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Early Versus Delayed Ureteroscopic Management after Acute Ureteral Obstruction: A Reteoscpective Comparative Analysis

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Abstract **Original Research Article**

Background: Ureteric obstruction by stones is a frequently encountered urologic emergency that requires appropriate rapid operative relief to prevent subsequent infection and/or renal parenchymal damage. Classically, this is usually done by double J catheter or nephrostomy tube insertion, and later on delayed ureteroscopy for definitive stone management. Modern urologic instruments and advances enabled for immediate early ureteroscopy to address such stones after their presentation, which offer less cost and morbidity and omits the need for a second definitive procedure in most cases. Still, the exact timing of definitive ureteroscopy for acutely obstructing ureteric stones is debatable among urologists. Proponents of early ureteroscopy support the advantage of reduced hospitalization and cost, since the stone is mostly managed in one early operation after presentation, while those supporting delayed definitive ureteroscopy after initial drainage, do so as it offers less intraoperative risks. Thus, our study aimed to compare the outcomes of early versus delayed ureteroscopy to better address which is of choice in managing acute ureteric stone obstruction. ***Objective*:** Perioperative outcomes and complications will be compared between early and delayed ureteroscopic management of acute ureteral obstruction. ***Methods***: This is a retrospective study done at Prince Hussein Urology Center / Royal Medical Services, Amman – Jordan, in the period of January 2022 to September 2025. Data were collected using the HAKEEM electronic medical recording system. Patients were divided into two groups, early group (≤72 hours) and delayed (4–6 weeks) ureteroscopy. Perioperative data included demographic variables, stone features, operative time, hospital stay, stone free rate (SFR) and post operative complications. Statistical analysis used SPSS version 26, with significance set at $p < 0.05$. ***Results***: A total of 180 patients were included, equally divided between the two groups. Baseline demographics and stone features were comparable between the two groups ($p > 0.05$). Mean operative time and hospital stay were significantly shorter in the early group($p<0.05$). Stone free rate was similar between both groups ($p>0.05$). There was no significant difference in complication or reintervention rate($p>0.05$). Multivariable analysis showed that timing of ureteroscopy was not an independent predictor of stone free rate (OR=1.45,95% CI 0.32-6.55, p=0.63). ***Conclusion***: Early ureteroscopic management of acute ureteral obstruction is considered safe and effective with shorter operative time and hospitalization and no significant increase in postoperative complication rate.

Keywords: Ureteroscopy, Acute Ureteral Obstruction, Early Intervention, Delayed Management, Retrospective Study.

INTRODUCTION

Acute ureteral obstruction by stones is a widely encountered urologic emergency worldwide, with subsequent loin pain, hydronephrosis, and possibly impaired renal function [1]. Management focuses on decompression to prevent subsequent infection and or renal damage. This is usually done via retrograde double J catheter or antegrade nephrostomy insertion, followed by ureteroscopic definitive management for most patients once the acute condition resolves [2]. But in modern endourologic practice, direct early ureteroscopy after the presentation of such condition is commonly done, offering immediate stone clearance with no treatment delay [3]. Advantages of such practice include: reduced hospital stays and cost, omitting the need for second procedure in most patients [4]. Still, it carries some disadvantages as well, such as: technical difficulty

in a non-instrumented inflamed ureter, possible iatrogenic ureteric injury and possibly a higher postoperative complication rate [5].

Multiple studies included this topic and yielded conflicting results; part of these conflicting results was due to conflicting definition of "early "ureteroscopy and variability in patient selection [6].

In Our institute, Royal Medical Services, and actually in Jordan, such data comparing between early and delayed intervention are limited.

Thus, this study was carried on to compare early and delayed ureteroscopic approaches in the management of acute ureteral obstruction.

Materials and Methods

Our study is a retrospective one done at Prince Hussein Urology Center, Royal Medical Services, Amman – Jordan, in the period of January 2022 to September 2025. The study gained acceptance of the ethical committee of the Royal Medical Services.

Data were obtained from the HAKEEM electronic medical record system. A total of 180 patients were included and divided equally into two groups: Group 1 (Early group, n = 90), which included patients treated with ureteroscopy within 72 hours from their presentation, and Group 2 (Delayed group, n=90), which included patients treated with ureteroscopy 4 – 6 weeks following initial decompression after presentation.

All patients were adults aged 18 years and older. All had radiologic confirmation of unilateral acute ureteric obstruction by a stone and all patients had complete medical records. Exclusion criteria included: bilateral obstruction, age less than 18 years, patients with urosepsis, those with hemodynamic instability at presentation, those with uncorrected coagulopathies, those with prior ureteroscopic or endourologic surgeries, and patients with incomplete records.

Collected Variables Included:

Age, gender, stone features (side, size, location), degree of hydronephrosis, operative time, hospital stay period, postoperative stent insertion, stone free rate (SFR), and post operative complications according to Clavien – Dindo classification.

Data were analyzed using SPSS version 26.0 (IBM Corp., Armonk, NY, USA). Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequencies and percentages. The student's t-test was applied for continuous data, and the Chi-square or Fisher's exact test for categorical data. A p-value < 0.05 was considered statistically significant.

Results

A total of 180 patients treated with rigid ureteroscopy for acute ureteric stone obstruction were analyzed; 90 patients (50%) treated with early ureteroscopy after the onset of presentation, and 90 patients (50%) were treated with delayed ureteroscopy after initial decompressive intervention. Demographic variables and stone features were comparable, with no significant difference between the two groups (table 1). Mean age and stone size showed no significant difference ($p > 0.05$). Gender, stone side, stone location, and degree of hydronephrosis were all similar between both groups ($p > 0.05$); thus, both groups exhibited balance at baseline.

Table 2 shows operative and postoperative studied variables. Mean operative time was significantly shorter in the early group ($p < 0.001$). Similarly, mean hospital stay was also shorter for the early group ($p < 0.001$). No intra or postoperative surgery related major complications were reported in either group.

Table 3 shows that stone free rate did not exhibit a significant difference between both groups ($p > 0.05$). Both groups also had similarly low and statistically indifferent reintervention and complication rates ($p>0.05$). Most complications were minor (Clavien Dindo 1 – 2) and were managed conservatively.

Multivariable logistic regression analysis was carried out and showed that timing of ureteroscopy was not an independent predictor of stone free rate (SFR), as shown in Table 4, with an odds ratio (OR) of 1.45 (95% CI 0.32 -6.55, P = 0.63). No other variable, such as; age, gender, stone size or degree of hydronephrosis, were significantly affecting treatment success rate.

Thus, the study demonstrated that early ureteroscopic intervention for acute ureteric stone obstruction has similar safety and stone free rate when compared to delayed option.

Table 1: Baseline characteristics of Early and Delayed ureteroscopy groups (n = 180)

Variable	Category	Early (n=90)	Delayed (n=90)	Test Used	p-value
Age (years)	—	45.6 ± 12.3	50.6 ± 12.5	MWU	0.0197
Stone size (mm)	—	8.9 ± 2.0	8.8 ± 2.5	MWU	0.6605
Sex	Female	26 (28.9%)	20 (22.2%)	Chi-square	0.3929
	Male	64 (71.1%)	70 (77.8%)	—	—
Stone side	Left	49 (54.4%)	43 (47.8%)	Chi-square	0.4559
	Right	41 (45.6%)	47 (52.2%)	—	—
Stone ureteric location	Lower	56 (62.2%)	62 (68.9%)	Chi-square	0.5137

Variable	Category	Early (n=90)	Delayed (n=90)	Test Used	p-value
	Mid	15 (16.7%)	10 (11.1%)	—	—
	Upper	19 (21.1%)	18 (20.0%)	—	—
Hydronephrosis grade	I	32 (35.6%)	32 (35.6%)	Chi-square	0.6240
	II	35 (38.9%)	40 (44.4%)	—	—
	III	23 (25.6%)	18 (20.0%)	—	—

Abbreviations: MWU = Mann–Whitney U test.

Table 2: Perioperative outcomes (continuous variables)

Variable	Early mean ± SD	Early median [IQR]	Delayed mean ± SD	Delayed median [IQR]	p-value
Operative time (min)	46.8 ± 10.7	46.0 [39.2–54.5]	54.0 ± 10.4	54.0 [47.6–60.5]	<0.001
Hospital stay (days)	2.2 ± 0.6	2.3 [1.9–2.6]	3.7 ± 0.9	3.8 [3.0–4.3]	<0.001

Abbreviations: SD = Standard deviation; IQR = Interquartile range. Tests: Mann–Whitney U for non-normal distributions.

Table 3: Primary outcomes by group

Outcome	Early n/N (%)	Delayed n/N (%)	p-value
Stone-free	87/90 (96.7%)	85/90 (94.4%)	0.7203
Reintervention	1/90 (1.1%)	5/90 (5.6%)	0.2108
Any complication	16/90 (17.8%)	7/90 (7.8%)	0.0723

Abbreviations: URS = Ureteroscopy. Tests: Chi-square or Fisher's exact as appropriate.

Table 4: Multivariable logistic regression for stone-free status

Predictor	OR	95% CI Lower	95% CI Upper	p-value
Intercept	52.89	0.40	7079.14	0.1122
Early vs Delayed (ref: Delayed)	1.45	0.32	6.55	0.6318
Female (ref: Male)	2.34	0.27	20.23	0.4394
Age (years)	0.98	0.92	1.04	0.4413
Stone size (mm)	1.03	0.75	1.42	0.8367
Hydronephrosis (per grade)	0.84	0.32	2.17	0.7136

Abbreviations: OR = Odds ratio; CI = Co

DISCUSSION

This retrospective comparative study between early and delayed ureteroscopy for acute ureteric obstruction clearly shows that both offer high and comparable SFR with low complication rates; yet, the early option shows a significantly shorter operative time and hospital stay. Such findings support the suitability and practicality of early ureteroscopy, especially when practiced by experienced endourologists [7].

Previous research shows that acute inflammation with mucosal edema of ureteric wall in acute obstruction is associated with increased risk of iatrogenic injury upon endoscopic ureteric intervention, however. Koo *et al*., showed that there is no significant increase in ureteric perforation or post operative sepsis with early ureteroscopic intervention for an obstructed ureter, provided that infection is excluded preoperatively [8]. Tok *et al*., also reported a similar complication profile between early and delayed ureteroscopy for obstructed ureters and showed that the early option offers less patient discomfort [9].

Ng *et al*., observed that early definitive ureteroscopy at onset of obstruction presentation significantly reduce the total duration of medical care, with improved patient satisfaction and a comparably high success rate to delayed option [10]. Also, Atis *et al*., showed that early ureteroscopy offers equivalent stone free rate as delayed option [11].

Demirci *et al*., showed that early ureteroscopy offers a significantly shorter treatment time with lower stent associated morbidity, which is encountered with the delayed option [12]. Traxer *et al*., illustrated that recent endourologic advancements in digital ureteroscopy and laser sources for stone disintegration led to improved safety when ureteroscopy is done early on with acute obstruction [13]. Sarica *et al*., specifically exhibited that using thulium fiber laser via ureteroscopy to disintegrate an acutely obstructing stone offers precise stone ablation without risking thermal mucosal injury; this further supports the early intervention arm [14].

Our study had several advantages such as; having a relatively large cohort, the use of an integrated electronic health recording system to accurately collect data and ensuring that all patients were treated by experienced surgeons, since our center is a tertiary referral one. Still, there are limitations to this study, including: its retrospective design, lack of long-term follow-up data to assess late complications.

Thus, further multicenter prospective studies are needed to furtherly support our findings.

CONCLUSION

Early ureteroscopic management for acutely obstructed ureters by stones is as safe and effective as delayed option when done in appropriately selected patients. It offers a significantly shorter operative time and hospital stay without increasing post-operative complications. This supports early ureteroscopy for acutely obstructed ureters when it's done for appropriate patients, with modern endourologic equipment and in proper urologic centers. Having that demarcated, further prospective multicenter trials with extended postoperative follow-up are still needed to confirm such practice.

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