

The Efficacy of Semi-Rigid Ureteroscopy in the Treatment of Lower Ureteric Stone in Al-Muthanna Province

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Annotation: Objective: The efficacy of semi-rigid ureteroscopy in the treatment of lower ureteric stone in Al-Muthanna province. Patients and methods: This study was conducted at Al-Hussein Teaching Hospital from 22 December 2021 to 10 April 2022. Twenty-seven patients (16 females, 11 males) aged between 11 and 65 years (mean 38 years, with lower ureter stones from 4 mm to 19 mm (mean 11.5 mm), underwent treatment for lower ureteral stones with semi-rigid ureteroscopy and were included in this study. Results: Success rate was 85%. There were no major perioperative complications; minor complications were encountered in a few patients and treated accordingly. Conclusion: S-URS is an efficient and safe treatment for lower ureteral stones, with an increased efficiency with smaller stones less than 1 cm in size. Morbidity, hospital stay, and complication rates are low, with a good stone-free rate.

Keywords: Ureteral Calculi; Ureteroscopy; Endoscopy, Urologic; Minimally Invasive Surgical Procedures; Treatment Outcome; Complications; Stone Size; Iraq.

Introduction

Ureter Stones are the leading cause of emergency department admissions, with a lifetime incidence of 12% in males and 6% in females [1],[2]. Approximately 70% of all patients who develop ureteral stones will develop a stone in the distal ureter.[3],[4] Recurrent stones are a global issue affecting all stone formers; nearly half will experience a recurrence within ten years of developing their first stone.[5] The risk of developing ureteral stones is based on both intrinsic factors (i.e., age, sex, genetic predisposition) and extrinsic factors (i.e., geographic location, climate, season, dietary habits, fluid intake, and occupation). [6]

The predominant types of stones worldwide are calcium oxalate (80% of all stones) and calcium phosphate/CaPh mixed; other major stone types are uric acid (9%), struvite (10%), and cystine (1%).[7] Symptomatic patients with ureteral stones typically present with sudden onset of severe unilaterally colicky flank pain, often radiating from the flank toward the groin and into the genitals over a period of hours and often accompanied by nausea, vomiting, and hematuria.[8] Since there are many other serious conditions capable of mimicking renal stones, prompt diagnosis of ureteral stones should be confirmed with a non-contrast CT scan as quickly as possible. Often an accompanying plain x-ray is taken to determine if the stone is i.e. radio-opaque and/or whether plain x-ray may be useful as an adjunctive imaging technique (e.g. monitoring spontaneous stone passage in patients expected to spontaneously pass their stones.) There are 5 anatomical sites throughout the ureter that can act as sites of obstruction for the passage of stones to the bladder (1) From the pelviureteric junction (PUJ) to where the ureter crosses over the bifurcation of the common iliac artery, and 3 separate sites in the distal ureter. Stones that measure less than 5mm in diameter are likely to pass spontaneously (90%). Medical expulsive therapy using α -blockers or calcium channel blockers (nifedipine) has shown variable efficacy, and there are differences in clinical practice regarding the routine use of these therapies to assist in expelling stones. [9]

The history of the ureteroscope (URS) traces back to as early as 1912 when a pediatric cystoscope was accidentally introduced into the renal pelvis of a child with a dilated ureter and subsequently reported in 1929 by Young and McKay. [10] A major advancement occurred in 1956 when Hopkins developed a rod lens cylinder system that allowed for smaller diameter scopes and improved light transmission, thus enhancing both access and image quality during endoscopy. [11] Initially, the acceleration of progress in ureteroscopy was restrained due to the slow integration of fiberoptic technology into medicine. [10] The first dedicated ureteroscope (12 F, 50 cm rigid instrument with separate optic and working channels) was developed by urologist Perez-Castro and Karl Storz in 1980. The device was used successfully for lithotripsy of a renal calculus during the In 1989, the introduction of the first semi-rigid ureteroscope revolutionized ureteroscopy as it easily displaced previously utilized rigid ureteroscopes by introducing the ability to deflect up to 2 inches from the vertical axis without distortion of the image thus significantly decreasing the rate of the instrument breaking. Since then there have been tremendous advances in technology, to the point where flexible and rigid ureteroscopes can be found all over the world. [11][12][13]

Ureteroscopy for the management of ureteral stones has become an increasingly accepted approach over the past 10 to 15 years, encouraged by the increased practicality, improved tolerability of patients, and the consistently high success rates when performed by experienced surgeons. With increasing surgical skills and advanced technical resources available, such as minimally invasive and highly effective intracorporeal lithotripsy devices, the indications for ureteroscopic management of ureteral stones have widened. Today, ureteroscopy can be used to treat not only lower ureteral calculi, but also stones in the mid and upper ureter. Unfortunately, even with advances in surgical skills and the availability of technologies to successfully perform ureteroscopy, successful outcomes of ureteroscopy for stone management are still highly dependent upon stone

factors including size, location, chemical composition, how closely the stone is adhered to the ureteral mucosa, and the degree of obstruction. [14][15]

Although laparoscopic ureterolithotomy and extracorporeal shockwave lithotripsy (ESWL) remain viable surgical alternatives for treating mid and distal ureteric stones, ureteroscopy has established itself as the preferred first-line surgical treatment option for many urologists with respect to total stone removal success, cost-effectiveness, and reduced ureteral trauma. With the arrival of small semi-rigid ureteroscopes and the introduction of the holmium: YAG laser into the urology armamentarium, ureteroscopy has become increasingly popular and accepted by urologists for the treatment of all ureteral stone locations. [16][17]

There have been numerous advancements made to ureteroscopy device design and ureteroscopy method that have contributed to the overall safety and effectiveness of this procedure while at the same time decreasing the frequency of serious complications associated with ureteroscopy. [18][19] Most recently, the rates of complications associated with ureteroscopy (e.g., ureteral perforation with subsequent stricture development) have been reported to be less than 5%. [16]

Patients and Methods

This study was done in Al-Hussein teaching hospital.

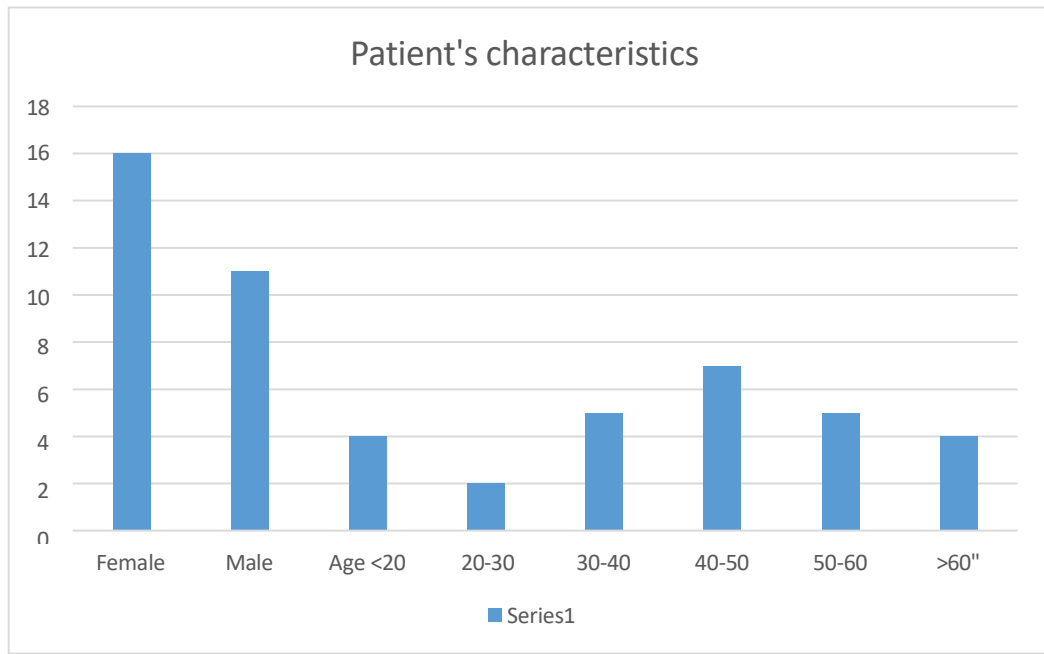
From the period of 22 December of 2021 to 10 April of 2022. A twenty-seven patients (16 females, 11 males) aged between 11-65 years (mean 38 years) underwent treatment for lower ureteral stones with semi-rigid ureteroscopy were included in this study.

As illustrated in table (1): -

Table 1. Patient's Characteristics.

Variable	No. Of patients	%
Number	27	
Female	16	59%
Male	11	40%
Age (year)		
<20	4	14.8%
20-30	2	7.4%
30-40	5	18.5%
40-50	7	25.9%
50-60	5	18.5%
>60	4	14.8%
Operation		

With double J	26	96.2%
Without double J	1	3.7%



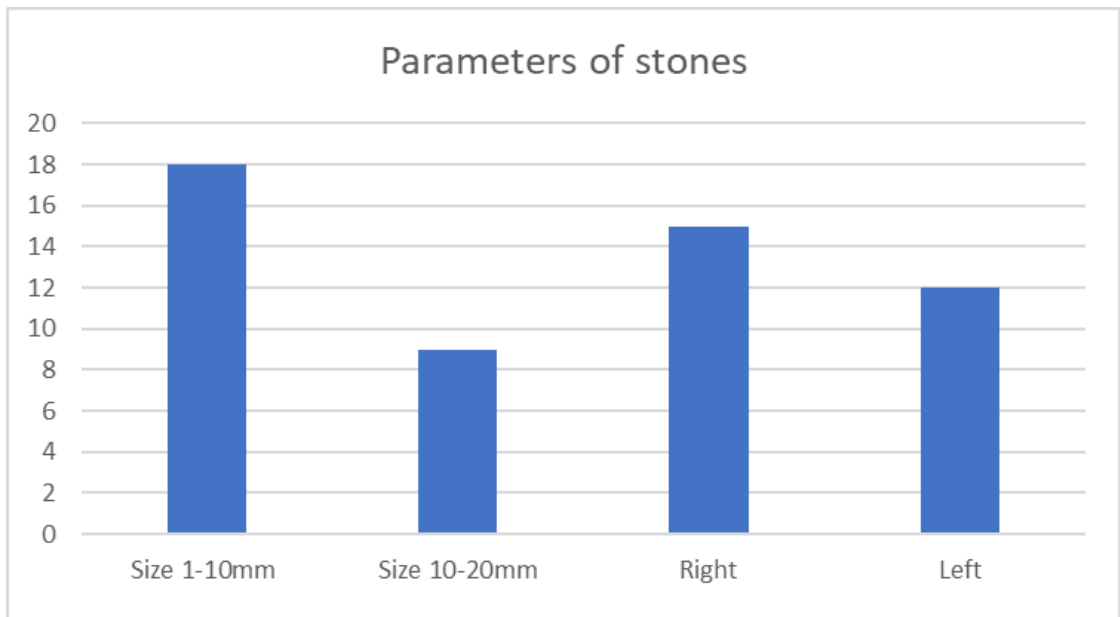
Results

Twenty-seven patients were enrolled in our study and their characteristics was shown previously in table (1).

They were treated by semi-rigid ureteroscopy. The parameters of treated stones in our patients were illustrated in table (2) below

Table 2. Parameters of treated stones

Variable	No. Of patients	%
Stone size 1-10 mm	18	66.6%
10-20 mm	9	33.3%
Laterality Rt	15	55.5%
Lt	12	44.4%

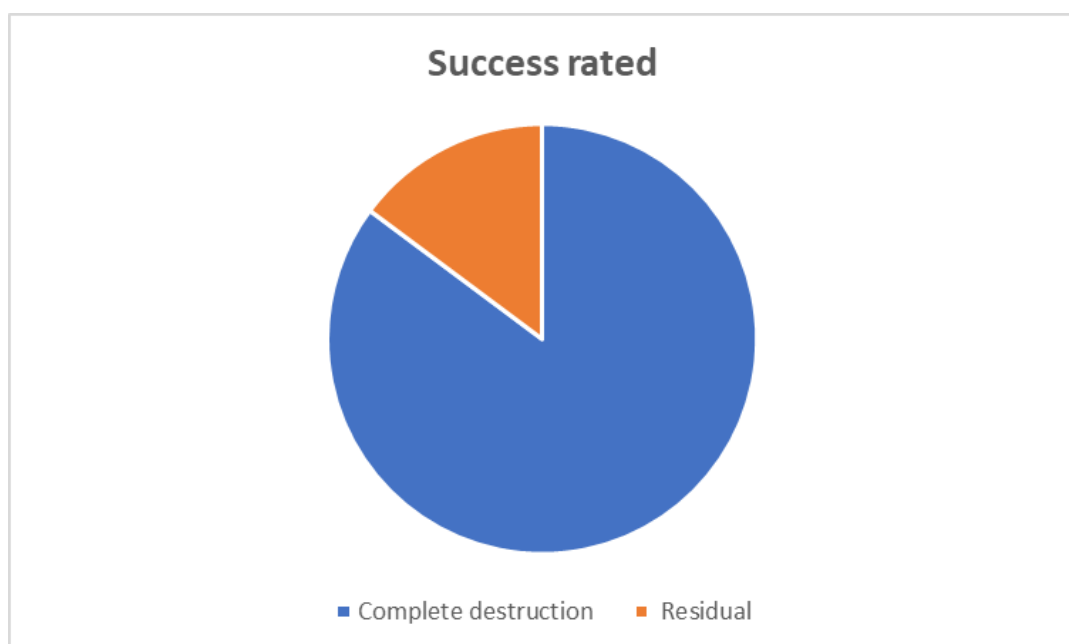


Primary success (stone free or insignificant residual fragments) was achievable in 23 patients (13 females, 10 male) 85% after a single ureteroscopic procedure at first post - operative day.

As illustrated in table (3)

Table 3. Success and Failure Rates.

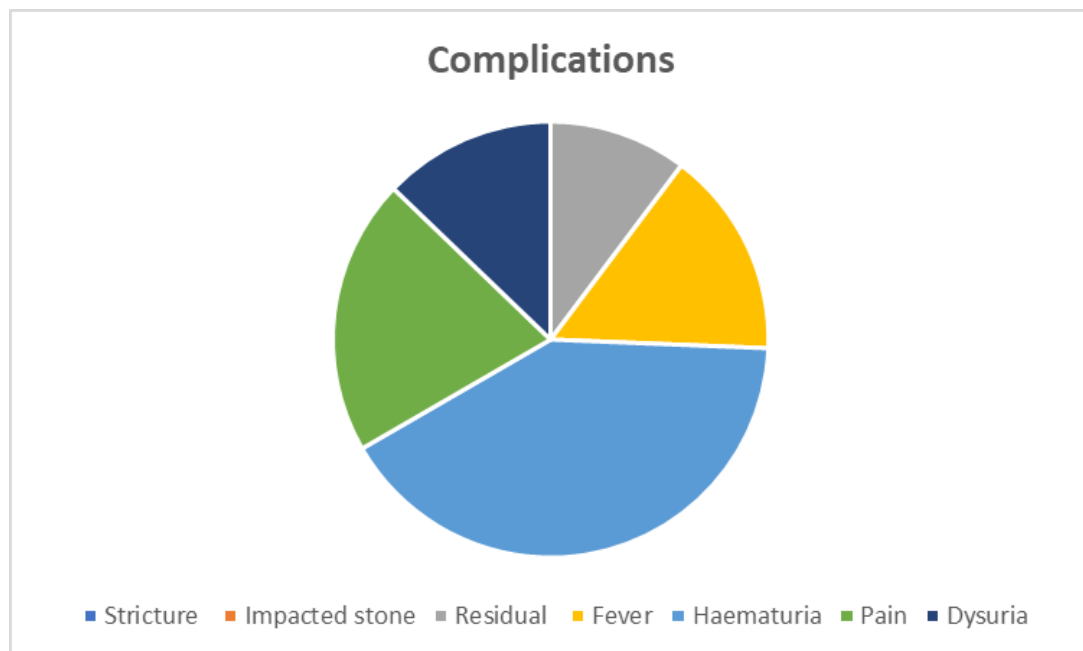
Variable	No of patients	%
Complete destruction	23	85.1%
Residual	4	14.8%



No major perioperative complications were occurred in our patients, but minor intra and postoperative had been encountered, as illustrated in table (4).

Table 4. Intra-Operation and Post-Operation Complications.

Variable	No. of patients	%
Intra- operative	0	0%
ureteric stricture	0	0%
impacted stone	0	0%
Avulsion residual	4	14.8%
Post- operation	6	22.2%
fever hematuria pain	16	59.2%
Dysuria	8	29.6%
	5	18.5%



A urologist faces a major challenge when deciding how to treat a ureteral stone - actively try to get rid of it or watch for the stone to pass on its own. [20][21] Normally a stone will pass on its own within two weeks, but a person may still have problems with renal colic or urinary tract infection during that time frame. [22] Other factors will also affect the urologist's decision to treat the stone. These factors include the size of the stone, its location, how obstructed the urinary tract is, the urinary tract anatomy, and the patient's wishes. Therefore, the urologist will need to schedule follow-up appointments for continued evaluation, including clinical assessment, laboratory testing, or imaging. [23]

Urological procedures will usually be done to treat urinary tract stones by the same parameters of stone size and location, and whether there are any signs or symptoms present that would indicate obstruction. Stones can lodge in three locations in the ureter - proximal, mid (over sacroiliac joint), or distal. The expected spontaneous passage rate for small ureteric stones (<5 mm) is about 70%,

and for stones >5 mm but <10 mm is about 50%. The use of α -blockers have been shown to increase this rate of passage by approximately 30%. [24]

For ureteric stones >10 mm, the stone cannot be treated with medications, and there is persistent pain that is not being addressed with intramuscular medications (e.g., diclofenac or pethidine) and/or there is renal obstruction, endoscopic surgical treatment (URS) of the stone should be performed. When this is not able to be performed right away, a ureteric stent or nephrostomy tube can be placed temporarily until the URS procedure can be scheduled. In cases of an obstructed kidney where there is also evidence of an infection, it is considered necessary to perform urgent decompression. Patients who have small (less than 10 mm) ureteric stones without any complications may receive α -blocker therapy along with adequate pain control, with an evaluation to occur at two weeks. Ureteric stones may also be addressed via lithotripsy (i.e., shock wave treatment) if located in the proximal or mid ureters and are less than 10 mm in size; however, stones that are located in the distal ureter and are of all sizes can be treated most effectively with ureteroscopic surgery (URS). [24]

Our institution has utilized URS as its first option for ureteral calculus treatment. The following report summarizes our experience during the periods covered by this study as it pertains to the management of urethral calculus management of 27 patients. Our analysis focused on two main categories of factors: characteristics of the stone (size, location, and laterality) and characteristics of the patient (name/age/gender).

The age distribution showed there was an increased proportion of young adults (ages of 20-60 years) comprising 70.3% of the total patients treated in this group. The next largest proportion were patients over age 60 (14.8%), with an equal number of patients being less than 20 years of age (14.8%). All three patient groups had a high success rate with very few complications experienced from their surgeries.

All patients were discharged with a Double J (DJ) ureteric stent placed at the time of ureteroscopy; this was done to prevent obstruction from reactive ureteral edema that may occur after the ureteroscopy/stone manipulation, promote ureteral healing as well as possibly decreasing the risk of future ureteral stricture formation. In the present series, we define success on day 1 after surgery as an 85% success rate for 23 of 27 patients (85%), which is consistent with success rates in similar studies conducted in Cairo, Egypt (Khaled Mursi, Mohammed S. Elsheemy, Hany A. Morsi, et al., 2013) of 95% for lower ureter, 77% for middle ureter, 85% for upper ureter, or 53% for renal pelvis.[26]

There were no complications (major complications) of the current series, such as bleeding requiring blood transfusions or hematuria or septic complications.

Post-operative complications:

Fever - Six patients developed low-grade fever.

Hematuria - In sixteen patients, hematuria was transient, self-limiting and without the need for Interventions to resolve.

Dysuria & Pain: Five and eight patients had mild dysuria and pain respectively. They were treated successfully with Medicine.

Each of the complications were treated conservatively. This experience is consistent with the results of a study by M. El-Qadhi (2014) in Cairo, Egypt, that reported that complications (whether intraoperative, early post-operative, or late post-operative) were generally minor and did not require any intervention. Early post-operative fever, renal colic, and post-operative persistent

hematuria were generally self-limited and did not require an intervention for resolution within a few days with conservative therapy.[27]

Ureteral strictures have not been reported for any of the patients included in our study, likely due to the relatively short follow-up period. Ureteral strictures have been reported to occur in less than 0.4% of patients with ureteral strictures based upon data from current series.[28][29][30][31] Ureteral strictures are primarily caused by instrumentation injury during ureteroscopy, particularly using large diameter ureteroscopes and with impacted stones.

Ureteral avulsion, the most undesirable outcome of ureteroscopy, is defined as a circumferential tear resulting in a complete removal of the ureter. No patient in our series experienced an ureteral avulsion. Typical causes of ureteral avulsion include attempting to remove a stone that is too large to fit through the ureter or attempting to remove a stone from a basket when it is too large to pass the stone through the ureter.[32]

Conclusion

According to our research results we stated:

Semi-rigid ureteroscopy provides effective and safe therapy for ureteral calculi with minimal morbidity, hospitalization and complications, whereas, there is a good chance of achieving a stone-free status. There was also an extremely low failure rate associated with lower ureteral calculus, as well as, a stone size of < 10mm versus stone sizes > 15mm which had an increased incidence of retention.

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