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Abdelhamid Khattab
Urology department, Damanhur National Medical Institute, Damanhur, Al-Beheira governorate, Egypt

Alaa Ali Mousa
Urology department, Damanhur National Medical Institute, Damanhur, Al-Beheira governorate, Egypt, dralaamousa2020@gmail.com

Fayez el askari
Urology department, Damanhur National Medical Institute, Damanhur, Al-Beheira governorate, Egypt

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ORIGINAL STUDY

Ureteric stenting after ureteroscopy is it a must?

Abdelhamid Khattab, Alaa A. Mousa*, Fayez El askari

Department of Urology, Damanhur National Medical Institute, Damanhur, Al-Beheira governorate, Egypt

Abstract

Background: **Ureteroscopy (URS) is a common treatment for renal and ureteral stones. This procedure may have caused some ureteral stress. Ureteral trauma can result in oedema, ureteral obstruction, and flank pain. You may need to be admitted to the hospital or have a secondary ureteral stent inserted. It is not quite apparent if urologists should routinely implant temporary ureteral stents as a preventative measure to avert these issues.**

Objective: **Ureteric stent uses after URS (as an overnight ureteric catheter attached to the urethral catheter) versus nonstenting ureters; to evaluate the morbidity of ureteral stenting following simple URS for lower ureteric stones.**

Patients and methods: **A randomized controlled trial included 60 patients with lower ureteric calculi who were treated by URS during January 2021−January 2022 at Damanhur National Medical Institute.**

Results: **Regarding flank discomfort, temperature, frequency, and urgency, there was no difference between the groups under investigation ($P > 0.05$). While in group I, postoperative dysuria was observed in seven (23.3%) patients, it occurred in group I in 20 patients (66.7%). Additionally, there was a significant difference ($P < 0.001$) in the prevalence of postoperative hematuria between group Λ, which included 16 (53.3%) patients, and group ΛI, which included 23 (76.7%) patients. Hematuria was more common, severe, and long-lasting in the stented group compared with the nonstented group, with a significant difference ($P = 0.039$).**

Conclusion: **Individuals without stents experience much fewer irritative urine symptoms, spend less money, have shorter hospital stays, and are not at risk for more complications.**

Keywords: Dysuria, Hematuria, Ureteric stent, Ureteroscopy, Urgency, Urolithiasis

1. Introduction

Urolithiasis, one of the most prevalent urinary tract diseases, affects men three times more than women and can affect up to 15% of persons over their lifetime [1,2]. The global prevalence of stone disease is currently believed to be between 5 and 10%, with a significant increase in recent years [3]. It is probable that as people's quality of life has improved, its prevalence has risen. The distal ureter is home to roughly one-third of all urinary tract stones [4].

Ureteric stones are one type of urinary stone that must be discovered and treated right away because, if left untreated, they can modify back pressure and cause obstructive uropathy [3]. Colicky pain of various intensities first arises in association with a ureteric stone. This is one of the most common issues that send patients to the emergency room [5].

While various factors can contribute to spontaneous ureteric stone evacuation, the position and size of the stone are the most relevant predictors of stone passage. If ureteral stones cannot pass on their own, intervention is required [6]. Over the last decade, there has been a major shift in the surgical management of ureteric stones because of advances in technologies such as reduced caliber semi-rigid and flexible ureteroscopes and laser-assisted intracorporeal lithotripsy. As an outpatient treatment for treating stones in all ureteric locations, ureteroscopy (URS) has become safer, less traumatic, and more effective because of these developments [7,8].

Ureteric stents are usually placed in the ureter if URS is hampered by ureteral damage, the most severe of which can extend through the ureteral wall. URS is often deemed complex when individuals come with acute renal failure and a

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* Corresponding author at: Damanhur, Al-Beheira Governorate, 24890 Egypt.
E-mail address: alaamousa2020@gmail.com (A.A. Mousa).

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urinary tract infection. However, opinions on what constitutes a ‘complicated’ URS vary [9,10].

Ureteral stents are commonly inserted after URS and are advised for acute oedema, infection, renal failure, or ureteral injury. According to one stent implantation study, 80% of patients received stent placement after renal stone therapy and 60% received stent installation after ureteral stone treatment [11]. Postoperative ureteral stenting is expected to help prevent renal obstruction caused by tiny stone pieces or postoperative ureteral oedema. It is also supposed to reduce the effects of instrumentation and the aftermath of subsequent oedema, as well as to stop the formation of ureteral strictures [12]. However, using a stent is not without cost. The most common cause of postoperative morbidity is ureteral stent side effects, which include flank discomfort, pelvic pain, hematuria, dysuria, and frequent and urgent urination [13]. These side effects may necessitate trips to the ER and the doctor's office, but skipping the stent may necessitate extra visits and interventions [14]. The purpose of this study was to compare the morbidity of ureteral stenting following simple URS for lower ureteric stones to that of using a ureteric stent after URS (in the form of an overnight ureteric catheter coupled to a urethral catheter) vs. nonstenting ureters.

2. Patients and methods

Total 60 patients with lower ureteric calculi treated by URS at Damanhur National Medical Institute between January 2021 and January 2022 were enrolled in a randomized controlled experiment. Before the procedure, all the patients under study were split into two groups, which were as follows:

Group I (nonstented group): 30 patients had not a ureteric stent postoperatively.

Group II (stented group): After surgery, 30 patients received a ureteral catheter connected to a urethral catheter for a whole day.

Ethical approval and consent to participate.

The patient was given a thorough explanation of the study's goals before being asked to sign an informed consent form. The Helsinki Declaration and the Quality and Improvement System of the Egyptian Ministry of Health served as the guidelines for preparing the consent form.

2.1. The inclusion criteria

(a) A lower ureteric stone with normal kidney function is located beneath the sacroiliac joint.
(b) Ultrasonography shows the stone's longitudinal diameter on KUB is less than 15 mm.
(c) In the intravenous urography (IVU), calyceal blunting with light pelvic dilatation indicated mild hydronephrosis, while calyceal clubbing with significant pelvic dilatation indicated moderate hydronephrosis [15].

2.2. The exclusion criteria

(a) Significant lower ureteric stones and impaired renal function.
(b) The stone on KUB has a longitudinal diameter of more than 15 mm, as verified by ultrasound.
(c) Significant hydronephrosis, as shown by pelvic dilatation, enlarged kidney, and calyceal ballooning [15].
(d) Pathology is related to the same renal unit or bladder.
(e) Patients had intraoperative complications during URS, such as ureteral damage or erroneous passage.

2.3. Preoperative evaluation

(a) Clinical assessments include a complete history and examination. Urinalysis tests are used in laboratory examinations to look for urinary tract infections; if they are discovered, urine culture and sensitivity tests are done.
(b) A complete blood count, blood urea, serum creatinine, coagulation profile, liver function test, and fasting blood sugar were all used as part of the preoperative renal function screening. Radiological exams include IVU, abdominal ultrasonography, and simple urinary tract radiography (KUB).

2.4. Ureteroscopy procedure

Each patient underwent a URS while under spinal anesthesia. Patients were given intravenous third generation cephalosporins 30 min before surgery. A 0.038-inch guide wire was advanced to the renal pelvis under fluoroscopic guidance. A balloon dilator was used to dilate each patient's intramural ureter for 5 min. An 8.9 French rigid URS with a 5 French working channel was used to locate the stone. The stone was then broken up with a pneumatic lithotripter or removed with stone forceps or a basket in toto. Large bits of stone were retrieved with a basket or stone forceps. A URS was performed at the end of the therapy to ensure that there were no problems or remaining calculi.

Patients in group I did not get stent implants. Patients in group II used a ureteric stent (6 French ureteric catheter) coupled to a 14 Fr or 16 Fr Foley's catheter for urine collection into a bag to undergo a 24 h closed drainage system. To calculate the operative time, the URS's admission into the urinary tract and the endoscope's eventual removal were timed. Fluoroquinolone was administered orally for 5 days following URS, followed by a maximum of 24 h of intravenous antibiotic treatment. Every patient's KUB radiography film was completed the following day.

2.5. Early postoperative protocol

For 1 week, the following symptoms were monitored: fever, hematuria, flank discomfort, and bladder irritation (dysuria, frequency, and urgency). Parenteral or oral analgesics were used in the recovery room and for a week following hospital discharge to address postoperative discomfort.

2.6. Late follow-up

Patients underwent a reevaluation three months after their URS, which included urinalysis (with urine culture and sensitivity if a UTI was discovered), blood urea, serum creatinine, abdominal ultrasonography, and intravenous urography. At the 6-month follow-up, all patients had the same evaluation; the only change was that an IVU was only given to those with significant pelvicalyceal dilatation on abdominal ultrasonography. If the IVU indicated insufficient or no kidney excretion, renal isotope scanning was examined.

2.7. Outcome of the study

Preoperative back pressure, postoperative problems, operation duration, and hospital stay were among the current study's outcomes.

2.8. Sample size estimation

To identify a difference in pain scores between stented patients and control groups, a sample size of 11.0 was computed using PASS 11.0, based on the previous randomized controlled trial by Savić *et al.* [16], with a standard deviation of 5 (standard value of 1.96). The findings revealed that routine implantation of a ureteral stent following URS is not required and may be associated with stent complications. Simple URS can be treated safely without the use of a stent. Using the 80% research power test, a sample size of 60 patients would be required (30 without a ureteric stent and another 30 with a ureteral catheter connected to a urethral catheter postoperatively).

2.9. Statistical analysis

The findings were tabulated and statistically analyzed on a personal computer using Microsoft Excel 2019 and SPSS v. 25 (SPSS Inc., Chicago, IL, USA). The descriptive statistics included the mean, median, and SD. The Kolmogorov–Smirnov test findings showed that the variables had a normal distribution. The analytical statistics used to analyze hazards included the odds ratio (OR), independent t-test (t), Mann–Whitney U test (U), Fisher exact test (FE), and χ^2 test. P values of less than 0.05 were considered statistically significant.

3. Results

Figure 1 displays a flowchart for the study population. From January 2021 to January 2022, 74 patients hospitalized at Damanhur National Medical Institute with lower ureteric calculi underwent URS. Five patients refused to participate in the research, and nine others did not meet the inclusion criteria. This left fourteen people out. Sixty patients were allocated, participated in the trial, and provided their consent. The study's patients were divided into two groups: group I, which included 30 patients who did not have a ureteric stent after surgery, and group II, which included the remaining 30 patients who had a ureteral catheter attached to a urethral catheter after surgery for 24 h. Thirty patients (group I) did not have a ureteral stent after surgery out of the 60 patients had rigid URS for lower ureteral calculi. A total of 30 patients had ureteral catheter implantation for 24 h postoperatively, comprising 23 (76.7%) males, seven (23.3%) females, and a mean age of 37.9 ± 7.43 years (group I). The mean age of the 24 (80%) men and six (20%) women was 39.9 ± 9.11 years (Table 1).

In addition, the predominant complaint of our patients was actual pain in 44 (73.3%) patients, followed by irritative lower urinary tract symptoms (LUTS) in 36 (60%) patients and hematuria in 13 (21.7%) patients. Furthermore, in group I (the nonstented group), stone sizes ranged from 4 to 13 mm, with an average diameter of 8 mm. Stones of group II (stented group) ranged in size from 4 to 14 mm, with an average diameter of 9 mm (Table 2). Moreover, the preoperative degree of back pressure was mild in 23 (76.7%) patients and severe in seven (23.3%) patients in group I. In group II, 21 (70%) patients had mild degrees, while nine (30%) individuals had intermediate degrees (Table 3).

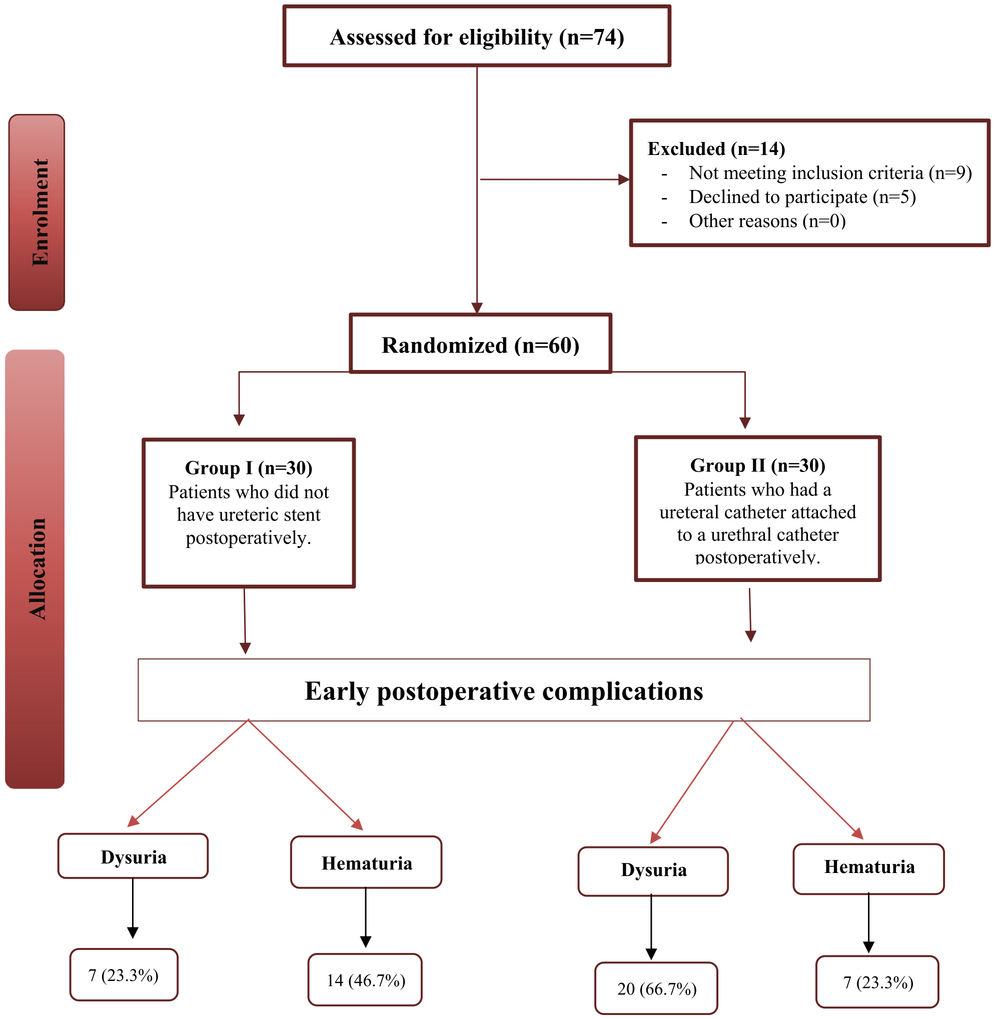

Fig. 1. Flowchart of the studied groups.

Table 1. The demographic distribution of the studied patients.

	Group I ($n = 30$) N (%)	Group II ($n = 30$) N (%)	Sig test	
			X^2	*P value*
Gender				
Male	23 (76.7)	24 (80)	0.854	0.354
Female	7 (23.3)	6 (20)		
Age (years)				
Mean	37.9 ± 7.43	39.9 ± 9.11	t = 1.31	0.072
Range	23–55	23–60		

Independent *t*-test (t), Chi-square test (X^2).

Table 2. Stone diameter among the studied groups.

Stone size	Group I ($n = 30$)	Group II ($n = 30$)	Sig test	
			t	*P value*
Mean ± SD	8.2 ± 2.2	8.7 ± 2.6	0.813	0.420
Range	4.0–13.0	4.0–14.0		

Independent *t*-test (t).

Table 3. Preoperative back pressure among the studied patients.

Degree of backpressure	Group I ($n = 30$)	Group II ($n = 30$)	Total	X^2	*P value*
Mild N (%)	23 (76.7%)	21 (70%)	44 (73.3%)	2.67	0.059
Moderate N (%)	7 (23.3%)	9 (30%)	16 (26.7%)		

Chi-square test (X^2).

There was no discernible difference between the study groups in terms of flank discomfort, temperature, frequency, or urgency ($P > 0.05$). Postoperative dysuria was seen in seven (23.3%) patients in group I, but only in 20 (66.7%) patients. Furthermore, there was a significant difference ($P < 0.001$) in the prevalence of postoperative hematuria between group I, which included 16 (53.3%) patients, and group II, which included 23 (76.7%) patients. There was a statistically significant difference in the frequency, intensity, and duration of hematuria between the stented and nonstented groups ($P = 0.039$), (Table 4).

Furthermore, the average operating time for group I, which spanned from 20 to 36 min, was

Table 4. Early postoperative complications among the studied groups.

	Group I ($n = 30$) N (%)	Group II ($n = 30$) N (%)	Total N (%)	X^2	P-value
Flank pain	12 (40)	11 (36.7)	23 (38.3)	0.071	0.791
Dysuria	7 (23.3)	20 (66.7)	21 (45)	13.455	**0.001**[a]
Fever	3 (10)	4 (13.3)	7 (11.7)	FE = 0.162	0.688
Hematuria	16 (53.3)	23 (76.7)	39 (65)	6.506	**0.039**[a]
Frequency	3 (10)	9 (30)	12 (20)	FE = 3.750	0.053
Urgency	3 (10)	5 (16.7)	8 (13.3)	FE = 0.577	0.448

Chi-square test (X^2), Fisher exact test (FE).
[a] Significant.

29.3 min (SD = 3.9), whereas group I, which ranged from 25 to 42 min, was 34.1 min (SD = 4.5). The two groups showed a statistically significant difference ($P < 0.001$). Furthermore, the average length of hospital stay for group Λ was 24 h, with a range of 12–30 h, while for group ΛI it was 38 h, with a range of 24–48 h. The difference between the two groups was statistically significant ($P < 0.001$), (Table 5).

In both study groups, there was a significant link between stone size and degree of backpressure ($P = 0.041$, 0.34, respectively); moderate patients had higher levels of backpressure than mild patients (Table 6). There was a significant association ($P = 0.001$) between the two study groups in terms of backpressure and flank pain. Hematuria in this case was significantly linked with the group I's amount of backpressure ($P = 0.001$), (Table 7).

Table 5. Hospital stay among the studied groups.

	Group I ($n = 30$)	Group II ($n = 30$)	t	P-value
Operative time/min				
Mean ± SD	29.3 ± 3.9	34.1 ± 4.5	6.951	**<0.001**[a]
Range	20–36	25–42		
Hospital stay				
Mean ± SD	23.600 ± 6.484	37.967 ± 7.950	7.670	**<0.001**[a]
Range	12.0–30.0	24.0–48.0		

Independent t-test (t).
[a] Significant.

4. Discussion

Over time, ureterotomy has emerged as an essential diagnostic and therapy option for ureter and intrarenal collecting system abnormalities [17]. The primary cause of postURS morbidity is the use of ureteric stents, and technological advancements such as smaller URS, holmium-YAG lasers, and softer stone baskets have made the procedure more painful. Furthermore, removing stents necessitates a second cystoscopy, raising the expense of patient care unless a pull string is employed [18]. Many urologists regard ureteral stents to be the most valuable instrument in their arsenal [19]. Placing a ureteral stent during a URS is expected to assist tiny pieces moving through more readily and lower the risk of oedema-related pain after surgery [20]. Nonetheless, some data suggests that stent

Table 6. Stone size in relation to degree of backpressure among the studied groups.

Stone size	Group I (n = 30)			Group II (n = 30)		
	Mild	Moderate	^{U}P-value	Mild	Moderate	P-value
Mean ± SD	6.64 ± 2.43	8.45 ± 2.17	**0.041***	8.93 ± 2.49	6.83 ± 2.00	**0.034**[a]

Mann-Whitney U test (U).
[a] Significant.

Table 7. Early postoperative complications in relation to degree of backpressure among the studied groups.

Complications	Group I ($n = 30$)				Group II ($n = 30$)			
	Mild $n = 27$	Moderate $n = 7$	^{FE}P-value	OR (95%CI)	Mild $n = 21$	Moderate $n = 9$	^{FE}P-value	OR (95%CI)
Flank pain	5 (18.5%)	7 (100%)	**0.001**[a]	2.4 (1.22–4.68)	2 (9.5%)	9 (100%)	**0.001**[a]	5.5 (1.6–19.2)
Dysuria	3 (11.1%)	3 (42.9%)	0.084	0.20 (0.029–1.37)	15 (71.4%)	6 (66.7%)	0.794	1.25 (0.23–6.7)
Fever	2 (7.4%)	1 (14.3%)	0.066	0.57 (0.04–7.43)	2 (9.5%)	2 (22.2%)	0.348	0.36 (0.04–3.1)
Hematuria	14 (51.9%)	1 (14.3%)	**0.031**[a]	9.33 (0.95–90.4)	17 (81%)	7 (77.8%)	0.842	1.2 (0.17–8.2)
Frequency	1 (3.7%)	2 (28.6%)	0.660	0.11 (0.09–0.85)	7 (33.3%)	2 (22.2%)	0.543	1.7 (0.28–10.7)
Urgency	2 (7.9%)	1 (14.3%)	0.671	1.16 (0.51–2.66)	3 (14.3%)	2 (22.2%)	0.593	0.58 (0.08–4.3)

Odds ratio (OR), Confidence Interval (CI), Fisher exact test (FE).
[a] Significant.

implantation can cause considerable side effects that remain until the stent is removed [21]. This study aimed to compare the outcomes of URS and non-stenting ureters and assess the morbidity of ureteral stenting after uncomplicated URS for lower ureteric stones.

In our study, 11 out of 30 (36.7%) stented patients required less analgesics in the recovery room than 12 out of 30 (40%) nonstented patients. However, this difference is not statistically significant since the nonstented group's symptoms of flank pain are transient and easily treated with analgesics. However, whether a stent was present had no significant effect on postoperative pain that required parenteral or oral analgesics. According to our findings, Netto *et al.*'s study [22] assessed the amount and duration of parenteral or oral analgesics needed to treat flank pain after surgery. The trial results show that the presence or absence of a stent had no significant effect on the delivery of analgesics. Furthermore, Jeong *et al.* [23] discovered that, while there was no discernible difference in postoperative pain between the stented and non-stented groups, patients in the stented group had their stents removed to relieve flank discomfort. Furthermore, Ibrahim *et al.* [7] found no statistically significant difference in the severity of flank discomfort between the stented and nonstented groups. Thus, the number of analgesics needed in the recovery room remained constant; however, throughout the two weeks that the stent was in the ureter, stented patients took more analgesics after being discharged from the hospital.

The percentage of patients in the nonstented group (seven out of 30 patients, or 23.3%) and the stented group (20 out of 30 patients, or 66.7%) who experienced postoperative dysuria differed considerably. Denstedt *et al.* [24] found that the stented group had significantly more symptoms of irritative voiding than the nonstented group. Furthermore, Ibrahim *et al.* showed that the non-stented group had much less dysuria than the stented group [7]. In research by Falahatkar *et al.* [21], dysuria was observed in 24 out of 28 (86%) patients and 13 out of 28 (46%) patients in a group with stents and a nonstent, respectively. The group with stents had a considerably greater rate of dysuria. Furthermore, Nabi *et al.* [25] reported stenting results in the management of patients following a simple URS, and it indicated that patients who had a stent inserted after URS had a significantly higher incidence of LUTS.

There was no statistically significant difference between the two groups, as postoperative lower urinary tract problems were reported in three out of 30 (10%) patients in the nonstented group and nine out of 30 (30%) patients in the stented group in our study. Compared with the nonstented group, the stented group had a higher rate of LUTS, such as urine frequency or urgency, at various follow-up intervals, according to numerous studies by Jeong *et al.* [23], Denstedt *et al.* [24], and Srivastava *et al.* [26].

Postoperative hematuria was discovered in 16 patients (53.3%) in group I of our investigation, and in 23 patients (76.7%) in group II. The frequency, severity, and duration of hematuria differed significantly between the stented and non-stented groups. Most of the studies found a statistically significant difference in the incidence of postoperative hematuria, despite the fact that their detection abilities differed. Jeong *et al.* [23] discovered that the stented group had a higher risk of hematuria than the non-stented group. Furthermore, Falahatkar *et al.* [21] evaluated the difference in the incidence of postoperative hematuria between the stented and non-stented groups. They discovered that Hematuria was observed in 7 out of 8 patients (25%) in the stented group and in 3 out of 28 patients (11%) in the unstented group. According to statistics, the difference is small. The increased incidence of hematuria in our study compared with Falahatkar and colleagues could be attributed to the fact that we employed a stiffer 6 Fr ureteral catheter via cystoscopy after balloon dilatation than they did through the ureteroscope [21].

During our trial, each patient received 5 min of standard intramural ureteral dilation using balloon dilators. During the long-term follow-up period, our patients showed no signs of ureteral stricture. Furthermore, we found no difference in the rate of ureteric stricture between the groups that received stents and those that did not. In response to this worry, 88% of patients had their distal ureters balloon-dilated, according to Hosking *et al.* [27]. In 63% of the patients, intravenous urography or ultrasonography was performed at a later stage. No evidence of ureteral strictures was found.

Furthermore, Srivastava *et al.* [26] discovered that 83.3% of patients with postoperative imaging did not have any symptoms of ureteral stricture at the 3-month visit (80.8% in the stent group and 86.4% in the non-stent group). Nabi *et al.* [25] conducted a meta-analysis of nine randomized, controlled studies of stenting following URS, which supported this conclusion. Participants who had a stent placed during URS had a significantly higher incidence of LUTS, with no effect on the rate of stone-free transit, urinary tract infection, analgesic required, or long-term development of ureteric strictures.

In our study, the mean operating time varied significantly: 29.3 min in the nonstented group, with a range of 20−36 min (SD = 3.9), and 34.1 min in the

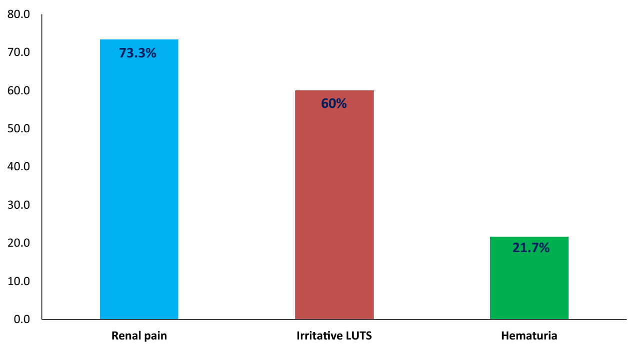

Fig. 2. Preoperative clinical presentation.

stented group, with a range of 25–42 min (SD = 4.5). Byrne *et al.* [28] found that the stenting group had a mean operating time of 55 min ($P = 0.013$), which was substantially longer than the nonstenting group's 43 min. Furthermore, despite the minor difference, Srivastava *et al.* [26] reported that the nonstented group had a significantly shorter operating room stay (32.1 vs. 37.8 min in the nonstented and stented groups, respectively). Ibrahim *et al.* [7] found no difference in primary operation time (34 min) between the nonstented and stented groups (36 min). Furthermore, Falahatkar *et al.* [21] found no statistical difference in the mean operation time between stented and without stented groups (24.2 min and 22.5 min, respectively, for patients with and without stents).

The average length of hospital stays in group I was 12–30 h, while in group II it was 24–48 h. The two groups differ statistically significantly. Grossi *et al.* [18] and Damiano *et al.* [29] found that patients with stents have longer hospital stays than those without. Furthermore, Falahatkar and colleagues [21] found that the average length of hospital stay was 2.14 days for the group with stents and 1.25 days for the group without. The group that underwent stenting had to stay in the hospital for much longer.

4.1. Conclusion

Individuals without stents have fewer irritative urinary symptoms, spend less money, stay in the hospital for shorter periods, and are less likely to develop problems. We also discovered that the safest method for removing distal ureteral calculi is to do a basic URS without stent implantation following treatment. Routine ureteral stenting is thus unnecessary for lower ureteric calculi following uncomplicated URS Fig. 2.

Ethical consideration

A consent form was obtained from all patients after explain the aim of the study. They signed an informed consent form after receiving approval from the local ethics commission. Every procedure was conducted by the 1964 Declaration of Helsinki and its subsequent amendments.

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Authors contribution

A.K. and A.A.M. prepared the conceptualization; A.K., A.A.M., and F.E. prepared data curation; A.A.M., and F.E. conducted formal analysis; A.K., A.A.M., and F.E. investigated and applied the treatment in the field experiments; A.K., A.A.M., and F.E. wrote the methodology; A.A.M., and F.E. searching the sources; A.K., A.A.M., and F.E. working on the software; A.K. and A.A.M. wrote the primary original draft, A.K., A.A.M., and F.E. reviewed and edited. All authors have read and agreed to the published version of the manuscript.

Conflicts of interest

There are no conflicts of interest.

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