Renal Failure

ISSN: 0886-022X (Print) 1525-6049 (Online) Journal homepage: https://www.tandfonline.com/loi/irnf20

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To cite this article: Murat Suher, Eyup Koc & Gulden Bayrak (2006) Simple Renal Cyst Prevalence in Internal Medicine Department and Concomitant Diseases, Renal Failure, 28:2, 149-152, DOI: 10.1080/08860220500530841

To link to this article: https://doi.org/10.1080/08860220500530841

Published online: 07 Jul 2009.

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Renal Failure, 28:149–152, 2006
Copyright © Taylor & Francis Group, LLC
ISSN: 0886-022X print / 1525-6049 online
DOI: 10.1080/08860220500530841

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CLINICAL STUDY

Simple Renal Cyst Prevalence in Internal Medicine Department and Concomitant Diseases

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A total of 684 patients who had not been diagnosed with renal cyst but had undergone abdominal ultrasonography for various reasons were evaluated. Patients with and without renal cyst were classified into two groups and were compared in terms of hypertension (HT), hyperlipidemia (HL), diabetes mellitus (DM) and obesity (body mass index: ≥30 kg/m^2) prevalence. Although 94 patients (13.7%) were established with a renal cyst, 590 patients (86.3%) did not have a renal cyst. The mean age of the patients established with a simple renal cyst was 67.3 ± 12.1 years (range: 28–82 years); 54 (57.4%) of them were women and 40 (42.6%) were men. Of the patients established with a simple renal cyst, 64 (68.1%) had HT, 40 (42.6%) had DM, 20 (21.3%) had HL, 42 (44.7%) were obese, 18 (19.1%) had nephrolithiasis, and 6 (6.4%) had urinary tract infection. Of the patients without a cyst, 272 (46.1%) had DM, 212 (35.9%) had HT, 122 (20.7%) had HL, and 96 (16.3%) were obese. HT and obesity were significantly higher in patients with a renal cyst when compared with those without a cyst. However, although HL incidence was higher in patients with a cyst, the difference was not significant statistically. HT, HL, and obesity are more prevalent in patients with a renal cyst when compared with patients without. Consequently, patients with a simple renal cyst should be evaluated and followed up in terms of atherosclerotic risk factors.

Keywords simple renal cyst, hypertension, hyperlipidemia, obesity

INTRODUCTION

Simple renal cyst is the most common form of renal cystic diseases.[1] There is no consensus regarding its incidence. Its incidence was reported to be 4.8% in ultrasonography (USG) studies, 24% in computed tomography (CT) studies, and 50% in necropsy studies for patients at and older than 50.[2,3] It is rarely observed before the age of 40 years. Its prevalence increases with age.[2,4,5] It is more common in men than it is in women.[6–8] Simple renal cysts are generally noticed incidentally during investigation for other reasons. They can be solitary or multiple, unilateral or bilateral. Although they are generally located in the cortex, they can also be observed in the medulla. They are rarely symptomatic. Studies conducted revealed that simple renal cysts led to impaired renal functions.[1] Furthermore, a significant correlation was observed between simple renal cysts and HT.[8,9]

Renal cyst prevalence and comorbid conditions in our region had not been investigated sufficiently. Therefore, this study investigates the prevalence of simple renal cysts in patients presenting at our clinic. Demographic characteristics of these patients, their renal functions, and concomitant diseases were also investigated.

MATERIAL AND METHOD

A total of 684 patients who had not been diagnosed with renal cyst but had undergone abdominal USG for various reasons at our internal medicine department were evaluated. A total of 94 (13.7%) patients with unilateral or bilateral, solitary or multiple cysts of 10 mm or larger were included in the study. Simple renal cyst diagnosis was made with USG. Renal ultrasonography was performed by the same radiologist using EUB HITACHI 6000 ultrasound equipment, which was produced in 2003. The radiologist was instructed to scan the kidneys in the transverse and longitudinal planes. Simple renal cyst was identified on the basis of standard sonographic parameters: lack of internal echoes, and thin wall and distal enhancement. Patients were excluded if they were observed with late-stage renal failure, nephrectomy, familial history of cystic genetic disease (autosomal dominant polycystic renal disease, tuberosclerosis, Von Hippel-Lindau syndrome), hydronephrosis,

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renal ectopia, abnormality (horseshoe kidney), and solitary mass. Similarly, patients with a cyst smaller than 10 mm were not included due to diagnostic difficulties.

Patients were examined for serum urea, creatinine, uric acid levels, and density of first morning void urine sample. Creatinine clearance (mL/min) and microalbuminuria (mg/24 h) levels were established by collecting 24-h urine samples of the patients. Although an albuminuria level below 30 mg/24 h was regarded to be normal, 30 to 300 mg/24 h was regarded as microalbuminuria, and above 300 mg/24 h was regarded as macroalbuminuria. The patients were regarded to have a urinary tract infection (UTI) if $\geq 10^5$ of microorganism growth was observed during urine culture, carried out for patients observed with a leukocyte count of ≥5 in urine microscopy.

Patients with a body mass index (BMI) of ≥30 kg/m^2 were regarded to be obese. By using anamneses and laboratory results, the presence of concomitant HT, DM, and HL was investigated. The patients observed with and without simple renal cysts in abdominal USG were compared in terms of prevalence of HT, HL, DM, and obesity.

Patient selection was performed on the original database and then exported into SPSS software version 11 (SPSS, Inc., Chicago, IL, USA). The Student's *t* test was used to determine statistical significance of various parameters, including age, BMI, systolic versus diastolic blood pressure, serum urea, and creatinine levels. The chi-square test was used to analyze differences between groups. All values are expressed as the mean ± SD, and statistical significance was set at $p < 0.05$.

RESULTS

Of the 684 patients undergoing abdominal USG, 460 (67.3%) were women and 224 (32.7%) were men. Of the patients, 94 (13.7%) were established with a simple renal cyst. The mean age of the patients with a renal cyst was 67.3 ± 12.1 years (28–82 years); 54 (57.4%) of these were women, 40 (42.6%) were men. The age groups of the patients were as follows: 6 patients (6.4%) were 25 to 44 years old, 24 patients (25.5%) were 45 to 64 years old, and 64 patients (68.1%) were 65 years old or older. The mean age of the patients without renal cyst was 65.4 ± 5.9 years (29–80 years); 406 (68.8%) of these were women, 184 (31.2%) were men. The two groups were alike in terms of age and gender distribution (Table 1).

Simple renal cyst was presented in 48 patients (51.1%) only in the left kidney, in 24 patients (25.5%) only in the right kidney, and in 22 patients (23.4%) as bilateral renal cyst. Cysts were observed in the cortex in 66 patients (70.2%) and in the medulla in 24 patients (25.5%), whereas 4 patients (4.3%) were established with corticomedullary cysts. Although 48 patients (51.1%) had solitary cysts, 46 patients (48.9%) had multiple cysts. The mean cyst diameter was 26.9 mm, with the smallest having a diameter of 10 mm, and the largest 80 mm. The mean cyst sizes in relation to age groups were as follows: 18 mm in the 25 to 44 years group, 34.6 mm in the 45 to 64 years group, and 23.7 mm in the 65 years or older group (Figure 1).

Table 1
Patient characteristics

	Patients with renal cyst *n* (%)	Patients without renal cyst *n* (%)	Total
Number of patients	94 (13.7)	590 (86.3)	684
Women	54 (57.4)	406 (68.8)	460
Men	40 (42.6)	184 (31.2)	224

Although the mean systolic blood pressure was 130.4 mmHg, diastolic blood pressure was 78.9 mmHg in the group with simple renal cyst. The mean systolic blood pressure was 121.7 mmHg, and diastolic blood pressure was 75.6 mmHg in patients without simple renal cyst. Although mean serum urea value for the patients with simple renal cyst was 49.7 mg/dL, creatinine was 1.2 mg/dL, albumin was 3.8 mg/dL, uric acid was 5.5 mg/dL, urine density was 1019.8, and creatinine clearance in 24-h urine was 58.8 mL/min. Upon investigating 24-h urine, 6 patients (6.4%) were established with macroalbuminuria, and 34 patients (36.2%) were established with microalbuminuria. The remaining 54 patients (57.4%) did not have albuminuria. The mean serum urea value for patients without renal cyst was 37.0 mg/dL, creatinine was 1.0 mg/dL, uric acid was 4.8 mg/dL, urine density was 1019.8, and creatinine clearance in 24-h urine was 65.1 mL/min (Table 2).

In the group with renal cyst, 64 patients (68.1%) had concomitant HT. Furthermore, 42 patients (44.7%) were established with obesity, whereas 40 patients (42.6%) had DM, 20 patients (21.3%) had HL, 18 patients (19.1%) had

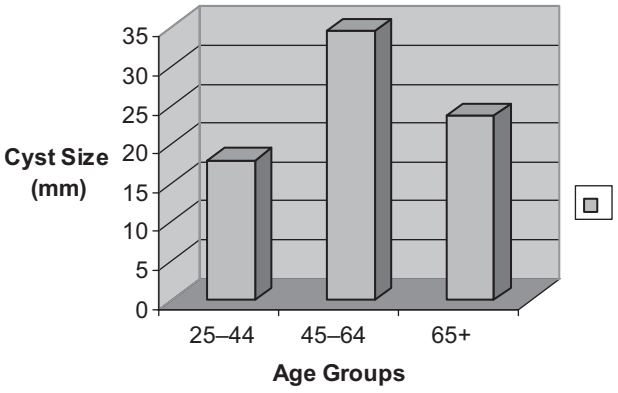

Figure 1. Relation between age groups and mean cyst sizes.

Table 2
Relationship between renal cyst and kidney functions

	Patients with renal cyst	Patients without renal cyst	*P* value
Serum urea (mg/dL)	49.7	37.0	<0.01
Serum creatinine (mg/dL)	1.2	1.0	NS
Serum uric acid (mg/dL)	5.5	4.8	<0.05
Serum albumin (g/dL)	3.8	3.8	NS
Urine density	1019.8	1019.8	NS
Albuminuria (mg/24 h)	131.0	34.8	<0.01
Creatinine clearance (mL/min/1.73 m^2)	58.8	65.1	NS

NS, not significant.

Table 3
Concomitant diseases in patients with and without renal cysts

	Patients with renal cyst *n* (%)	Patients without renal cyst *n* (%)	*P* value
Diabetes mellitus	40 (42.6)	272 (46.1)	NS
Hypertension	64 (68.1)	212 (35.9)	<0.001
Hyperlipidemia	20 (21.3)	122 (20.7)	NS
Obesity	42 (44.7)	96 (16.3)	<0.001

NS, not significant.

nephrolithiasis, and 6 patients (6.4%) had UTI. In contrast, in the group without renal cysts, 272 patients (46.1%) had DM, 212 patients (35.9%) had HT, 122 patients (20.7%) had HL, and 96 patients (16.3%) were obese. The patients with renal cysts had significantly higher incidence of HT and obesity when compared with the patients who did not have renal cysts ($p < 0.001$) (Table 3).

DISCUSSION

Mechanism behind the formation of a simple renal cyst is not fully known. Increasing nephron loss may lead to aberrant tubular growth and cyst formation by stimulating compensatory hypertrophy and hyperplasia in older age.[8,10,11] Microdissection has revealed ectasia, cystic dilatation, and diverticulum of the distal tubules more commonly in patients with a simple renal cyst at or older than age 60.[12] The most widely accepted theory maintains that elasticity decreases in nephron basal membrane with advanced age. Urinary tract obstruction leads to weakened nephron supportive tissue, particularly in patients with prostatism, resulting in higher diverticulum and cyst incidence.[6] This mechanism may be responsible for higher cyst incidence in men and at older ages. The number of male patients in the studies conducted is more than the number of female patients.[4,5,8,13] However, renal cyst incidence was observed to be higher in women than men in our study. This fact may be attributed to the higher number of women enrolled in this study.

Simple renal cyst incidence varies greatly due to differing cyst prevalences according to geographic regions, competence of staff conducting USG, difficulty in diagnosing cysts smaller than 1 cm through USG, insufficient echogenity in obese people, and sensitivity of the diagnostic methods employed.[8] Our study established the prevalence to be 14.3%, but percentages between 1 and 50 have been reported in various studies.[8,14]

Al-Said et al. reported unilateral renal cysts to be two times more common than bilateral renal cyst.[4] In agreement with the literature, unilateral renal cyst incidence was higher than bilateral renal cyst in our study. There was no statistically significant difference between the incidence of solitary and multiple cysts in this study, and the most common location for the cysts was the left kidney. However, some studies stated that solitary cysts were more common than multiple cysts, and the most common location for the asymptomatic renal cyst was reported to be the upper pole of the right kidney.[4,14] The literature reports increased cyst dimensions in older patients.[2,15] However, middle-age patients were observed with larger cysts than the older patients in this study. This condition may be related to the number of patients with renal cysts being less in our study.

Studies conducted have established a correlation between simple renal cyst and HT.[8,9] Some studies have suggested that the pressure applied by the cyst on the tissue results in ischemia. This stimulates renin-angiotensin system and leads to HT.[16] As certain studies reported normalization of blood pressure following the surgical excision or decompression of the cyst, it may be suggested that cyst plays a part in HT etiopathogenesis.[16] However, both simple renal cyst and HT incidences increase with age.[17] Therefore, it is also possible to postulate that high blood pressure in patients with cysts is associated with age rather than the cyst itself. There was not a significant difference between the two groups with and without simple renal cyst when compared according to their ages. However, HT prevalence in the group with renal cyst was higher. Because of these, we believed that simple renal cyst might be one of the causes of HT.

A recent study investigating the effects of simple renal cyst on renal functions reported decreased bilateral kidney dimensions in patients with simple renal cysts.[1] The same study stated that kidney dimensions were smaller in patients with bilateral renal cysts when compared with patients with unilateral renal cysts, but the difference was not statistically significant. However,

establishing a direct link between kidney size and renal functions is not simple. We found the levels of serum urea, uric acid, and albuminuria were higher in group with simple renal cyst. But other parameters, including the levels of serum creatinine and albumin, urine density, and creatinine clearance, were alike in two groups.

It was reported that HT and HL led to renal ischemia by inducing atherosclerosis, eventually leading to cyst formation.[18] Higher incidence of atherosclerotic risk factors, such as HT, HL, and obesity, were also observed in patients with renal cysts in this study. However, the same was not true for DM. Therefore, further studies are needed to support the results of this study.

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