Extracorporeal shock wave lithotripsy and ureterorenoscopy procedures of ureteric stone disease in patients with a solitary kidney in Aden

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Received: July 2019; Accepted: August 2019; Published: September 1, 2019.
Citation: Ali Ahmed Salem Hatroom. Extracorporeal shock wave lithotripsy and ureterorenoscopy procedures of ureteric stone disease in patients with a solitary kidney in Aden. World Family Medicine. 2019; 17(9): 24-29.
DOI: 10.5742MEWFM.2019.93681

Abstract

Objective: To investigate and compare the treatment success of ESWL and URS for the treatment of ureteral stones.

Materials and method: We retrospectively identified patients with solitary kidney who complained of ureteric stones, treated with ESWL or URS in Aden, between 2011 and 2014.

The collected parameters were: age, sex, stone size, and stone location.

Results: The total study patients were 90. They were 64 (71.1%) males and 26 (28.9%) females with male to female ratio 2.5:1.

Their age ranged from 17 to 58 years and the mean age was 36.9±11.7 years.

The age group 41 – 50 years represents the highest percentage of patients 31 (34.5%).

Most patients 68 (75.6%) were aged between 21 – 50 years.

The symptoms were anuria + nausea + vomiting in 80 (88.9%) patients and 10 (11.1%) complaining of dysuria frequency and haematuria. The mean duration from starting symptoms was 2 ± 0.8 days. The most common side location was lower ureter 44(48.9%).

The treatment procedure URS + DJ (double j – ureteric stent) fixation was predominant with 70 (77.8%) while the treatment procedure DJ + ESWL was done for 20 (22.2%) patients. There was a significant association between patients' age groups and sex (p-value = 0.001).

The frequency of ureteric stones was significantly higher among males in the age group 41-50 years 26 (28.9%) while in females the frequency was significantly higher in age group 31-40 years 11 (12.2%). Also, there was a high statistically significant difference between the two groups of treatment procedures related to sex (p = 0.000). In the ESWL group, females were more than males 13(14.4%). In the URS group, males were predominant with 57(63.3%) (p = 0.001).

Success and stone free rate after ESWL was 85%, while in the URS group it was successful in all patients - stone-free 100% (p < 0.05).

Conclusion: URS seems to be more successful in the treatment of ureteral stones; further prospective studies with more patients are needed to clarify our results.

Key words: ESWL, URS, ureteral stones, treatment success

Introduction

The surgical management of ureteric stones has changed over the past few decades because of advances in instruments and techniques (1).

Extracorporeal shock wave lithotripsy (ESWL) and ureteroscopy, with or without intracorporeal lithotripsy, are the most common interventions used to treat ureteral stones. ESWL treatment is less invasive than ureteroscopy, but has some limitations such as a high retreatment rate, and is not available in all centres (2).

Ureteroscopy and extracorporeal lithotripsy have become a highly effective, minimally invasive treatment for ureteric calculi (2). The routine placement of ureteric stents after fragmentation and retrieval of ureteroscopic stones is questionable. The main advantages of stenting are the prevention of ureteric obstruction and renal pain that may develop as a result of ureteric oedema from balloon dilation or stone manipulation during ureteroscopy. Ureteric stents may aid in the passage of residual stone fragments secondary to the passive ureteric dilation that occurs with an indwelling ureteric stent and may prevent or delayed the formation of the ureteric stricture (3,4). However, stent placement is associated with considerable morbidity as stent-related complications are reported in 10-85% of cases. Related complications such as migration, infection, pyelonephritis, breakage, encrustation, and stone formation are not uncommon (5). Placement of ureteric stents also results in additional costs. Furthermore, unless a pull string is routinely used at the distal end of the stent; secondary cystoscopy is required to remove the stent, which has cost implications and the potential to add to the disruption of patients' lives.

Patients with a functionally or anatomically solitary kidney require carefully planned surgery in order to optimize the chance for recovery after one effective surgical procedure, and minimize the risk of complications (6).

Objective

To investigate and compare the treatment success of ESWL and URS in patients for the treatment of ureteral stones

Materials and Method

We retrospectively identified patients with ureteric stones treated with ESWL or URS at Urology unit, Surgical Department, Saber Hospital and Al-Saeedi Hospital in Aden, between 2011 and 2014. Patients with solitary kidney and who complained of ureteric stones and a stone diameter of 5–20mm were included.

Pretreatment stone size and location were generally assessed by ultrasonography (US) and radiological examination [X-ray and or non-contrast computed tomography (CT) of the abdomen]. The following preoperative parameters for each patient were noted: age, sex, stone size, and stone location (upper ureter, middle ureter, lower ureter).

Success rate after intervention was assessed by patient being stone-free. As a primary endpoint, we assessed stone-free rates for each treatment method during follow-up using X-ray, US or CT.

The data was entered into a computer and analyzed using SPSS version 17, statistical package. For variables difference, chi-square tests, and P values were calculated, with differences at the 5% level being regarded as significant.

Results

During the four year study period, 90 patients with solitary kidney and who had ureteric stones were seen in our private health center.

There were 64 (71.1%) males and 26 (28.9%) females with ratio male to female 2.5:1 (Figure 1, and Table 1).

Table 1 also reveals the age of patients ranged from 17 to 58 years. The mean age of the patients is 36.9±11.7 years. The age group 41 – 50 years represents the highest percentage of patients 31(34.5%) and the lowest percentage is the age group ≤ 20 years with 10 (11.1%). Most of our study patients 68 (75.6%) were aged between 21 – 50 years while patients aged ≤ 20 years and > 50 years were only 22 (24.4%). It also shows the symptoms, which were Anuria + Nausea + Vomiting in 80 (88.9%) patients and 10 (11.1%) complaining of dysuria frequency and heamaturia; also, the mean duration from starting symptoms was 2 ± 0.8 days.

The most common side location of ureteric stones was lower ureter 44 (48.9%) followed by middle ureter 28(31.1%) and upper ureter 18 (20.0%).

Table 1 also shows the distribution of treatment procedures for patients in which ureteroscopic laser lithotripsy (URS) + DJ (double j – ureteric stent) fixation procedure was predominant with 70 (77.8%) while the treatment procedure DJ + Extracorporeal Shock Wave Lithotripsy (ESWL) after 2 weeks was done for 20 (22.2%) patients.

Using Chi square test it was found that there was significant association between patients' age groups and sex in the occurrence of ureteric stones (p-value = 0.001).

The frequency of ureteric stones was significantly higher among males in age group 41-50 years 26 (28.9%). The frequency of ureteric stones was significantly higher among females in age group 31-40 years 11 (12.2%) as shown in Table 2.

By comparing the two treatment procedures in managing the ureteric stones in patients with solitary kidney as shown in Table 3, there was a highly statistical significant difference between the two groups of treatment procedures related to sex (p = 0.000).

In the treatment group ESWL females were more than males 13(14.4%) while males were 7 (7.8%). In the treatment group URS males were predominant with 57 (63.3%).

Most patients treated with ESWL 13(14.4%) were aged between 21 – 50 years.

There was also a statistically significant difference between groups of treatment procedures (ESWL & URS) regarding age groups (p = 0.001).

Success and stone free rate after ESWL was 85%, while in the URS treatment group it was successful in all patients who all become stone-free (100%).

There was a statistical significance between the two treatment groups (Table 3).

Figure 1: Distribution of patients related to sex

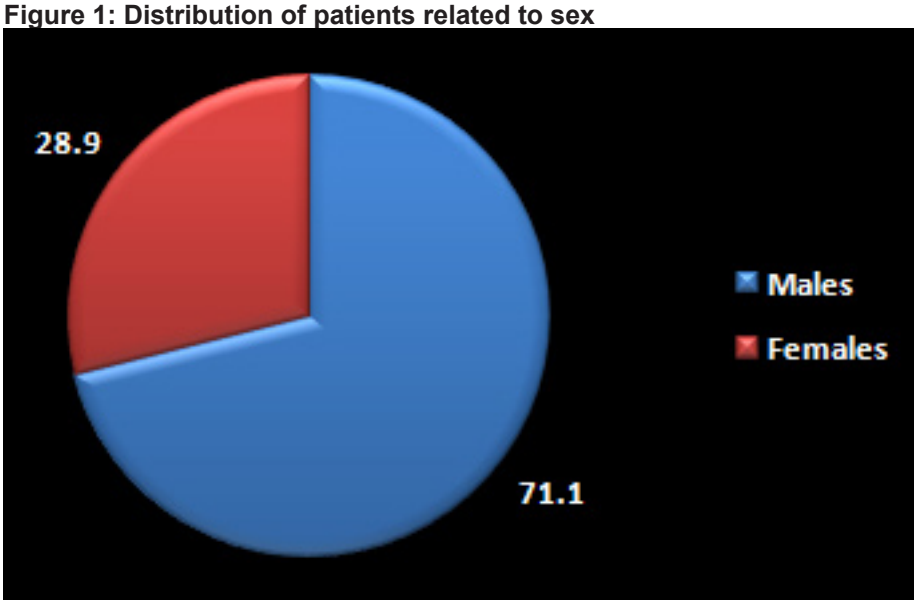

Table 1: Demographic, clinical characteristics and treatment procedures of the parents (no=90)

Variables	No	%
Sex:		
Males	64	71.1
Females	26	28.9
Range of age & mean age (years):	17 to 58; 36.9±11.7	
Age (years):		
≤ 20	10	11.1
21-30	20	22.2
31-40	17	18.9
41-50	31	34.5
> 50	12	13.3
Symptoms:		
Anuria+Nausea+Vomiting	80	88.9
Dysuria frequency haematuria	10	11.1
Duration from starting symptoms: Mean (days)	2 ±0.8	
Location of stones:		
Lower Ureter	44	48.9
Middle Ureter	28	31.1
Upper Ureter	18	20.0
Range of stone size and mean size:	>5-<20 mm; 10.5±4.6 mm	
Treatment procedure:		
DJ + ESWL After 2 week	20	22.2
URS+DJ fixation	70	77.8

Table 2: Association between frequency of ureteric stones and age groups and sex among study patients

Age	Males		Females		Total	
	No	(%)	No	(%)	No	(%)
≤ 20	8	(8.9)	2	(2.2)	10	(11.1)
21-30	12	(13.3)	8	(8.9)	20	(22.2)
31-40	6	(6.7)	11	(12.2)	17	(18.9)
41-50	26	(28.9)	5	(5.6)	31	(34.5)
> 50	12	(13.3)	0	(0.0)	12	(13.3)
Total	64	(71.1)	26	(28.9)	90	(100)

Chi-square: 19.534 ; p-value: 0.001

Table 3: Relation between sex, age groups, and success with treatment procedures groups (ESWL and URS groups).

Variables	ESWL		URS		p-value
	No	(%)	No	(%)	
Sex:					
Males	7	(7.8)	57	(63.3)	P = 0.000
Females	13	(14.4)	13	(14.4)	
Age groups:					
≤ 20	4	(4.4)	6	(6.7)	P = 0.001
21-30	3	(3.3)	17	(18.9)	
31-40	9	(10.0)	8	(8.9)	
41-50	1	(1.1)	30	(33.3)	
> 50	3	(3.3)	9	(10.0)	
Success	17	(85)	70	(100)	
Failure	3	(15)	0	(0.0)	P = 0.001

Discussion

Urinary stones are the third most common affliction of the urinary tract, exceeded only by urinary tract infections and pathologic conditions of the prostate. Stone disease has been a major problem afflicting the human population ever since antiquity. The disease is both very common among men and women with estimated prevalence among the population of 2–3% and an estimated lifetime risk of 12% for white males (7) and 5–6% for white females (8). The increased incidence of urinary stones in the industrialized world is associated with improved standards of living (mainly including the high dietary intake of proteins and minerals) as well as with race, ethnicity and region of residence (9).

In our study the number of treated males 64 (71.1%) was usually higher than females 26 (28.9), with a ratio male to female 2.5:1.

The reported prevalence rate of stone disease is 5%-12% in men, 4%-7% in women (10). Stone formation is affected by gender, age and geography. Men's possibility of forming stones is more than women's. However, the ratio has decreased from a 3:1-male to female predominance to less than 1.3:1 (11).

Published literature reports that men have been shown to have higher prevalence rates of stone disease 10.6–12% than women 4.8–7.1% (12,13).

In developing countries the male-to-female ratio ranges from 1.15:1 in Iran (14) and 1.6:1 in Thailand (15) to 2.5:1 in Iraq (16) and 5:1 in Saudi Arabia (17).

Literature on ureteral stone disease has documented that males are at greatest risk of developing urolithiasis (18). The incidence rate among men is two times higher and the prevalence rate about four times higher among men compared to women (18).

The present study revealed that the age of patients ranged from 17 to 58 years. The mean age of the patients is 36.9±11.7 years. Most of our study patients 68 (75.6%) were aged between 21 – 50 years while patients aged ≤ 20 years and > 50 years were only 22(24.4%).

Hesse et al (19) reported that people aged ≥65 years are 2.5 times more likely to have stone disease than 35–49 years olds.

Hughes (20) reported that ages between 20 and 30 years have increased incidence of ureteric stones and the incidence is relatively constant above 30 years until the age of 70 years.

In our study we found that 80 (88.9%) of patients complained of anuria + nausea + vomiting and 10 (11.1%) complained of dysuria frequency and haematuria; also, the mean duration from starting symptoms was 2 ± 0.8 days.

Sreedharan et al (21) reported that in the clinical presentation of these patients, most of the patients (95.1%) reported with ureteric colic pain. The mean duration of pain was 4.1 days with a standard deviation of 3.4 days (range minimum one day to 30 days).

In the current study we found that the treatment procedure ureteroscopy lithotripsy (URS) + DJ fixation was predominant with 70 (77.8%) while the treatment procedure DJ + Extracorporeal Shock Wave Lithotripsy (ESWL) was 20 (22.2%).

Depending on stone size and position, most ureteric stones are managed expectantly, with ESWL, or by ureteroscopic extraction and disintgration (URS).

Most ureteric stones of size 5 mm or less will pass, and the relatively uncommon ureteric calculus of 20 mm or greater is best managed by ureteroscopy, percutaneous or laparoscopic means. For those ureteric calculi of dimensions that lie between 5 mm and 20 mm the treatment alternatives are ESWL or URS (22).

In the present study there was a high statistically significant difference between the two groups of treatment procedures ESWL and URS related to sex (p = 0.000).

In the treatment group of ESWL, females were more than males 13 (14.4%) while males were 7 (7.8%). In the treatment group of URS, males were predominant with 57 (63.3%).

Also, there was a statistically significant difference between groups of treatment procedures ESWL and URS regarding age groups (p = 0.001).

Success and stone free rate after ESWL was 85%, while in the URS group was 100%.

There was a statistical significance between the two treatment groups.

Miller et al (23) mentioned that some early studies reported success and stone free rate after ESWL in up to 90%.

Mobley et al (24) mentioned that in a remarkable study from the United States, 18,825 patients were treated with one to three sessions of ESWL for ureteral stones of variable location and size. All patients were treated within a 6 year follow up period (1988–1993) and the mean stone free rate was 83.8%.

Iqbal et al (25) mentioned that the success rate (stone free rate) of URS has been around 80% in the proximal ureter.

It is seen in literature that URS has a higher stone-free rate for stones smaller than or equal to 10 mm in the distal ureter and stones larger than 10 mm in the proximal ureter (26). It is pertinent here that besides the influence of stone size and position, the efficiency of the URS procedure depends on the experience and skill of the operating urologist as well (27). In another study stone- free rate after URS was 86.7% (28).

Conclusion

We concluded that in comparison with ESWL, URS methods can be preferred due to their successful rates (stone free rates) and lower complication rates in ureteral stones. However more prospective studies with a higher number of patients will help to reach more clear conclusions.

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