

Preoperative ureteral stenting prior to ureteroscopy for management of urolithiasis does not impact the postoperative return for unplanned care

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Abstract

Introduction: Return for unplanned postoperative care is an important quality metric in the United States. Most of our postoperative return visits occur after ureteroscopy. Routine preoperative ureteral stenting is not recommended by the American Urological Association due to its impact on the quality of life, despite its proposed operative advantages. We evaluated the association between preoperative ureteral stenting and the resulting perioperative outcomes in the context of quality measures such as return to the emergency department (ED) and readmission rates.

Materials and Methods: After the Institutional Review Board approval, a retrospective review of patients undergoing ureteroscopy from February 2014 to present was conducted. Patient's demographics and perioperative outcomes were compared based on the presence or absence of a ureteral stent before ureteroscopy. Details and rates of nurse calls, returns to the ED, and readmissions within 90 days were also compared.

Results: A total of 421 instances of ureteroscopy, 278 preintended ureteroscopy (psURS), and 143 direct ureteroscopy (dURS) were included for analysis. Preoperative demographics were similar. The psURS cohort was more likely to undergo flexible ureteroscopy, utilized an access sheath more often ($P < 0.0001$), and had less ureteral dilation ($P < 0.0001$). Preintending did not influence operative time ($P = 0.8534$) or stone-free rates ($P = 0.2241$). dURS patients were more likely to call the nurse; however, psURS versus dURS yielded no difference in return to the ED or readmission within 90 days.

Conclusions: In this study, preoperative stenting offered few operative advantages and did not meaningfully influence returns to the ED and readmissions within 90 days after ureteroscopy.

Keywords: Readmission, stent, ureteroscopy, urolithiasis

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INTRODUCTION

Quality measures are of increasing importance in today's health-care climate in the United States. Centers for

Medicare and Medicaid Services are reducing payments to hospitals for readmissions within 30 days for certain diagnoses and procedures; likewise, quality measures impact

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physician reimbursement in many health systems. The association between preoperative double J (DJ) stenting and the resulting perioperative outcomes has not been well studied in the context of quality measures such as returns to the emergency department (ED) and readmission rates.

The American Urological Association (AUA) and Endourological Society recommend against the routine preoperative placement of an indwelling DJ ureteral stent before ureteroscopy for renal or ureteral calculi.^[1] DJ stenting is associated with pain, irritative urinary symptoms, and hematuria, which can significantly impact a patient's quality of life.^[2,3] Despite this, the presence of a ureteral stent before definitive stone management by ureteroscopy has been reported to increase stone-free rates and decrease operative times perpetuating ongoing controversy on the topic.^[4-6]

In this study, patient demographics, perioperative outcomes, and postoperative outcomes were compared based on the presence or absence of a DJ ureteral stent before ureteroscopy at our institution. The details and rates of nurse calls, returns to the ED, and readmissions within 90 days were also compared between the two groups.

MATERIALS AND METHODS

Patients

After the Institutional Review Board approval, a retrospective review of patients undergoing ureteroscopy for treatment of renal and/or ureteral calculi by eight surgeons at the authors' institution from February 1, 2014, to April 30, 2016 was performed. Four hundred and fifty-eight instances of ureteroscopy were identified during the study period through a search of the operative logs at the authors' institution for CPT codes 52352, 52353, and 52356. Patients were grouped based on whether they were pre-stented ureteroscopy (psURS) or went for direct ureteroscopy (dURS). Twenty-four patients were excluded because they were miscoded and underwent ureteroscopy for reasons other than stone. Eleven patients had inadequate follow-up data and were also excluded from the study. Three hundred and eighty-two patients who underwent 421 instances of ureteroscopy were ultimately included for the final analysis. Forty-one patients had repeat instances of ureteroscopy during the study period. Patient demographics and perioperative outcomes were compared along with details and rates of nurse calls, returns to ED, and readmissions within the first 90 days postoperatively.

Procedure

Perioperative evaluation, technique, and follow-up varied between surgeons at the studied institution. When absolute

indications for ureteral stent are absent, preoperative stenting was performed based on surgeon and/or patient preference. It was found to be standard practice to treat positive preoperative urine cultures as per the AUA guidelines.

A 7.5 F fiber optic flexible and/or 7 F semi-rigid ureteroscope was used for the majority of cases. Necessity of ureteral dilation was decided by the surgeon and was typically performed either by using a 12 F ureteral balloon dilator or by serially passing the inner obturator alone and then the entire assembled ureteral access sheath. A 10/12 F or 12/14 F ureteral access sheath was placed when felt to be clinically indicated by the surgeon. This is also the case for postoperative ureteral stent placement.

Follow-up intervals and imaging modalities varied slightly between surgeons. It typically consisted of renal ultrasound with or without plain film abdominal X-ray at 6–8 weeks postoperatively. Patients were characterized as stone-free if documented in the operative report as visually and radiographically stone-free and/or on follow-up imaging.

Statistical analysis

All statistical analysis was performed in SAS 9.4 (SAS Institute Inc, Cary, North Carolina, USA). A Chi-square test or Fisher's exact test was used for bivariate comparison of categorical variables. Continuous variables were analyzed using the Wilcoxon Rank-Sum test. Generalized estimating equations were used to account for patients who had repeat instances of ureteroscopy during the study period. Statistical significance was defined as $P < 0.05$.

RESULTS

A total of 382 patients, who underwent 421 instances of ureteroscopy, 278 instances of psURS, and 143 instances of dURS during the study period, were included for the final analysis. Forty-one patients had repeat ureteroscopy. Patient demographics are summarized in Table 1. Age and body mass index were similar between the two groups. Pre-stented patients had higher American Society of Anesthesiologists (ASA) scores and were statistically more likely to be female.

Preoperative urine culture was positive in 55 pre-stented patients versus 13 undergoing dURS ($P = 0.0015$). Stone location was categorized as either ureteral (proximal, mid, and distal) or renal based on the location of the most proximal stone, as this stone would be most likely to drive operative technique [Table 2]. Stone location was renal in 36.7% of dURS and 37.6% of psURS ($P = 0.8541$).

When only a ureteral stone was treated, the dURS group had more distal location of stones compared with more proximal ureteral stones in the psURS group ($P = 0.0009$). Right ureteral stone size was larger in psURS versus dURS ($7.00 \text{ mm} \pm 2.31$ vs. $5.00 \text{ mm} \pm 2.13$, $P = 0.0039$). There was no statistically significant difference in left ureteral, right renal, or left renal stone size between the two groups. Those who underwent a trial of passage were more likely to undergo dURS versus psURS (36.36% vs. 25.88% , $P = 0.0353$).

Operative times were similar, despite the presence or absence of a preoperative stent ($70.70 \text{ min} \pm 45.66 \text{ min}$ vs. 73.79 ± 48.92 , $P = 0.8534$) [Table 3]. About 75.82% of psURS utilized flexible ureteroscopy alone or in combination with semi-rigid ureteroscopy, as compared with just 59.29% of dURS ($P = 0.0007$). A ureteral access sheath was placed more often in cases of psURS (66.55% vs. 45.07% , $P < 0.0001$); such patients required less ureteral dilation than those undergoing dURS (19% vs. 48.18% , $P < 0.0001$). Intraoperative failure of the procedure and/or ureteral injury were more common in the absence of a preoperative ureteral stent ($P = 0.0092$). There was an inability to reach the stone requiring stent placement and staged ureteroscopy in four dURS versus zero psURS. Intraoperative injury to the ureter occurred on four occasions during dURS and only once during psURS.

Stone-free rates (as documented in the operative report as visually and radiographically stone-free and/or on follow-up imaging within 90 days) were similar between the two groups (96.04% stone-free psURS vs. 93.71% stone-free dURS, $P = 0.2441$) [Table 3]. psURS patients were then stented postoperatively 91.37% of the time versus 80.42% of dURS ($P = 0.0012$).

Within the first 90 days postoperatively, 16.20% of dURS patients called the clinic nurse for a urologic reason directly related to their surgery compared with 8.99% of pre-stented patients ($P = 0.0263$) [Table 4]. Despite calling the nurse more often, dURS patients returned to the ED at a similar rate compared to psURS patients within 90 days of surgery (15.49% vs. 15.47% , $P = 0.9854$). PsURS patients were readmitted from the ED (7.22%) of the time while dURS only 4.23% of the time. However, this did not reach statistical significance ($P = 0.2797$). The most common urologic reasons for a return to the ED were pain, infection, and hematuria. When stratified for a return to the ED within 90 days for urologic reasons only, psURS patients tended to return at lower rates when compared to dURS (8.66% vs. 11.97%); however, this was not statistically significant ($P = 0.2942$). Pre-stented patients returned to

Table 1: Patient demographics

	n	dURS (%)	psURS (%)	P
Median±SD age	382	52±17.14	53.5±17.78	0.6087
Gender				0.002
Male	223	94 (42.20)	129 (57.8)	
Female	198	49 (24.8)	149 (75.2)	
Median±SD BMI	382	28.74±7.22	30.20±7.20	0.2564
ASA Score				0.0092
I	14	7 (4.90)	7 (2.52)	
II	220	85 (59.9)	135 (48.6)	
III	169	46 (32.4)	123 (44.2)	
IV	17	4 (2.80)	13 (4.68)	

Table 2: Stone burden

	n	dURS (%)	psURS (%)	P
Ureteral stone size (mm), median±SD				
Right	112	5.00±2.13	7.00±2.31	0.0039
Left	145	6.00±2.81	6.00±2.48	0.6550
Renal stone size (mm), median±SD				
Right	57	7.00±8.08	8.00±5.08	0.2856
Left	45	8.00±3.13	8.00±3.47	0.3853
Location				
Renal	142	51 (36.7)	91 (37.6)	0.8541
Ureteral	239	88 (63.3)	151 (62.4)	
Ureteral location				
Proximal	100	26 (30.6)	74 (51.0)	0.0009
Mid	21	5 (5.9)	16 (11.0)	
Distal	109	54 (63.5)	55 (37.9)	

dURS: Direct ureteroscopy, psURS: Pre-stented ureteroscopy, SD: Standard deviation

Table 3: Operative characteristics

	n	dURS (%)	psURS (%)	P
Pre-stent	421	143 (34.0)	278 (66.0)	
Positive urine culture	68	13	55	0.0015
Operative time (min), mean±SD	421	73.79±48.92	70.70±45.66	0.8534
Flexible ureteroscopy	290	83	207	0.0007
Ureteral access sheath	249	64	185	<0.0001
Ureteral dilation	117	66	51	<0.0001
Intraoperative complication				
Failure of procedure	4	4	0	0.0092
Ureteral injury	5	4	1	
Postoperative stent	369	115	254	0.0012
Stone free	401	134	267	0.2241

SD: Standard deviation, dURS: Direct ureteroscopy, psURS: Pre-stented ureteroscopy

Table 4: Nurse calls, return to emergency department, and readmission within 90 days

	n	dURS	psURS	P
Nurse call	54	24	30	0.0263
Return to ED	65	22	43	0.9854
Return to ED for urologic reasons	41	17	24	0.2942
Readmission	26	6	20	0.2797

*Repeat returns within 90 days by the same patient excluded for purposes of statistical analysis. ED: Emergency department, dURS: Direct ureteroscopy, psURS: Pre-stented ureteroscopy

the ED more frequently for non-urologic reasons than dURS (19 vs. 5 patients).

For those who had a postoperative stent, psURS and dURS tended to return to the ED similarly after the ureteral stent was removed (68.97% vs. 61.54%, $P = 0.7291$). The time from surgery to return to ED or from stent removal to ED did not differ between prestented and dURS patients (7.5 days \pm 24.33 vs. 8.5 days \pm 21.40, $P = 0.9880$) (3.5 days \pm 25.61 vs. 7.0 days \pm 21.3, $P = 0.8073$). Of all patients that returned to the ED, those who returned for urologic reasons presented sooner than those who presented for other reasons (5 days \pm 11.55 vs. 27.50 days \pm 26.20, $P < 0.0001$) within the first 90 days postoperatively.

DISCUSSION

In a matched-pair analysis of 246 patients, and using a similar definition of “stone-free” to the present study, Netsch *et al.*^[5] showed a statistically significant improvement in stone free rate (SFR) (98.2% psURS vs. 83.3% dURS) for those with large stones ≥ 5 mm. Using a strict definition of stone-free, Rubenstein *et al.*^[4] demonstrated similar findings of statistically significant improvement in SFR in favor of psURS. Meanwhile, other studies have shown no statistically demonstrable impact on stone-free rates,^[6,7] and in the present study, SFR favors psURS 96.04% versus 93.71% but does not reach significance.

Operative times were also similar between the psURS and dURS groups in this study. The time that is purportedly saved by already having access to the ureter in psURS is likely mitigated by the more proximal location of ureteral stones, need for flexible ureteroscopy, and more prevalent use of ureteral access sheath and the associated time needed to place it. The majority of retrospective studies on the topic are in line with our findings.^[4,5,8] Chu *et al.*^[9] demonstrated shorter total operative times for prestented patients with overall stone burdens > 1 cm; however, similarly, there was no difference for stone burdens < 1 cm.

The conflicting perioperative results with regard to SFR and operative times highlight the relatively low level of evidence on psURS versus dURS and the need for randomized prospective studies on the topic.

The negative impact of ureteral stenting on the quality of life is a central feature of the AUA/Endourological Society Guideline. Through validation studies of the Ureteral Stent Symptom Questionnaire, Joshi *et al.*^[2] found that of 85 patients with a unilateral indwelling ureteral stent, 76% reported bothersome urinary symptoms, 80% experienced pain directly attributed to the stent, 32% reported sexual

dysfunction, and 58% noted that the stent had a negative impact on work performance.

How patients experience symptoms related to a ureteral stent may impact unscheduled postoperative care in the form of nurse calls, return to the ED, and readmission. The Affordable Care Act has addressed this problem with the Hospital Readmissions Reduction Program, which penalizes hospitals for readmissions within 30 days for certain diagnoses and surgical procedures. Though ureteroscopy is not included on the list, the creation of this program highlights a theme moving forward that may be relevant for many surgeons and subspecialists, including urologists. Similarly, some institutions, including our own, already reimburse urologists based on these quality measures.

Prior study has been directed at postoperative stent status and unplanned return to the ED after ureteroscopy. A recent meta-analysis performed by Pais *et al.*^[10] showed a 60% increase in the risk of unplanned ED return when a postoperative stent was omitted. In the present study, psURS patients were stented postoperatively at a significantly higher rate than dURS patients. psURS patients trended toward lower 90-day return to ED rates, but this did not reach statistical significance and could be explained by confounding postoperative stent status. dURS patients also called to the nurse for urologic reasons more often than psURS, and it is unclear whether or not this deterred them from presenting to the ED as compared with psURS patients who used this resource less often.

The presence of a ureteral stent and the passive dilation it provides (as evidenced in this study by lower rates of ureteral dilation, ureteral injury, and failure to reach the stone) does not seem to offer advantages in how patients experience pain after the procedure. Pain was the most common reason for return to ED in both psURS and dURS groups. Both psURS and dURS patients who were stented postoperatively returned to the ED at similar rates with the stent still in place. This indicates that the experience of having a stent preoperatively has little impact on the pain that is experienced postoperatively compared to dURS.

Readmission within 90 days after ureteroscopy trended toward a higher rate in psURS patients but did not reach statistical significance. psURS patients tended to have higher ASA scores and presented at higher rates for non-urologic reasons, which may explain this finding. Interestingly, those who returned to ED within 90 days for urologic reasons presented sooner than those who presented for other reasons. With physician compensation becoming more and more reliant on quality measures such

as these, the future study may be useful in delineating appropriate return to ED time cutoffs so that physicians are not subject to penalties that are not directly related to the surgery performed.

CONCLUSIONS

In this study, preoperative ureteral stent placement offers few operative advantages and does not offer meaningful influence to quality measures such as return to ED and readmission within 90 days after ureteroscopy. Future prospective studies would be useful to further evaluate.

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Conflicts of interest

There are no conflicts of interest.

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