Single-use flexible ureteroscope for the treatment of renal stone

Ureteroscopio flexible de un solo uso para el tratamiento de cálculos renales

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Abstract

Objectives: This study aims to describe the effectiveness of a single-use flexible ureteroscope regarding the time of surgery, stone-free rate, and complications.

Material: This prospective work was performed at Basrah Urological Centre for the period March 2022 to April 2023. Sixty-one patients were enrolled in this study after we excluded patients who had ureteral stricture, high blood urea, and untreated urinary tract infection. All patients were selected older than 20 years of age. Patients were operated upon by the same surgeon.

Results: This study involved 61 patients of them 23 (37.7%) male and 38 (62.3%) female patients. The mean age of patients was 37.3 years with a standard deviation of 11.1. The average total stone burden was 10.1 ± 3.3 mm, with a range of 7-15 mm. The average stone density was 1000.3 ± 271.5 HU, ranging from 820 to 1411 HU.

Conclusion: The present study concluded that the single-use flexible ureteroscope for treating renal stones is effective and causes fewer complications.

Keywords: Single-Use, Flexible Ureteroscope, Treatment, Renal Stone.

Introduction

Renal calculi represent a growing problem all over the world. They occur mostly in the age group of 20-40 years[1]. Treatment of renal stones aims at reducing morbidity with the highest possible stone-free rate. The invasiveness of interventions is wanted to be as low as possible[2]. The options for managing renal stones less than 2 cm varied from retrograde intrarenal surgery to extracorporeal shockwave lithotripsy and percutaneous nephrolithotomy (PNL)[3]. However, a flexible ureteroscope became the first option in this case[4]. Single-use or multiple-use devices are available[5]. The essential development in ureteroscope manufacturing was the introduction, in 2011, of the first single-use ureteroscope (PolyscopeTM) by Lumens which made use of reusable fiberoptic bundles that could be attached to disposable flexible catheters[6]. The devices were developed over the last 25 years and the first device that accessed the upper ureter is LithoVuetm™[7]. The safety and effectiveness of the device were studied and confirmed[8].The novel single-use digital device that has been recently introduced is Uscope UE3022 developed by Pusen™ (Zhuhai Pusen Medical Technology Co, Ltd., Zhuhai, China)[2]. Pusen™ device was developed to overcome the limitations of reusable ureteroscopes[9]. This study aims to describe the effectiveness of a single-use flexible ureteroscope regarding the time of surgery, stone-free rate, and complications.

Materials and methods

This prospective work was performed at Basrah Urological Centre for the period March 2022 to April 2023. Sixty-one patients were enrolled in this study after we excluded patients who had ureteral stricture, high blood urea, and untreated urinary tract infection. All patients were selected older than 20 years of age. Patients were operated upon by the same surgeon. A special data collection tool was designed to collect demographic information and surgical assessment information, including stone size and location, time of intervention, duration of fluoroscopy, and any residual stone. Also, ureteroscope problems were reported. All patients were investigated by urine exam, CBC, spiral abdomen CT, and urine culture. We used Pusen™ fr. 7.5 flexible ureteroscope with 10 fr. ureteral access sheath and laser machine Storz™ caluclase III. All patients received and signed informed consent. General anesthesia was applied to all patients. The semirigid ureteroscope was then inserted using a guidewire. In case the lower ureter was not dilated efficiently, a JJ catheter was inserted and the procedure resumed after one week. The ureteral access sheaths, 11 fr., were used under fluoroscopic control. All patients had JJ stent postoperatively. Collected data were fed into SPSS file version 27 for tabulation and analysis. Continuous variables were presented as means and standard deviations while categorical variables were shown as frequency and percentages. Student's t-test and ANOVA tests were used to investigate mean differences. Associations between categorical variables were studied using chi-squared tests. The level of significance was set at 0.05.

Results

Table 1: Basic characteristics of patients

Parameter		Result
Age at surgery (years)		37.3 ± 11.1 (range 20-63 years)
Gender	Male	23 (37.7%)
	Female	38 (62.3%)

This study involved 61 patients of them 23 (37.7%) male and 38 (62.3%) female patients.

The mean of score for the age of patients was 37.3 years and a standard deviation of 11.1.

Table2: Stone burden and density

Characteristics	Measures
Total stone burden (mm in CT scan)	10.1 ±3.3 (range 7-15)
Stone density (HU)	3.3 ±271.5 (range 820-1411)

Table 2 shows that the average total stone burden was 10.1 ± 3.3 mm, with a range of 7-15 mm. The average stone density is 1000.3 ± 271.5 HU, ranging from 820 to 1411 HU.

Table 3: Stone location according to size

Location	Total	<10 mm	>= 10 mm	P value*
Upper ureter	11 (18.0%)	4 (17.4%)	7 (18.4%)	0.001
Renal pelvis	28 (45.9%)	11 (47.8%)	17 (44.7%)	
Upper calyx	7 (11.5%)	2 (8.7%)	5 (13.2%)	
Middle calyx	9 (14.8%)	5 (21.7%)	4 (10.5%)	
Lower calyx	6 (9.8%)	1 (4.3%)	5 (13.2%)	

*Chi-squared test

Table 3 provides information on the distribution of renal stones based on their location and size. In the upper ureter, out of the total 11 stones in this location, 4 (17.4%) are smaller than 10 mm, and 7 (18.4%) are equal to or larger than 10 mm. Among the 28 stones in the renal pelvis, 11 (47.8%) are smaller than 10 mm, while 17 (44.7%) are equal to or larger than 10 mm. Upper calyx: There are 7 stones in the upper calyx, with 2 (8.7%) being smaller than 10 mm and 5 (13.2%) equal to or larger than 10 mm. No P value is provided. Out of the 9 stones in the middle calyx, 5 (21.7%) are smaller than 10 mm, and 4 (10.5%) are equal to or larger than 10. Among the 6 stones in the lower calyx, 1 (4.3%) is smaller than 10 mm, and 5 (13.2%) are equal to or larger than 10 mm. There were significant variations in the distribution of renal stones locations in relation to size.

Table 4: Surgical parameters and complications

Parameter	Mean ±SD
Surgical time (minutes)	65 ±38.0
Fluoroscopy time (seconds)	29.3 ± 12.5
Stone free rate	96.8%
Complications	5 (8.2)

From Table 4, the mean surgical time was 65 minutes, with a standard deviation of 38.0 minutes. The mean

fluoroscopy time is 29.3 seconds, with a standard deviation of 12.5 seconds. The stone-free rate is reported as 96.8%. Out of the total number of procedures performed, 8.2% of patients experienced some form of complication. The nature and severity of these complications are listed below:

Sepsis: one case

Bleeding that obscured the view: two cases

Partial ureteral injury by access sheath: one case

Fornix rupture due to high intrarenal pressure: one case

Discussion

Because of benefits including reduced invasiveness, less blood loss, and shorter hospital stays, flexible ureteroscopy has been widely used for the treatment of upper urinary tract stones [10]. This study involved 61 patients of them 23 (37.7%) male and 38 (62.3%) female patients. The mean age of patients was 37.3 years with a standard deviation of 11.1. The results of this study agreed with study[11] which stated that most of the study sample was female (70.4%). Table 2 shows that the average total stone burden was 10.1 ± 3.3 mm, with a range of 7-15 mm. The average stone density was 1000.3 ± 271.5 HU, ranging from 820 to 1411 HU. The present study's results consisted of a study[12] which stated the stone burden was 10 mm with a percentage (51.5%). Table 3 provides information on the distribution of renal stones based on their location and size. In the upper ureter, out of the total 11 stones in this location, 4 (17.4%) are smaller than 10 mm, and 7 (18.4%) are equal to or larger than 10 mm. Among the 28 stones in the renal pelvis, 11 (47.8%) are smaller than 10 mm, while 17 (44.7%) are equal to or larger than 10 mm. Upper calyx: There are 7 stones in the upper calyx, with 2 (8.7%) being smaller than 10 mm and 5 (13.2%) equal to or larger than 10 mm. No P value is provided. Out of the 9 stones in the middle calyx, 5 (21.7%) are smaller than 10 mm, and 4 (10.5%) are equal to or larger than 10. Among the 6 stones in the lower calyx, 1 (4.3%) is smaller than 10 mm, and 5 (13.2%) are equal to or larger than 10 mm. There were significant variations in the distribution of renal stones locations in relation to size. The results of the current study are consistent with a study[12] which reveals that most of the stones are found in the renal pelvis (73.2%). From Table 4, the mean surgical time was 65 minutes, with a standard deviation of 38.0 minutes. The mean fluoroscopy time is 29.3 seconds, with a standard deviation of 12.5 seconds. The stone-free rate is reported as 96.8%. Out of the total number of procedures performed, 8.2% of patients experienced some form of complication. The nature and severity of these complications are Sepsis: in one case, Bleeding that obscured the view: in two cases, Partial ureteral injury by access sheath: in one case, and Fornix rupture due to high intrarenal pressure: one case. The results of the current study agreed with a study[12] which reveals the stone-free rate is reported as (95.2%). The mean surgical time was 52 minutes. Complications are Persistent hematuria 0% (0/684), Ureteral perforation 0.87% (6/684), Moderate fever 0.7% (5/684), and Urosepsis 0% (0/684).

Conclusions

The present study concluded that the single-use flexible ureteroscope for treating renal stones is effective and causes fewer complications.

Author Contributions:

Design: Majed A Mohammad

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