

How long should double J stent be kept in after ureteroscopic lithotripsy?

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Abstract Ureteroscopic lithotripsy (UL), for renal or ureteral stones, is a standard technique for every urologist. However, the length of time the double J (DJ) stent needs to be kept in postoperatively is still controversial. This study investigated how the duration of DJ stenting after UL affects postoperative adverse events, especially infection and pain. One hundred and twenty-five patients were enrolled in this study and data were analyzed retrospectively. We set the median duration for keeping the DJ stent postoperatively as 14 days from median value in all cases and compared it to a longer duration group (>15 days) and a shorter duration group (<14 days) in terms of febrile complications, urinalysis, and the need to give antibiotics at the time of DJ stent removal. The duration of DJ stenting was from 3 to 61 (median 14) days. Thirteen patients had adverse events related to DJ stent removal (febrile complications, 11 patients; lumbago, 2 patients). Thirty-one patients were given antibiotics at the time of DJ stent removal. Patients with longer durations (>15 days) of DJ stenting had a significantly higher ratio of adverse events such as fever or lumbago ($p = 0.041$). In conclusion, this study demonstrated that shorter duration (<14 days) DJ stent use after UL may decrease adverse events and require

less antibiotic use. Further prospective studies are needed to determine the optimal duration of DJ stent use after UL.

Keywords Ureteroscopic lithotripsy · Duration of double J stent storage

Introduction

Ureteroscopic lithotripsy (UL) has become routine for urologists, including fiberoptic UL (f-UL) using lasers [1]. In addition to technical improvements and better devices, patients' quality of life (QOL) during and after stone treatment is greatly affected by the practice of leaving a double J (DJ) stent in after UL. Patients often have pain or discomfort relating to the indwelling DJ stent [2–4].

Basically, the DJ stent is intended to support the ureter after UL. The length of time the stent should be left in, or even whether it should be routinely used, is subject to some disagreement [2, 5, 6]. The need to dilate the ureteral orifice is also controversial [7, 8]. Some authors feel that only cases where the ureter was injured during the UL procedure need an indwelling DJ stent after UL [9].

In addition, the guidelines for preventing perioperative infections in urological surgery recommend short durations of antibiotic treatment [10] since unnecessary antibiotics may lead to infection by resistant strains [11, 12]. Long-duration DJ stenting after UL may not only cause pain and abdominal discomfort [2, 3, 5] but also bacteriuria or pyuria and potential urinary tract infections (UTI), with the concomitant risk of developing an antibiotic-resistant strain. We designed this retrospective study to generate and analyze data that may contribute to future guidelines since there is no standard method regarding the time of DJ stent removal. Our transurethral UL cases were performed by

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general urologists who did not specialize in stone disease. In our medical system every urologist usually does several kinds of urologic surgery including stone disease, cancer and benign prostate hyperplasia. Therefore, our study can provide guidance for general urologists.

In this study, we investigated retrospectively how the length of time a DJ stent was left in place after UL affected peri- or postoperative infectious complications at the time of removal of the DJ stent.

Patients and methods

Patients and UL procedure

One hundred and twenty-five transurethral UL cases from January 2003 to February 2010 were included in this study. UL was performed under general or lumbar anesthesia, generally by the following procedure as a rule: (1) insertion of a safety guidewire (Sensor Guidewire®, Boston Scientific, Natick, Massachusetts, USA), (2) dilation of ureteral orifice with or without ureteral dilation by a UroMax Ultra™ (4 or 10 cm, 75 cm in length, Boston Scientific), (3) observation by 8.5 Fr rigid ureteroscope (Richard Wolf Medical Instruments Cooperation, Vernon Hills, Illinois, USA), (4) use of basket maneuver with a Zero-tip® (2.4/3.0, Segura 2.4/3.0, Gemini 3.0, Parachute 3.1, Boston Scientific) or Litho Catch Basket®, 2.2 Fr, 110 cm, Boston Scientific) or Escape® (1.9 Fr, 120 cm, Boston Scientific) catheter just above the stone, (5) lithotripsy by a Litho-Clast® (Boston Scientific) or a Holmium YAG laser and/or removal of the stone by a basket maneuver, (6) insertion of a double J stent (6 Fr, 22, 24, or 26 cm, Boston Scientific) and urethral catheter. If a flexible ureteroscope was used, the procedure included: (1) another inserted guidewire, (2) ureteral dilation performed by a ureteral dilator such as a UroMax Ultra™ (Boston Scientific), (3) insertion of a flexible ureteroscope (6 Fr, KARL STORZ endoscopy Japan, Tokyo, Japan) with Access Sheath® (Cook Medical Inc., Bloomington, Illinois, USA), (4) detection of the stone, (5) lithotripsy or grasping the stone with a basket device, (6) removing the stone or lithotripsy by rigid ureteroscope.

The urethral catheter was removed the day after UL as a rule if the patient did not have a fever, and prophylactic antibiotic medication (2nd generation cephalosporin or sulbactam/ampicillin) was given for 2 days (at the initiation of transurethral UL, 6 h later and twice at the next day). In general, the time when the DJ stent was removed depended on the surgeon's discretion. Eight surgeons participated in this study. At the time of removal of the DJ stent, either the string attached to the DJ stent was pulled [13] or the stent was removed by flexible cystoscopy with

or without prophylactic antibiotics if the string was lost or was not kept. The decision to use prophylactic antibiotics at the time of stent removal also depended on the physician's discretion. The duration of DJ stenting was noted and patients were evaluated for fever or pain (lumbago) and urinalysis before and after removal of the stent. This study was approved by the hospital's Institutional Review Board Committee on 15 July 2011.

Statistical analysis

Statistical analysis was conducted with STATA (StataCorp LP, Lakeway Drive, College Station, Texas, USA). The correlation between the occurrence of fever or pain (lumbago) after removal and the duration of DJ stenting was investigated and the cutoff of the quantitative value was determined by the median of all data. Statistical significance was established at the 0.05 level.

Results

One hundred and twenty-five UL cases were included in this study. The patients' backgrounds are shown in Table 1. DJ stents were left in after UL for a median of 14 days (range 2–61 days) in all data from 108 consecutive UL cases for which data about the DJ stenting was available. Thirty-one patients were given oral or i.v. antibiotics just before or after removal of the DJ stent. Thirteen patients had adverse events relating to DJ stent removal; 11 patients had fever and 2 had lumbago. When urinalyses were compared before and after DJ removal (during follow-up at the urological outpatient department 2 weeks to 1 month after DJ stent removal), no apparent trends emerged (Table 2).

In our statistical analyses of the relationship between the length of time the DJ stent was left in and the occurrence of adverse events, those patients with longer duration (>15 days) DJ stenting had a significantly higher ratio of the occurrence of adverse events such as fever or lumbago ($p = 0.041$) (Table 3). The patients' comparative data

Table 1 Patients' backgrounds

<i>N</i>	125
Age	14–86 (median 60)
Sex	Male 84, female 41
Renal (R) stone	6
Ureteral (U) stone	106
R + U stone or unknown	13
Right	48
Left	71
Both or unknown	6

according to the duration of DJ stenting are shown in Table 4. There were no significant differences between the two groups (longer or shorter duration) ($p > 0.05$) regarding patients' age, surgeon, stone size, stone location, or number of stones (Table 5).

In addition, the cases with antibiotic use had a significantly higher ratio of febrile complications ($p = 0.003$) and adverse events ($p < 0.001$) (Table 4).

Table 2 Stent storage, adverse events and antibiotic use

Duration of DJ stent	2–61 (median 14) days
Febrile complication	13 cases
Pain (lumbago)	2 cases
Use of antibiotics at the time of removal of DJ stent	31 cases

Table 3 Statistical correlation of duration of keeping DJ stent for 15 days or more with complication factors

Complication factors	Odds ratio (OR)	<i>p</i> value
Febrile complication	2.75	0.118
Adverse events	3.62	0.041
Improvement of RBC in urinalysis	0.6	0.308
Improvement of WBC in urinalysis	1.04	0.929

RBC red blood cell, WBC white blood cell

Bold value indicates that the correlation is statistically significant

Table 4 Comparison between shorter (14 days or less) and longer (15 days or more) duration of DJ stenting

	Shorter duration of keeping DJ stent	Longer duration of keeping DJ stent	<i>p</i> value
<i>N</i>	59	49	
Stone location			
U1	33	27	
Others	26	22	0.449
Stone size (major axis: mm)	5–27 (11)	3–30 (12)	0.611
Surgeon			
KS	33	25	
Others	26	24	0.61
The number of stone			
One	50	37	
Two or more	9	12	0.103

N seventeen cases were unknown or non-DJ stent removal, *U1* upper ureteral stone, *KS* Katsumi Shigemura (the first author)

Table 5 Statistical correlation of antibiotics use at the DJ stent removal with complication factors

	Odds ratio (OR)	<i>p</i> value
Febrile complication	6.33	0.003
Adverse events	8.7	<0.0001

Discussion

Ureteroscopic lithotripsy (UL) has become a standard procedure for urologists [1, 14] but controversy remains over dilating the ureteral orifice and DJ stent placement after UL. Studies disagree on the need for a DJ stent after UL and the length of time it should be left in [6]. The decision to use a DJ stent after UL depends on the surgical procedure or the extent of ureteral injury, a somewhat different issue from how long the stent needs to be left in place after the procedure [2, 9]. For instance, Damiano et al. [15] reported that the use of a DJ stent was associated with less discomfort and did not significantly affect operative time compared with a non-stented group.

Currently there are no reports studying the effects of long-term use of DJ stents after UL. This study focused on the relationship between adverse events after transurethral UL and the duration of DJ stenting. Our results showed that keeping a DJ stent for 14 days or less was associated with fewer adverse events, such as pain or fever, compared to longer durations. This suggested that longer use of the DJ stent should be avoided if there is no major ureteral injury at the time of UL. Canepa et al. [6] found that DJ stents should be removed within 3–7 days after UL and Ibrahim et al. [16] supported their conclusions in a study of 220 cases. Our findings and those of others suggest that we need to study shorter durations of DJ stenting prospectively in cases without ureteral injury.

Although the use of a DJ stent after transurethral UL is generally thought to provide support for the ureter and relieve pain, some patients feel discomfort and experience macrohematuria from DJ stenting [4, 16]. Though the string attached to a DJ stent is considered to make removal without transurethral endoscopy easier, some patients accidentally pull the string and the DJ stent, during urination for instance, which can cause problems [16]. On the whole, it appears better to remove the stent as soon as possible if the patients' conditions permit it [5, 6, 17]. Some authors argue against the use of the DJ stent because the stent may cause adverse infectious diseases or pain [9, 16] or lead to stent occlusion by crushed stone in the ureter. It would be worthwhile to compare results in patients with or without a DJ stent. We also found that quicker removal of the DJ stent might lead to improvements in hematuria, and less pyuria,

suggesting that longer-duration DJ stents may cause symptoms that affect patients' quality of life.

Our study has limitations in that the patients were not stratified by disease condition or the extent of ureteral injury caused by the UL procedure. This kind of clarification would be more complicated since it would involve the patients' underlying disease state, such as diabetes mellitus (DM), patient medications such as immune-suppressants, and factors such as stone size or location or operative time. In addition, this is retrospective study, so those factors might affect the results. Based on the current data, prospective studies with for instance a much shorter duration of DJ stenting are needed to establish a standard for the duration of DJ stenting after transurethral UL. The study should include patients without a DJ stent as mentioned above. The end points to be investigated could also be more detailed, such as the amount of pain relief taken. This prospective study should be our next project in the near future.

In conclusion, this study investigated how the length of time the DJ stent was left in after transurethral UL affected adverse events such as infection or lumbago. Our results demonstrated that a shorter duration (<14 days) of stenting resulted in fewer adverse events after removal of the stent. A prospective study based on the current data is needed to focus on whether shorter durations of DJ stent use contribute to better quality of life for patients.

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