statistically significant difference for complete stone removal in our findings when we compared elderly patients with the younger group.

As a result; PNL is a technique used for many years with successful results in kidney stone disease [21]. As a minimally invasive treatment, PNL is the gold standard approach for kidney stones, and an effective and reliable treatment modality for elderly patients too, provided that the patients are evaluated in a detailed way and the concomitant diseases are sufficiently controlled in the preoperative period, general surgical principles are carefully observed and the operation is completed at the earliest possible time.

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