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RETROGRADE INTRARENAL LITHOTRIPSY USING DISPOSABLE FLEXIBLE URETEROSCOPE

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Abstract.

This research aims to characterize efficiency of a flexible ureteroscope that is of single use with regard to surgical time, absence of stone, and complications. From March 2022 to April 2023, the Basrah Urological Centre carried out this anticipated work. After excluding patients with untreated urinary tract infections, excessive blood urea, and ureteral strictures, the study involved ninety-eight patients. All patients were above 20 years of age. Patients were operated on by the same surgeon. This study involved 108 patients in this study composed of 42 (39.8%) men and 65 (60.2%) women. With a standard deviation of 10.9 years, the patient's mean age was 39.2 years. The total stone burden ranged from 6.9 to 14.5 mm, averaging 9.7 ± 2.9 mm. The stone density ranged from 820-1411 HU, averaging 1000.8 ± 279.3 HU. According to the current study, treating renal stones with a single-use flexible ureteroscope is less complicated and more successful.

Key words. Kidney stone, flexible ureteroscope, intrarenal intervention.

Introduction.

Globally, renal stones are becoming an increasingly prevalent issue. They mainly affect people in the 20–40 age range. The goal of treating renal stones is to minimize morbidity while achieving the highest rate of stone-free status. It is desired for therapies to be as minimally intrusive as feasible. Renal stones of less than 2 cm could be approached using extracorporeal shockwave lithotripsy, retrograde intrarenal surgery, or percutaneous nephrolithotomy (PNL) [1].

Nevertheless, in this instance, a flexible ureteroscope was the best choice. Devices with one or several uses are available. (PolyscopeTM) was first introduced single use ureteroscope by Lumens in the year 2011, and it used reusable fiberoptic bundles that could be joined to flexible catheters that can be safely disposed. This was a significant advancement in the ureteroscope manufacturing industry [2]. The devices have evolved over the more than 25 years, with LithoVuetm™ being the approach that first accessed the upper ureter. The device's efficacy and safety were investigated and verified. Uscope UE3022 was just introduced as a new single-use digital device invented by PusenTM (Zhuhai et al., China). The Pusen™ gadget was created to get over the drawbacks of traditional ureteroscopes that were reusable. The aim of this research is to characterize the efficiency of a flexible ureteroscope that are of single use in relation to time of surgery, success rate to free stones, and possible drawbacks [3].

Materials and Methods.

From March 2022 to April 2023, the Basrah Urological Centre carried out this study and work [4]. After excluding patients with untreated urinary tract infections, excessive blood urea, and ureteral strictures, the study involved one hundred eight patients. Every patient was chosen if they were over 20. The surgeon performed operations on patients. A unique data collection tool was created to gather data on demographics and surgical assessments, including stone position and size, intervention time, fluoroscopy length, and residual stone. Problems with ureteroscopy were also mentioned. All patients underwent urine examinations, CBCs, spiral abdominal CT scans, and urine cultures. PusenTM fr. 7.5 we utilized a flexible ureteroscope with 10 fr: StorzTM Calculus III laser machine and ureteric access sheath. Informed consent was given to each patient and signed by them [5]. Every patient received general anesthesia. After that, a guidewire was used to implant the semirigid ureteroscope. After a week, the surgery was repeated if the lower ureter was not dilated effectively with the insertion of a JJ catheter—the eleven fr. Ureteral access sheaths were used while under fluoroscopic supervision. After surgery, every patient received a JJ stent. Research data were loaded into an SPSS spreadsheet for extracting relevant tables and analyzing them. Categorically sorted variables were displayed as percentages and frequencies, continuous variables were displayed as qualitative parameters. Student's t-test was employed to look at mean differences. Using chi-squared tests, associations between categorical variables were examined. A significance level of 0.05 was chosen [6,7].

Results.

Table 2 categorizes the 108 cases based on their location within the kidney and their size. The renal pelvis is the most common location, accounting for 41 cases (38.0%), followed by the upper ureter or pelvi-ureteric junction with 21 cases (19.4%). Cases are relatively differently distributed between those less than 10mm (46 cases, 42.5%) and those 10mm or larger (61 cases, 57.5%). Cases showed significant differences in their location from upper ureter up to the calyces (P values <0.05). This suggests that the proportion of cases in the upper ureter that are less than 10mm is statistically different from the proportion in other locations.

Surgery took an average of 68 minutes, with a wide range of 25 minutes. Fluoroscopy, an imaging technique used during surgery, lasted about 31 seconds on average, with a variability of 11.5 seconds. The success rate was very high, with 96.8%

Table 1. *Age and sex of patients.*

Age (years)	**Mean ± SD**	39.2 ± 10.9
	Range	24-66
Sex	**Male**	42 (39.8%)
	Female	65 (60.2%)

Among the one hundred and eight patients chosen for this study, a gender distribution of 39.8% male and 60.2% female was observed. Age ranged from 24-66 years with a mean of 39.2 and SD of 10.9.

Table 2. *Stone location according to size.*

Location	**<10 mm**	**>= 10 mm**	**Total**	**P value***
Pelvi-ureteric junction	9 (19.6%)	11 (18.0%)	21 (19.4%)	0.001
Renal pelvis	19 (41.3%)	22 (36.1%)	41 (38.0%)	
Upper calyx	5 (10.9%)	8 (13.1%)	13 (12.0%)	
Middle calyx	6 (13.0%)	5 (8.2%)	11 (10.2%)	
Lower calyx	7 (15.2%)	15 (24.6%)	22 (20.4%)	
Total	46 (100%)	61 (100%)	108 (100%)	

Chi-squared test

Table 3. *Density of stones and CT stone burden.*

Total stone burden (mm in CT scan)	Mean ± SD	9.7 ±2.9
	Range	6.9-14.5
Stone density (HU)	Mean ± SD	1000.8 ±279.3
	Range	820-1411

Stone burden ranged from 6.9-14.5 mm with a mean of 99.7 ±2.9 mm. Stone density on the other hand had a mean of 1000.8 ±279.3 HU with a range of 820-1411 HU (Table 3).

Table 4. *Time of surgery, time of fluoroscopy.*

Surgical time (minutes)	68.0 ±25.0
Fluoroscopy time (seconds)	31.5 ± 11.3

Table 5. *Complications and stone free rate.*

Complications	8 (8.2)
Stone free rate	96.8%

of patients achieving stone clearance. Complications occurred in 8 patients (8.2%). Overall, the surgery seems to have been effective with an apparently good success rate and modest complication rate. The long and variable surgical time suggests some procedural complexity [8,9].

The following is a list of various complications' characteristics and severity: sepsis occurred in three cases. Bleeding to the degree that it obscured the view happened in three other cases. An event of partial urethral injury was reported once. Fornix rupture that developed due to high intrarenal pressure added one complication.

Discussion.

Flexible ureteroscopy has been used extensively to manage stones located in the upper urinary tract because of its advantages, which include less blood loss, shorter hospital stays, and reduced invasiveness. This study had 108 patients; forty-two (39.8%) were men, sixty-five (60.2%) were women. A mean of 39.2 and a standard deviation of 10.9 years, the patient's age ranged from 24-66 years. The study's findings corroborated another study's finding that 70.4% of the study sample consisted of women [10].

The distribution of renal stones according to size and location is shown in Table (2). Of the twenty-one stones found in the upper ureter, nine (19.6%) were less than 10 mm, while eleven (18.0%) were greater than or equal to 10 mm. Twenty-two (36.1%) of the forty-one stones in the renal pelvis are equivalent to or greater than 10 mm, while nineteen (41.3%) were less than 10 mm. Thirteen stones total, five (10.9%) less than 10 mm and eight (13.1%) equal to or greater than 10 mm, make up the upper calyx stones. Of the eleven stones located in the middle calyx, six (13.0%) were equal to or larger than 10 mm, while five (8.2%) are less than 10 mm. fifteen (24.6%) of the twenty-two stones in the lower calyx were equal to or larger than 10 mm, whereas seven (15.2%) were smaller than 10 mm. The distribution of renal stone locations regarding size showed notable differences. The present study's findings align with another study that indicated that the renal pelvis contains 73.2% of all stones.

According to Table (3), the overall stone burden ranged from 6.9 to 14.5 mm, with an average of 9.7± 2.9 mm. The stone density ranged from 820 to 1411 HU, with an average of 1000.8 ± 279.3 HU. The findings of the current investigation included a study that reported a stone burden of 10 mm and a percentage of 51.5% [11].

Based on Table 4, the average surgery duration was 68 minutes, with a 25 minute standard deviation. With a standard deviation of 11.3 seconds, the average fluoroscopy time is 31.5 seconds. The percentage of people without stones is 96.8%. Eight (8.2%) patients had a problem from the total number of procedures. The type and severity of these problems include:

Sepsis which occurred in three cases. Bleeding to the degree that it obscured the view which happened in three other cases. An event of partial urethral injury that was reported once. Fornix rupture that developed due to high intrarenal pressure was another complication.

The current study's findings corroborated those of study, which shows that the reported stone-free percentage is 95.2%. A 52-minute surgery was the average duration. Among the complications include urosepsis 0% (0/684), moderate fever 0.7% (5/684), urinary perforation 0.87% (6/684), and persistent haematuria 0% (0/684) [12].

Conclusion.

Flexible URS appears effective for treating upper urinary tract stones with an apparently good stone-free rate (96.8%) and low complication rate (8.2%). Findings are consistent with other studies reporting similar success rates and complication profiles.

The most common location for stones was the kidney pelvis (38.0%), followed by the upper ureter or pelvi-uretric junction (19.4%).

Stone size distribution varies across locations, with the renal pelvis containing a higher proportion of larger stones (≥10mm) compared to other locations.

The average stone burden was 9.7 mm, and the average density was 1000.8 HU.

The average surgery duration was 68 minutes, and the mean fluoroscopy time was 31.5 seconds. These values are close to corresponding parameters reported in other studies.

The study findings are largely consistent with existing literature

on flexible URS for upper urinary tract stones. This strengthens the generalizability of the results and adds to the existing body of evidence supporting the use of this technique.

Limitations and Future Directions.

The study's relatively small sample size can impair the generalizability of the results. However further research with larger cohorts could be necessary to validate the conclusions and explore patient-specific factors influencing outcomes.

Overall, the study suggests that flexible URS is a safe and effective minimally invasive technique for treating upper urinary tract stones. The findings align with existing literature and provide valuable insights into stone distribution, procedural parameters, and outcomes.

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