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Original Article

Comparison of symptomatic versus asymptomatic urolithiasis: surgical outcomes and medium-term follow-up

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Abstract: Background: Injury extent and optimal management of asymptomatic urinary stones remain unclear, though they can be removed by almost any version of surgical management that is applicable to symptomatic stones. Objective: To compare the general characteristics, surgical outcomes, safety and postoperative renal functional changes between symptomatic and asymptomatic urolithiasis treated with surgical procedures. Design, setting and participants: We retrospectively reviewed 87 symptomatic cases and 79 asymptomatic cases of upper urinary tract calculi treated with surgical procedures between the years of 2006-2011 and followed for no less than one year. Outcome Measurements and Statistical Analysis: We compared general characteristics, surgical outcomes, safety and postoperative renal functional changes between the two groups. A multiple logistic regression was performed to identify the factors independently associated with postoperative renal functional decline. Results and Limitations: The asymptomatic cases had a smaller mean stone size (1.8 vs. 1.5 cm), shorter operative time (110.5 vs. 95.1 min) and postoperative hospital stay (7.6 vs. 5.7 d). There was no statistical difference between the two groups in perioperative complications, stone free rate (SFR) and estimated glomerular filtration rate (eGFR) at hospital discharge (P>0.05). The incidence of renal functional decline was higher in the asymptomatic group (31.0% vs. 58.2%). Age, hydronephrosis and diabetes mellitus were the independent risk factors associated with renal functional decline in asymptomatic urolithiasis. Limited by duration of follow-up, only medium-term outcomes were analyzed. Conclusions: Regular monitoring should be considered for asymptomatic urolithiasis after hospital discharge, especially for those elderly, diabetic or preoperatively hydronephrosis-complicated patients. Patient summary: In this report we compared symptomatic and asymptomatic urolithiasis. We found that asymptomatic urolithiasis can cause more renal functional decline.

Keywords: Asymptomatic urolithiasis, renal functional decline, surgical outcome

Introduction

Silent urinary stones are usually detected in physical examinations and management of other health problems such as acute kidney injuries [1, 2]. Wimpissinger F et al. [3] indentified 40 patients with asymptomatic ureteral stones among 3711 patients with ureteral stones. Boyce CJ et al. [4] assessed a large cohort of 5047 by low dose noncontrast computerized tomography, which showed an 8% prevalence of urolithiasis in asymptomatic adults. Since the introduction of extracorporeal shock wave lithotripsy (ESWL), ureterscopic lithotripsy (URL) and percutaneous nephrolithotomy (PCNL), open surgery, which is associated with higher risk of perioperative complications, is reserved for complex urinary stones only [5]. However, considering the high recurrence rate in urolithiasis patients undergoing ESWL [6, 7], URL and PCNL are more commonly used in attempts to achieve a stone free rate. Optimal treatment must involve scientific preoperative evaluation, customized surgical treatment and targeted postoperative management [8]. Thus it is essential to investigate the difference in general characteristics, surgical outcomes and renal functional changes between symptomatic and asymptomatic urolithiasis.

The difference in demographic distribution and perioperative metabolic conditions between the symptomatic and asymptomatic urolithiasis is worth investigating. Furthermore, it is well

known that urolithiasis patients are very prone to recurrence, thus the stone free rate (SFR) is very important in evaluating the surgical outcomes of asymptomatic urolithiasis [9]. Previous studies have indentified some risk factors for renal functional decline, such as diabetes and postoperative complications [10, 11], however, the differences between silent and symptomatic patients remain unclear. A better understanding of the factors associated with renal functional decline in patients undergoing surgical management in the treatment of asymptomatic urolithiasis would aid in the postoperative management.

Existing reports with respect to asymptomatic urolithiasis have compared the efficacy of varied therapies [12, 13]. In present study, we compared general characteristics, surgical outcomes, safety and medium-term renal functional changes between symptomatic and asymptomatic urolithiasis patients undergoing surgical procedures. In addition, we analyzed the medical data to indentify factors associated with postoperative renal functional decline respectively in the two groups.

Patients and methods

Based on the epidemiology, therapeutic outcomes and follow-up records of symptomatic and asymptomatic cases of urolithiasis, this retrospective cohort study was approved by Institutional Review Board of The General Hospital of Shenyang Military Area Command, Shenyang. Written informed consent was not required because this study met the criteria of waiving informed consent. We used only one data bank for statistical analysis.

With all data analyzed anonymously, we retrospectively reviewed a total of 166 patients with symptomatic or asymptomatic urolithiasis who were admitted into our hospital between January 2006 and December 2011 and underwent different surgical procedures. General information, co-morbid diseases, stone demographics, surgical features and perioperative complications were evaluated. The inclusion criterion was upper urinary tract calculi treated with surgical management (PCNL, URL or combined PCNL and URL) for the removal of stones in our department with no less than one year of follow-ups. The exclusion criteria were: 1) previous urinary stone-related medical history; 2) past history of acute kidney injuries, bacterial nephritis, intoxication and other problems that may cause irreversible physical injuries in the urinary tract; 3) co-morbidities that can lead to acute renal functional decline; 4) non-operative auxiliary procedures such as ESWL; 5) occurrence of stone-unrelated problems that can impair renal function during follow-up.

Tests of serum biochemistry, urine culture and coagulation were performed before making the decision of surgical management. Preoperatively, non-contrast computed tomography (CT) and ultrasonography were used to confirm the location and size of stones; the stone size was measured as the longest diameter. The patients with sterile urine were administered with broad spectrum prophylactic antibiotics. Patients with bacteriuria were treated to achieve an infection free state before surgical management. The patients underwent surgical treatment in accordance to the guidelines and techniques in our hospital. Based on different sizes and locations of urinary stones, we performed PCNL, URL or combined PCNL and URL on each patient. A stone-free state was defined as no detectable residual fragments and no evidence of obstruction on radiological studies. All patients were divided into two groups based on the main clinical manifestations: the symptomatic group (n=87) comprised of the patients that presented with classical urinary stone-related symptoms, such as sharp pains in the lumbar or abdominal region, renal colic and visible hematuria, and the asymptomatic group (n=79) comprised of the patients that presented with no classical urinary stone-related symptoms, with or without mild symptoms such as lumbar pain.

Statistical analysis

Comparisons for proportions between groups were performed with chi-square or Fisher's exact probability test. Comparisons for continuous variables were performed with Student's t test; $P<0.05$ was considered statistically significant. Multiple-variable logistic regression was performed to evaluate renal functional decline respectively in symptomatic and asymptomatic groups. A forward method with the likelihood ratio for covariate entry was used and models were tested using the Hosmer and Lemeshow test. Variables candidates included age, gender, type of surgery, stone size, number of stones, location of biggest stone, hydrone-

Table 1. General characteristics of symptomatic and asymptomatic cases of urolithiasis

Characteristics	Overall	Symptomatic cases	Asymptomatic cases	*P*
Number of patients	166	87	79	-
Age (yr)	61.1±16.1 (33-87)	60.3±16.3 (33-87)	61.9±15.9 (35-86)	0.536
Gender				0.773
Male	86 (51.8%)	46 (52.9%)	40 (50.6%)	
Female	80 (48.2%)	41 (47.1%)	39 (49.4%)	
Involved renal unit (no bilateral case)				0.630
Left	85 (51.2%)	43 (49.4%)	42 (53.2%)	
Right	81 (48.8%)	44 (50.6%)	37 (46.8%)	
Stone size (cm)	1.6±0.4 (1.0-2.9)	1.8±0.5 (1.0-2.9)	1.5±0.3 (1.0-2.0)	<0.001
Number of stones				0.638
Staghorn	52 (31.3%)	28 (32.2%)	24 (30.4%)	
Multiple	61 (36.7%)	34 (39.1%)	27 (34.2%)	
Single	53 (31.9%)	25 (28.7%)	28 (35.4%)	
Location of biggest stone				0.881
Pelvis	35 (21.1%)	18 (20.7%)	17 (21.5%)	
Calyx	44 (26.5%)	23 (26.4%)	21 (26.6%)	
Upper ureter	25 (15.0%)	13 (14.9%)	12 (15.2%)	
Middle ureter	34 (20.5%)	16 (18.4%)	18 (22.8%)	
Lower ureter	28 (16.9%)	17 (19.5%)	11 (13.9%)	
Hydronephrosis	109 (65.7%)	52 (59.8%)	57 (72.2%)	0.093
Diabetes	55 (33.1%)	26 (29.9%)	29 (36.7%)	0.351
Hypertension	65 (39.2%)	36 (41.4%)	29 (36.7%)	0.538
Positive urine culture	44 (26.5%)	22 (25.3%)	22 (27.8%)	0.709

phrosis, diabetes, hypertension, positive urine culture, final SFR and eGFR at hospital discharge. For all categorical variables, reference was "no".

Results

166 cases of urolithiasis were included into this study. 87 (52.4%) were symptomatic cases and 79 (47.6%) were asymptomatic cases. The gender and age distribution were similar between the two groups (**Table 1**). All cases suffered unilateral urolithiasis, with even distribution of involved renal units, *P*=0.630. The mean stone size was 1.8±0.5 cm in symptomatic and 1.5±0.3 cm in asymptomatic cases; as expected, symptomatic cases had a significantly smaller mean stone size, *P*<0.001. 28 vs. 24 suffered staghorn calculi, 34 vs. 27 suffered multiple calculi and 25 vs. 28 suffered single calculi, in symptomatic vs. asymptomatic cases, *P*=0.638. Urolithiasis were located in pelvis, calyx, upper, middle and lower ureters, without significant difference between symptomatic and asymptomatic cases in location of the biggest urinary stone, *P*=0.881. 52 vs. 57 had hydronephrosis, *P*=0.093, 26 vs. 29 had diabetes, *P*=0.351, 36 vs. 29 had hypertension, *P*=0.538, in symptomatic vs. asymptomatic cases respectively; there was no statistical difference in co-morbidities between the two groups. Preoperative urine cultures showed that 22 (25.3%) of the symptomatic and 22 (27.8%) of the asymptomatic group needed antibiotic treatment before surgeries, *P*=0.709. A complete summary of demographic and preoperative characteristics of the patients was present in **Table 1**.

In symptomatic vs. asymptomatic cases respectively, 41 vs. 49 underwent PCNL, 27 vs. 14 underwent URL, 19 vs. 16 underwent combined PCNL and URL, *P*=0.095. The mean operative time was significantly shorter in asymptomatic cases, 110.5±47.1 vs. 95.1±35.9 minutes, *P*=0.018. The mean hemoglobin drop was 1.6±0.9 g/dl in symptomatic and 1.6±1.0 g/dl in asymptomatic cases, *P*=0.925. The mean postoperative hospital stay was significantly shorter in asymptomatic cases, 7.6±4.8

Table 2. Surgical characteristics of symptomatic and asymptomatic cases of urolithiasis

Characteristics	Overall	Symptomatic cases	Asymptomatic cases	*P*
Number of patients	166	87	79	-
Type of Surgery				0.095
PCNL	90 (54.2%)	41 (47.1%)	49 (62.0%)	
URL	41 (24.7%)	27 (31.0%)	14 (17.7%)	
Combined	35 (21.1%)	19 (21.8%)	16 (20.3%)	
Operative time (min)	103.2±42.8 (35-191)	110.5±47.1 (35-191)	95.1±35.9 (35-158)	0.018
Hemoglobin drop (gm/dl)	1.6±0.9 (0.6-6.3)	1.6±0.9 (0.6-6.2)	1.6±1.0 (0.6-6.3)	0.925
Postoperative hospital stay (d)	6.7±4.3 (1.0-16.0)	7.6±4.8 (1.0-16.0)	5.7±3.6 (1.0-12.3)	0.005
Preoperative eGFR (ml/min·1.73 m^2)	79.5±16.0 (53.7-106.0)	80.2±16.1 (53.7-105.1)	78.6±15.9 (54.6-106.0)	0.523
GFR at discharge (gm/dl)	79.2±16.1 (51.6-109.6)	79.9±16.2 (51.6-108.5)	78.4±16.0 (54.0-109.6)	0.562
eGFR at one year after discharge	76.0±19.2 (43.6-114.3)	79.2±18.5 (45.0-114.3)	72.6±19.4 (43.6-113.6)	0.026
Decreased renal function	73 (44.0%)	27 (31.0%)	46 (58.2%)	<0.001
Initial SFR	135 (81.3%)	69 (79.3%)	66 (83.5%)	0.485
Final SFR	151 (44.0%)	77 (88.5%)	74 (93.7%)	0.246
Complications	21 (12.7%)	14 (16.1%)	7 (8.9%)	0.162
Grade I	16 (9.6%)	10 (11.5%)	6 (7.6%)	
Grade II	4 (2.4%)	3 (3.4%)	1 (1.3%)	
Grade III	1 (0.6%)	1 (1.1%)	0 (0.0%)	
Grade IV	0 (0.0%)	0 (0.0%)	0 (0.0%)	
Grade V	0 (0.0%)	0 (0.0%)	0 (0.0%)	

PCNL: percutaneous nephrolithotomy; URL: ureterscopic lithotripsy; eGFR: estimated glomerular filtration rate; SFR: stone free rate.

days vs. 5.7±3.6 days, *P*=0.005. After single session of PCNL/URS, 69 (79.3%) symptomatic and 66 (83.5%) asymptomatic cases achieved stone-free state; *P*=0.485. After staged PCNL/URS, the number increased to 77 (88.5%) in symptomatic and 74 (93.7%) in asymptomatic cases; *P*=0.246.

The mean preoperative eGFR was 80.2±16.1 ml/min·1.73 m^2 in symptomatic and 78.6±15.9 ml/min·1.73 m^2 in asymptomatic cases, *P*=0.523. This value was stabilized at discharge in both groups, respectively 79.9±16.2 ml/min·1.73 m^2 in symptomatic and 78.4±16.0 ml/min·1.73 m^2 in asymptomatic cases; *P*=0.562. At one year after discharge, this value decreased to 79.2±18.5 ml/min·1.73 m^2 in the symptomatic group and 72.6±19.4 ml/min·1.73 m^2 in the asymptomatic group; *P*=0.026. The number of cases demonstrating eGFR decrease that equals to or transcends 5.0 ml/min·1.73 m^2 was 27 (31.0%) out of symptomatic cases and 46 (58.2%) out of asymptomatic cases; *P*<0.001.

14 (16.1%) symptomatic cases and 7 asymptomatic cases (8.9%) suffered perioperative complications; there were no cases suffering two or more complications. The complications were listed in **Table 2** following the Clavien classification. Respectively, 5 cases of postoperative pain, 5 cases of vomit, 3 cases of blood transfusion and one case of bleeding requiring multiple bladder washout in the symptomatic group, whereas 6 cases of postoperative pain and one case of blood transfusion in the asymptomatic group. For the comparison in grouped Clavien I to III complications between the two groups, there was no statistical difference, *P*=0.162.

The results of univariate analysis on symptomatic cases were summarized in the **Table 3**; *P*<0.3 was considered potential influence factors. Age, stone size, diabetes, final SFR and eGFR at discharge were selected as variables for the adjustment of final model. The Hosmer-Lemeshow test for the final model gave a *p*-value of 0.657. The independent risk factors to suffer postoperative renal functional decline were stone size [OR=17.650 (3.509-88.793); *P*<0.001], diabetes mellitus [OR=11.599 (3.024-44.493); *P*<0.001]; eGFR at discharge served as a protective factor [OR=0.948 (0.909-0.988); *P*=0.012] (**Table 5**).

The results of univariate analysis on symptomatic cases were summarized in the **Table 4**.

Table 3. Potential Independent factors of renal functional decline: symptomatic cases of urolithiasis

Characteristics	Overall	Maintenance	Decrease	*P*
Number of patients	87	60	27	-
Age (yr)	60.3±16.3 (33-87)	58.5±15.6 (35-87)	64.5±17.2 (33-86)	0.111
Gender				0.423
Male	46 (52.9%)	30 (50.0%)	16 (59.3%)	
Female	41 (47.1%)	30 (50.0%)	11 (40.7%)	
Type of Surgery				0.484
PCNL	19 (21.8%)	11 (18.3%)	8 (29.6%)	
URL	41 (47.1%)	30 (50.0%)	11 (40.7%)	
Combined	27 (31.0%)	19 (31.7%)	8 (29.6%)	
Stone size (cm)	1.8±0.5 (1.0-2.9)	1.6±0.5 (1.0-2.8)	2.0±0.5 (1.0-2.9)	0.003
Number of stones				0.673
Staghorn	28 (32.2%)	21 (35.0%)	7 (25.9%)	
Multiple	34 (39.1%)	23 (38.3%)	11 (40.7%)	
Single	25 (28.7%)	16 (26.7%)	9 (33.3%)	
Location of biggest stone				0.879
Pelvis	18 (20.7%)	11 (18.3%)	7 (25.9%)	
Calyx	23 (26.4%)	17 (28.3%)	6 (22.2%)	
Upper ureter	13 (14.9%)	9 (15.0%)	4 (14.8%)	
Middle ureter	16 (18.4%)	12 (20.0%)	4 (14.8%)	
Lower ureter	17 (19.5%)	11 (18.3%)	6 (22.2%)	
Hydronephrosis	52 (59.8%)	38 (63.3%)	14 (51.9%)	0.312
Diabetes	26 (29.9%)	11 (18.3%)	15 (55.6%)	<0.001
Hypertension	36 (41.4%)	23 (38.3%)	13 (48.1%)	0.390
Positive urine culture	22 (25.3%)	16 (26.7%)	6 (22.2%)	0.659
Final SFR	77 (88.5%)	50 (83.3%)	27 (100.0%)	0.027
GFR at discharge (gm/dl)	79.9±16.2 (51.6-108.5)	82.1±15.5 (51.6-106.9)	74.8±16.7 (53.7-108.5)	0.049
GFR at one year (gm/dl)	79.2±18.5 (45.0-114.3)	84.9±16.7 (49.4-114.3)	66.5±16.1 (45.0-98.2)	<0.001

Age, number of stones, hydronephrosis, diabetes, positive urine culture and eGFR at discharge was selected as variables for the adjustment of final model. The Hosmer-Lemeshow test for the final model gave a *p*-value of 0.712. The independent risk factors to suffer postoperative renal functional decline were age [OR=1.203 (1.106-1.308); *P*<0.001], hydronephrosis [OR=23.273 (3.077-176.027); *P*= 0.002] and diabetes mellitus [OR=8.392 (1.413-49.837); *P*=0.019] (**Table 5**).

Discussion

In the first report with respect to the drawbacks of conservative management on asymptomatic urolithiasis, Hubner et al. [14] noted that 83% of caliceal calculi required interventions within 5 years of diagnosis and they demonstrated that a lower caliceal stone are unlikely to pass spontaneously if it does not within the first five years. Up till now, the best treatment of asymptomatic urolithiasis has been debating. However, many existing reports suggested that surgical management is safer and more effective in removing urinary stones with lower risk of residual calculi [15-19]. Yuruk et al. [12] reported that in a prospective randomized trial, patients with asymptomatic lower pole urolithiasis treated with PCNL all achieved stone-free state at month 12 while the stone-free rate was 54.8% in patients treated with ESWL. For upper urinary tract calculi of <20 mm in size, ESWL has been considered to be a treatment of choice. However, a recent study conveyed by El-Nahas AR et al. [13] on URL versus ESWL in the treatment of lower pole stones of 10-20 mm demonstrated that the URL group presented with higher stone-free rate, lower retreatment rate and similar incidence of complications.

PCNL is characterized by SFR of 74 to 83% and acute complication incidence of 15% and has

Table 4. Potential Independent Factors of Renal Functional Decline: Asymptomatic Cases of Urolithiasis

Characteristics	Overall	Maintenance	DECREASE	*P*
Number of patients	79	33	46	-
Age (yr)	61.9±15.9 (35-86)	49.1±12.1 (35-80)	71.0±11.4 (40-86)	<0.001
Gender				0.436
Male	40 (50.6%)	15 (45.5%)	25 (54.3%)	
Female	39 (49.4%)	18 (54.5%)	21 (45.7%)	
Type of Surgery				0.349
PCNL	16 (20.3%)	5 (15.2%)	11 (23.9%)	
URL	49 (62.0%)	20 (60.6%)	29 (63.0%)	
Combined	14 (17.7%)	8 (24.2%)	6 (13.0%)	
Stone size (cm)	1.5±0.3 (1.0-2.0)	1.4±0.3 (1.0-1.9)	1.5±0.3 (1.0-2.0)	0.717
Number of stones				0.279
Staghorn	24 (30.4%)	8 (24.2%)	16 (34.8%)	
Multiple	27 (34.2%)	10 (30.3%)	17 (37.0%)	
Single	28 (35.4%)	15 (45.5%)	13 (28.3%)	
Location of biggest stone				0.465
Pelvis	17 (21.5%)	4 (12.1%)	13 (28.3%)	
Calyx	21 (26.6%)	10 (30.3%)	11 (23.9%)	
Upper ureter	12 (15.2%)	6 (18.2%)	6 (13.0%)	
Middle ureter	18 (22.8%)	9 (27.3%)	9 (19.6%)	
Lower ureter	11 (13.9%)	4 (12.1%)	7 (15.2%)	
Hydronephrosis	57 (72.2%)	19 (57.6%)	38 (82.6%)	0.014
Diabetes	29 (36.7%)	8 (24.2%)	21 (45.7%)	0.052
Hypertension	29 (36.7%)	14 (42.4%)	15 (32.6%)	0.372
Positive urine culture	22 (27.8%)	13 (39.4%)	9 (19.6%)	0.052
Final SFR	74 (93.7%)	32 (97.0%)	42 (91.3%)	0.581
GFR at discharge (gm/dl)	78.4±16.0 (54.0-109.6)	90.9±13.0 (57.9-109.6)	69.4±11.2 (54.0-99.0)	<0.001
GFR at one year (gm/dl)	72.6±19.4 (43.6-113.6)	90.6±13.4 (59.2-113.6)	59.6±10.8 (43.6-88.2)	<0.001

Table 5. Multivariable logistic regression for medium-term postoperative renal functional decline

	Independent factors	OR	95% CI	*P*
Symptomatic cases	Stone size	17.650	3.509-88.793	<0.001
	Diabetes mellitus	11.599	3.024-44.493	<0.001
	GFR at discharge	0.948	0.909-0.988	0.012
Asymptomatic cases	Age	1.203	1.106-1.308	<0.001
	Hydronephrosis	23.273	3.077-176.027	0.002
	Diabetes mellitus	8.392	1.413-49.837	0.019

considerable advantages in comparison with URL or other alternative therapies [20]. In our study, initial SFR was 79.3% in the symptomatic group and 83.5% in the asymptomatic group, which increased to 88.5% versus 93.7% after staged PCNL/URL with perioperative complication rate of 16.1% versus 8.9% respectively. Our data suggested that the efficacy and safety of surgical procedures in the treatment of asymptomatic urolithiasis are at least as good as that in symptomatic urolithiasis.

Most of publications addressing the adverse effects of urolithiasis on renal function have considered symptomatic urolithiasis only. Mahmoud et al. [21] reported one case of asymptomatic distal ureteral obstruction detected on a follow-up after ESWL, whose renal function decreased at 6 weeks after treatment and did not improve after removal of stone. Andrén-Sandeberg et al. [22] prospectively studied 358 patients with ureteral calculi until the calculus passed spontaneously and

they found renal functional decline in 25%, and persistent renal functional decline was detected in 7% of patients by pyelography. Kelleher et al. [23] diagnosed 76 patients as acute calculous obstruction by radiology and found that stone of >5 mm in size can cause obstruction and renal functional decline; 18% of the patients had renal functional impairment and 3% suffered persistent functional decrease after stone removal. To our knowledge, our study is the first to compare postoperative medium-term renal functional decline between symptomatic and asymptomatic urolithiasis. Postoperative medium to long-term renal functional decline reflects the severity of physical injuries in the upper urinary tract. Actually, it is possible that a certain percentage of symptomatic cases act as outgrowth of asymptomatic urolithiasis, i.e., these cases may have suffered significant pathological changes caused by long-existing silent urinary calculi, in addition to that caused by active stones. However, our data showed that renal functional decline rate was higher in the asymptomatic than in the symptomatic group (58.2% vs. 31.0%). Our data suggest that long-standing silent calculi in the upper urinary tract may cause additional physical injuries, which have persistent impact on renal functional recovery.

It is essential to identify the factors associated with postoperative renal functional decline. Large active stones can lead to obstruction in the upper urinary tract, followed by septic or aseptic inflammatory reactions, and stone-related inflammatory injuries constitute a large fraction of renal functional impairment in symptomatic patients with urolithiasis. Diabetes mellitus is one of the most important predictors of long-term renal functional decline [10]. Patients with lower eGFR at discharge are likely to have suffered more physical injuries to the upper urinary tract, which significantly prohibit renal functional recovery.

Our data showed that hydronephrosis was an independent risk factor associated with postoperative medium-term renal functional decline in asymptomatic patients with urolithiasis. A possible explanation is that severe hydronephrosis can generate considerate burden on the upper urinary tract, leading to inflexible muscular conduits and atrophy of renal parenchyma. On a total population scale, autopsy series have shown the prevalence of hydronephrosis in 3% of men and women younger than 65 years and 6% of men older than 65 years [24]. Past epidemiologic studies assessed the relationship between nephrolithiasis and renal functional loss and the results showed that hydronephrosis is a specific risk factor for chronic kidney disease (CKD) [25]. For asymptomatic patients with urolithiasis, acute inflammatory reactions are not present, thus renal functional decline is not dependent on the size of stones as much as in symptomatic patients.

Our study cannot be generalized for patients with asymptomatic urolithiasis as a whole due to the following limitations: 1) It is a one-center retrospective study; 2) Limited by duration of follow-up, only medium-term therapeutic outcomes were analyzed. Recurrence rate and long-term renal functional changes cannot be recorded for a more convincing analysis; 3) Underdeveloped health consciousness in Chinese patients did not allow us to establish a larger sample size.

The results of our study can be applied mainly to asymptomatic adult patients with upper urinary calculi of 10-20 mm; all the cases included into our study met this definition. The patients presented with no symptomatic recurrence or newly developed health problems requiring surgical treatment or long-term medication. We can assume that renal functional decline well reflected the natural course of injuries caused by urolithiasis.

Conclusions

In conclusion, surgical management such as PCNL and URL is safe and effective in the treatment of asymptomatic urolithiasis. Silent urinary stones are usually smaller and less active, however, they should be judiciously removed if detected, especially for elderly patients, those complicated with hydronephrosis or diabetes mellitus, and postoperative monitoring is strongly recommended for these patients.

Disclosure of conflict of interest

None.

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