Comparison of demographic data in patients undergoing Percutaneous Nephrolithotomy in Southeastern Anatolia and the Black Sea region: A multicenter study

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ABSTRACT

Objective: The aim of this study was to compare demographic data in adult patients undergoing percutaneous nephrolithotomy (PNL) for kidney stone disease in university hospitals from Southeastern Anatolia and the Black Sea regions.

Material and methods: The demographic data of 535 (53.3%) patients undergoing PNL from Gaziantep University, Department of Urology (GAUN group), and 468 (46.6%) patients undergoing PNL from Ondokuz Mayıs University, Department of Urology (OMU group) were evaluated retrospectively. Patients' gender, mean age, stone laterality, and size and results of the stone analyses were compared.

Results: The mean patient ages were 40.94±13.33 (17-81) and 48.03±13.95 (17-81) years in the GAUN and OMU Groups, respectively, (p=0.0001). The mean stone size was 716.01±449.60 (100-3000) mm² and 612.7±445.87 (65-3220) mm² in the GAUN and OMU Groups, respectively (p=0.0001). There were no statistically significant differences between the groups with respect to stone laterality (p=0.196), and gender of the patients (p=0.65). Stone analysis revealed that the distribution of stone composition was as follows in the GAUN group: Ca oxalate (90.19%), cystine (7.84%), uric acid (5.88%), and struvite (1.96%). In the OMU group, the stone composition was as follows: Ca oxalate (86.84%), cystine (1.34%), uric acid (13.15%), and struvite (9.21%).

Conclusion: The incidence of kidney stone disease varies throughout Turkey based on etiological factors, and a higher incidence of kidney stone disease is observed in the Southeastern Anatolia region endemically. Lower mean ages and higher stone sizes in patients undergoing PNL in southeastern Anatolia suggest that geographic factors can affect stone disease.

Key words: Black Sea region; kidney stone; percutaneous nephrolithotomy; Southeastern Anatolia region.

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Introduction

Urinary system stone disease is the most frequently seen urogenital system pathology following prostatic diseases, and urinary tract infections with an incidence of 4-20% in industrial countries.^[1-5] Studies performed reported prevalence of stone disease as 2-8% in the United States of America, 1-5% in Europe, 7% in Japan, and 3.5% in South Korea. However in our country where stone disease is endemic, its prevalence has been indicated as 14.8 percent.^[2-6] As stated in various studies, in parallel with sensitive imaging methods, and increase in advanced age population, in the last quarter of the 20 century, these rates reportedly increase in the whole World.^[1,7] In our country, among geographic regions, stone incidence can

demonstrate differences dependent on region-specific dietary habits, climatic conditions and variations in the amount of fluid intake. In the Southeastern Anatolia Region stone disease is more frequently seen than other regions due to hotter climate, inability to consume adequate amounts of fluid, overindulgence in intake of foods of animal source, and salty foods.^[2,6,8]

In our country where stone disease is observed endemically, almost every type of renal stones can be managed with minimally invasive methods (extracorporeal shock wave lithotripsy, retrograde intrarenal surgery, percutaneous nephrolithotomy, and laparoscopic stone surgery) in parallel with technologic advances. As a gold standard modality, percutaneous nephrolithotomy (PNL) has been successfully applied in the

renal stone surgery, in almost every medical center in our country. [8,9] In our study we aimed to compare demographic data of adult patients who had undergone PNL in two university hospitals in Southeastern Anatolia, and Black Sea regions with the indication of renal stone in order to demonstrate regional differences.

Material and methods

Demographic data of 1003 patients who had undergone PNL in the Department of Urology, Gaziantep University Faculty of Medicine (GAUN) (n=535; 53.3%) and in the Department of Urology, Ondokuz Mayıs University Faculty of Medicine (OMU) (n=468; 46.6%) between January 2005, and December 2011 were retrospectively evaluated. All patients who participated in the study completed enlightened consent forms.

Percutaneous nephrolithotomy was applied on the patients with the following indications: stone burden greater than 2 cm stones less than 2 cm which was resistant to extracorporeal shock wave therapy (SWL) or retrograde intrarenal surgery (RIRC), urolithiasis related intractable infection, and lower caliceal stones bigger than 1 cm. In patients with hemorrhagic diasthesis, and in cases where safe percutaneous interventions can not be performed because of abnormal body habitus, and adverse anatomic factors, other treatment alternatives were preferred.

Direct urinary system radiograms (KUB), intravenous pyelograms and/or non-contrasted computed tomograms (CT) were obtained for all patients preoperatively. Stone size was calcu-

lated (in mm³) by multiplying horizontal, and vertical axes of the stones as observed on radiograms.

Gender, and mean ages of the patients, laterality, and location of the stones were recorded. Stones were classified according to their locations as pelvic, upper pole, lower pole, pelvic, and multicalyceal stones. Stone samples retrieved during PNL were sent for biochemical evaluation.

Statistical analysis

In the evaluation of data Statistical Package for the Social Sciences v. 11.5 (SPSS Inc., Chicago, IL, USA) was used, and p<0.05 was accepted as the level of statistical significance. For intergroup comparisons Mann-Whitney U-Test, and *chi-square* test were used.

Results

In our study, GAUN Group consisted of 535 (53.3%) patients who had undergone PNL in the Department of Urology, Gaziantep University, Faculty of Medicine, and OMU Group comprised of 468 (46.6%) patients who had been managed by PNL in the Department of Urology, Ondokuz Mayıs University Faculty of Medicine. Mean ages of the patients in the GAUN, and OMU Groups were estimated as 40.94±13.33 (17-81), and 48.03±13.95 (17-81) years, respectively (p=0.0001). Distribution of the genders were as follows: GAUN Group: male/female: 325/210, and OMU Group: (male/female: 291/177) (p=0.65). Any statistically significant intergroup difference was not detected as for laterality of the stones (right, left or bilateral) (p=0.196) (Table 1).

Table 1. Comparison of demographic data related to the patients living in Southeastern Anatolian, and Black Sea regions, and analytical results of their stones

	GAUN Group	OMU Group	p
Patients n (%)	535 (53.3)	468 (46.6)	
Age (years)	40.94±13.33 (17-81)	48.03±13.95 (17-81)	p=0.0001
Gender (male /female)	325 /210	291 /177	p=0.65
Stone size (mm ²)	716.01±449.60 (100-3000)	612.7±445.87 (65-3220)	p=0.0001
Stone location			
Upper pole (%)	16.6	8.2	p=0.0001
Lower pole (%)	34.7	19.2	
Pelvis (%)	22.24	35.2	
Pelvic, and multicalyceal locations (%)	26.35	37.8	
Stone analysis (patients, n)	n=51	n=76	
Ca oxalate, Ca (%) phosphate	90.19	86.84	
Cystine (%)	7.84	1.34	
Uric acid (%)	5.88	13.15	
Magnesium ammonium phosphate (%)	1.96	9.21	

Mean stone sizes were calculated as 71601 ± 449.60 (100-3000) mm² in the GAUN, and 612.7 ± 445.87 (65-3220) mm² in the OMU group ($p=0.0001$), respectively. Stone locations in the patients in the GAUN, and OMU groups were determined as follows: upper (16.6 vs. 8.2%), and lower pole calyces (34.7 vs. 19.2%), pelvis (22.24 vs. 35.2%), and multicalyceal (26.35 vs. 37.8%) ($p=0.0001$) (Table 1).

Results of the stone analysis were available for 51 (9.53%) patients in the GAUN, and 76 (16.23%) patients in the OMU groups, respectively. The frequency of various urinary stones detected in both groups were as follows: GAUN group: Ca oxalate, and Ca phosphate, 90.9%; cystine, 7.84%; uric acid, 5.88%; magnesium ammonium phosphate, 1.96%; OMU group: Ca oxalate, and Ca phosphate 86.84%; cystine 1.34%; uric acid, 13.15%; magnesium ammonium phosphate, 9.21 percent (Table 1).

Discussion

In the etiology of the urolithiasis genetic factors, gender, age, dietary habits of the patient, geographic region, climate, and environmental factors play important roles, and its prevalence changes between countries.^[2,10] Lifetime prevalences of stone disease have been reported to be 5.2% in the USA, 5.7% in Iran, 5.5% in men, and 4.49% in women living in Germany, and 5.98% in male, and 4.49% of the female population of Argentina.^[11-13] In our country, the prevalence of the urinary stone disease has been reported as 14.8% with a male/female ratio of 1.5/1.^[2,6] Still, similar rates have been found in our study, male/female ratios were estimated as 1.54 in the GAUN, and 1.64 in the OMU groups, respectively ($p=0.65$). Uluocak et al.^[10] evaluated the prevalence of urinary stone disease in the city of Tokat, and found lifetime prevalence of urolithiasis as 11.42%, and reported that a certain percentage of their male, and female patients had a history of stone disease (10.35, and 12.45%, respectively). Similarly, Müslümanoğlu et al.^[14] analyzed rates of urolithiasis in our country, and demonstrated nearly equal rates of stone disease in both genders (1.5/1 in 1991, and 1/1 in 2009).

Weather, and climatic conditions undoubtedly have an important impact on the incidence of stone formation. Incidence of stone formation increases in July, August, and September where air temperature reaches its climax, and its incidence rate decreases between December, and March.^[15] High temperature increases perspiration, and can lead to production of concentrated urine with resultant higher rates of crystalluria during summer months. At the same time, enhanced production of 1.25 hydroxy vitamin D3 with increased impact of solar energy, and increase in urinary calcium excretion have been indicated.^[15] When meteorological conditions in our country were analyzed, in the Southeastern Anatolia Region median day/night air tem-

perature during summer months is 35.3/27.3°C, while in the Black Sea Region it has been reported as 26.1/14.7°C.^[16] Higher air temperatures in addition to inadequate fluid intake, increased consumption of diets rich in food of animal origin, and salty foods all contribute to the higher incidence of stone disease in the Southeastern Anatolia Region relative to other parts of Turkey.^[2,6,8] Within the last 20 years, prevalence of urinary stone disease has increased rapidly in the Marmara, and Aegean Regions which has been attributed to increased flow of immigration to these parts of Turkey from Eastern, and Southeastern Anatolia Regions.^[14]

In our country, the incidence of urinary stone disease increases with age, and it peaks in individuals aged between 30, and 60 years.^[6] Uluocak et al.^[10] reported prevalence of urinary stone disease as 14, and 17% in the age brackets of 35-49, and 50-64 years, respectively, while they encountered the lowest rate of prevalence in the age group of 18-34 years. Based on the study of Tefekli et al.^[2] most of the referrals with stone disease aged between 41, and 51 years. In our study, mean age of the patients who had undergone PNL for their renal stones was calculated as 48.03 years in the GAUN, and 40.94 years in the OMU groups, respectively. Statistically significant difference ($p=0.0001$) was seen between two groups because of the abovementioned interregional variations in the way of living, and meteorological diversities, in other words endemic stone disease has been encountered in the Southeastern Anatolia Region.

PNL has been performed in many medical centers of our country.^[9,17] As a gold standard in the management of renal stone disease. Even, in cases with heavier stone burden, and those with staghorn stones, it can be performed with higher reliability, and efficacy.^[17] In our study, mean stone sizes in patients who had undergone were 716 mm² in the GAUN, and 612.7 mm² in the OMU groups with significantly larger-sized stones in the Southeastern Anatolian patients ($p=0.0001$).

In various studies performed, incidence of calcium oxalate, and calcium phosphate stones in Northern America, and Europe has been reportedly constitute 70-80% of all urinary stones analyzed. Magnesium ammonium phosphate stones associated with urinary tract infections caused by urea-splitting microorganisms have been seen in 10-15% of the cases. However reported incidences of uric acid, and cystine stones were 10, and 1%, respectively.^[15] In our study, stone analysis results of the patients from the Black Sea Region (Ca oxalate, Ca phosphate 86.84%, Mg ammonium phosphate 9.21%, uric acid 13.15%, and cystine 1.34%) are almost in compliance with those cited in the literature. However the incidence rates in Southeastern Anatolia Region differ from those reported in the literature, and extremely higher rates of (90.19%) Ca oxalate, and Ca phosphate stones are strikingly noteworthy.

One of the limitations of our study is that the number of patients analyzed for stone disease represents only a very small proportion of the total number of patients. As a probable justification, it can be assumed that the medical centers do not routinely perform stone analysis in their laboratories, and the patients consult to private centers for stone analysis. Another limitation of the study is that patient selection criteria concerning stone size, and their calyceal location can change, even a little bit, between two centers, and potential differences in the frequency of usage of other treatment modalities exist.

As a conclusion, incidence of urinary system stone demonstrates differences dependent on the diverse etiological factors between geographic regions, and because of effective environmental factors, it is endemically seen at higher rates in the Southeastern Anatolia Region. In our study smaller mean age, and greater stone size in PNL patients support data related to regional stone disease.

Ethics Committee Approval: Ethics committee approval was not received for this study from the ethics committee, because of retrospective design.

Informed Consent: Written informed consent was obtained from patients who participated in this study.

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