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ORIGINAL ARTICLE

Double J stenting evaluation after ureteroscopy for urolithiasis

Évaluation du drainage par sonde double J après urétéroscopie pour maladie lithiasique

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KEYWORDS
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Ureteroscopy;
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Summary
Objectives. — During ureteroscopy for urolithiasis, postoperative ureteral drainage with double J stent is frequently used. It may reduce acute postoperative pain and late ureteral stenosis. Double J stent can have negative impact on life quality. After uncomplicated intervention, double J stent is not mandatory. Objective of our study was to evaluate pain and complications after ureteroscopy with or without stent.
Methods. — We retrospectively analyzed ureteroscopy performed between May 2014 and January 2017. Interventions were compared regarding ureteral drainage with double J stent or not. Our primary outcome was early postoperative pain evaluated with an oral pain scale form 1 to 10 on day one after intervention. Clinical characteristics, per- and postoperative data were collected. We also looked for risks factors of complications.
Results. — Three hundred and sixty-six interventions were included, 259 (70.8%) with and 107 (29.2%) without double J stent. Stone burden was higher in stented group (18.3 vs 9.4 mm, $P < 0.0001$). Patients without postoperative stents had more ureteral preparation with double J stent (78.5% vs 62.5%, $P = 0.0032$) and had more ambulatory interventions (75.7% vs 52.5%, $P < 0.0001$). Postoperative pain was not different (22% vs 17.75%, $P = 0.398$). Complication rate was similar (29% vs 20.5%, $P = 0.1181$), so was rehospitalization rate (0.8% vs 0.9%, $P = 1$). In multivariate analysis, complications factors were unprepared ureter, experienced surgeons and access sheath.

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Article of the month

Conclusion. — Not stenting after ureteroscopy do not increase pain or complications. Stenting should not be used after uncomplicated interventions for centimetric stones.
Level of evidence. — 4.

MOTS CLÉS
Calcul rénal ;
Urétéroscopie ;
Calcul urétéral ;
Stent urétéral ;
Maladie lithiasique

Résumé
Objectifs. — Lors des urétéroscopies pour fragmentation de calculs, le drainage urétéral postopératoire par sonde double J (SDJ) est fréquent. Celui-ci permettrait de diminuer le risque de colique néphrétique et de sténose urétérale. Il existe cependant des complications liées aux SDJ comme les douleurs lombaires et des symptômes urinaires. En cas d'intervention non compliquée, l'utilisation d'une sonde double J n'est donc pas recommandée. L'objectif de notre étude était d'évaluer l'intérêt du drainage urétéral par SDJ en fin d'URS sur la douleur postopératoire précoce et les complications.
Méthodes. — Nous avons analysé rétrospectivement, toutes les urétéroscopies réalisées entre mai 2014 et janvier 2017. Nous avons comparé les patients ayant été drainés par SDJ et ceux n'ayant pas eu de drainage urétéral. Le critère principal de jugement était la douleur postopératoire précoce évaluée par une échelle orale de la douleur cotée de 1 à 10, le lendemain de l'intervention. Nous avons mesuré les caractéristiques cliniques, les données péri- et postopératoires des patients avec et sans SDJ postopératoire. Nous avons également recherché les facteurs de risque de complications.
Résultats. — Nous avons inclus 366 interventions dont 259 (70,8 %) avec et 107 (29,2 %) sans SDJ. Les calculs étaient significativement plus volumineux (18,3 vs 9,4 mm, $p < 0{,}0001$) dans le groupe SDJ. Les patients sans SDJ avaient eu plus de SDJ préopératoires (78,5 % vs 62,5 %, $p = 0{,}0032$) et avait eu plus souvent une chirurgie ambulatoire (75,7 % vs 52,5 %, $p < 0{,}0001$). Concernant la douleur postopératoire, il n'y avait pas de différence entre les 2 groupes (22 % vs 17,75 % ; $p = 0{,}398$). Le taux de complication postopératoire était identique dans les deux groupes (29 % vs 20,5 % ; $p = 0{,}1181$). Le taux de réhospitalisation était identique dans les deux groupes (0,8 vs 0,9 %, $p = 1$). Les facteurs de risque de complications postopératoire étaient l'absence de SDJ préopératoire, l'expérience du chirurgien et l'utilisation d'une gaine d'accès.
Conclusion. — L'absence de drainage postopératoire par SDJ après urétéroscopie n'augmente pas le risque de douleurs ou de complications. Il n'est pas systématique en cas d'intervention non compliquée, pour des calculs centimétriques en cas d'uretère préparé.
Niveau de preuve.— 3.

Introduction

Management of renals and ureterals stones changed a lot in the past few years. Technical improvements as well as endoscopes miniaturization and better deflection have led to an increased use of ureteroscopy (URS). According to the European Association of Urology (EAU), flexible ureteroscopy (fURS) is now recommended in first line treatment for renal stone inferior to 20 mm. It is also available for lower pole renal calculi with unfavorable factor for extracorporeal shockwave lithotripsy (ESWL). URS is also recommended as second line treatment for renal stone superior to 20 mm [1].

Double J stenting (DJS) after URS is still debated between urologists [2,3]. In the last edition of the urolithiasis EAU recommendation, stenting after URS is not mandatory in uncomplicated URS with complete stone removal.

DJS after URS is used to prevent risk of obstruction resulting from a residual fragment or postoperative edema. It may also reduce postoperative ureteral stenosis. Risk of ureteral stenosis after ureteroscopy is estimated at 1%. It is higher in case of prolonged operative time, ureteroscope's diameter greater than 9.5F, ureteral perforation or impacted calculi [4] and may go unnoticed with repercussions on renal function [5]. However, those devices are not insignificant and patient's life quality can be affected with clinical symptoms like urgency, hematuria and social and sexual repercussions. In 2003, Joshi et al. reported 80% of stent-related pain with daily disruption of daily activities, 80% of urinary symptoms and 32% of sexual dysfunction. Other studies revealed, between 50 and 80% of morbidity [6,7].

Further, stent migration, encrustation, pyelonephritis and forgotten stent can occur after stent placement [8]. Consequently, DJS after URS is still debated among the

urologist [2,3]. In our study, we assessed if ureteral stenting with double J modify pain among patients after URS. We also search for risks of complications.

Methods

We retrospectively included every URS between May 2014 and January 2017 for ureteral and/or renal stone. Patients were eighteen years old or older. Interventions were excluded if the follow up was made in another center or if drainage of the upper urinary tract was made with a ureteral catheter. Urine sterility was controlled before every intervention and antibiotics were given if necessary. Patients received general anesthesia and prophylactic antibiotics during anesthesia induction. fURS were performed with a 7,5 Fr Karl Storz endoscope and semirigid with a 7 Fr Karl Storz uretero-renoscope. A 0.035 inch stiff terumo security wire and an access sheath (Flexor Ureteral Access Sheath) were used at the surgeon discretion. Position was controlled using fluoroscopy. A holmium laser YAG (Dornier Medilas H20) was used for stone fragmentation (200 to 550 um fiber) and a basket for stone evacuation if necessary. Every procedure lasted 90 minutes or less to minimize complications. At the end, 24 cm and 7 Fr silicone DJS was used according to the operator. The stent was removed 1 to 4 weeks after the intervention, in consultation under local anesthesia, or during the next procedure. Each patient received non-steroidal anti-inflammatory drug (NSAID) after the intervention for 3 days. Thirteen surgeons performed URS and were categorized between two groups, junior or senior. Seniors were titular surgeons and junior, one or two years after graduation. Data protection commission and ethic comity approved the study. Pre-stenting was used in case of emergency or if renal access was not possible in a prior intervention.

Pain was evaluated using Verbal Rating Scale (VRS). A telephone interview was conducted on day one for outpatient surgery; otherwise, the nurse used VRS during the hospitalization.

Our primary outcomes were postoperative pain and postoperative complications. Patient's data included age, gender, body mass index (BMI) and American Society of Anesthesiologists (ASA) score. Surgical data included presence of preoperative stent, use of ureteral access sheath, stone free status based on preoperative view or renal ultrasound or CT scan at 3 months, stone location, surgeon's experience, length of hospitalization and outpatient surgery status. Stone dimensions were measured with a CT scan; stone burden was evaluated with the biggest stone size and the cumulative size. Complications were recorded according to Clavien—Dindo classification [9]. Both groups were compared on the basis of these parameters. We also made a multivariate regression analysis to highlight complications factors.

Statistical analysis

Patients characteristics were summarized as counts (frequencies) for qualitative variables and with a mean ± standard deviation or median — [inter-quartile range (IQR)], as appropriate, for continuous variables.

Patients characteristics were compared using the Fisher or Chi^2 test for categorical variables and with Mann—Whitney for continuous variables, as appropriate.

A logistic regression was performed to find complications factors and validated, with manual backward variable selection process. This analysis is conducted to identify potential risk factors.

All tests were bilateral, with a type I error rate of 5%.

The statistical analysis was performed using Graphpad Prism 6.0 and R software version 3.4.1.

Results

Population

We included 366 interventions, 259 with a DJS and 107 without. Age, BMI, ASA score and gender were similar in both groups (Table 1). Maximum stone size was significantly higher in stented group (12.7 ± 12.9 mm versus 7.2 ± 2.5 mm; $P < 0.001$). Cumulative stone size was also significantly slightly higher in stented group (18.3 ± 14.9 mm versus 9.4 ± 5.2 mm; $P < 0.001$). Patients treated for renals stones used to have significantly more DJS (68.78% versus 44%; $P < 0.001$). Also, tubeless patients benefited form ureteral preparation significantly more often before intervention (78.50% versus 62.55%; $P = 0.004$).

Table 2 shows peroperative data. fURS was significantly higher in stented group (58.69% interventions versus 36.45%; $P < 0.001$) and significantly more access sheaths were employed (73.6% versus 42.4% $P < 0.001$). Surgeon's experience did not change postoperative drainage (43.63% versus 48.60%; $P = 0.4512$). Significantly more outpatient procedures were realized in non-stented group (75.7% versus 52.51%; $P < 0.001$) and patients had significantly less residuals fragments (89% versus 62.5%; $P < 0.001$). Length of stay was slightly longer in stented group (1.23 days versus 1; $P = 0.222$).

Postoperative pain

No differences were found regarding postoperative pain, 22% patients in the stented group suffered pain versus 17.75% ($P = 0.338$) in tubeless group. Also the VRS was not significantly different among painful patients.

In fURS subgroup, (Table 3), those results were similar with no differences on pain and complications. Also, patients without DJS had fewer residuals fragments and were more ambulatory.

Postoperative complication

We did not highlight differences in complications (29% versus 20,5%, $P = 0.1181$) (Table 4). More patients had postoperative fever (18.6% versus 9%) in DJS group and had grade 2 complications (7.7% versus 1.9%). One patient in tubeless group needed an early reintervention for double J stenting because of an obstructive pyelonephritis. Another in stented group needed an early fibroscopy 48 hours after ureteroscopy for double J ablation due to intense pain and one needed a nephrostomy under local anesthesia for a ureteral wound with an urinoma. One patient in each

Table 1 Demographic data and stones parameters ($n = 366$).

	Double J stent($n = 259$)	No double J stent($n = 107$)	*P*-value
Age (years)[a]	56.12 ± 17.2 (18–93)	54.7 ± 16.3 (20–91)	0.469
Gender male/females (ratio)	1.76	1.56	0.679
ASA (*n*, %)			0.044
1	90 (36.14)	46 (51.11)	
2	113 (45.38)	36 (40)	
3	43 (17.27)	8 (8.89)	
4	3 (1.2)	0 (0)	
BMI (kg/m^2)[a]	27.2 ± 6.36 (16–52.5)	26.54 ± 4.98 (17.6–42.9)	0.637
Maximum stone size (mm)[a]	12.7 ± 12.9 (2–90)	7.2 ± 2.5 (3–16)	**< 0.001**
Cumulative stone size (mm)[a]	18.3 ± 14.9 (2–90)	9.4 ± 5.2 (3–30)	**< 0.001**
Stone location (*n*, %)			**< 0.001**
Kidney	271 (68.8)	56 (44)	
Upper calix	48 (17.7)	5 (8.9)	
Middle calix	69 (25.5)	19 (33.9)	
Lower calix	91 (33.6)	22 (39.3)	
Pyelic	63 (23.2)	10 (17.9)	
Ureter	123 (31.2)	74 (56)	
Proximal	89 (72.35)	54 (73)	
Distal	34 (27.65)	20 (27)	
Pre-stent ureter (*n*, %)	162 (62.5)	84 (78.5)	**0.004**

ASA: American Society of Anesthesiologists; BMI: body mass index. *P*-value significant (i.e., < 0.05) indicated in bold.
[a] Mean ± standard deviation (range).

Table 2 Operative data characteristics ($n = 366$).

	Double J stent($n = 259$)	No stent($n = 107$)	*P*-value
Access sheath (*n*, %)	190 (73.4)	45 (42.1)	**< 0.0001**
Intervention (*n*, %)			**< 0.0001**
Flexible	152 (58.7)	39 (36.4)	
Semirigid	61 (23.5)	54 (50.5)	
Both	46 (17.8)	14 (13.1)	
Surgeon (*n*, %)			0.4512
Junior	113 (43.6)	52 (48.6)	
Senior	146 (56.4)	55 (51.4)	
Stone free (*n*, %)	160 (62.5)	89 (89)	**< 0.0001**
Ambulatory (*n*, %)	136 (52.5)	81 (75.7)	**< 0.0001**
Hospitalization length (days)[a]	1.29 ± 1.2 (1–11)	1 ± 0.27 (1–2)	0.222

P-value significant (i.e., < 0.05) indicated in bold.
[a] Mean ± standard deviation (range).

group had hematuria witch needed urethral stenting. One patient suffered from a sub capsular renal hematoma. Patients without DJS did not have more unplanned admissions.

In another analysis, presented ureters were less painful (Table 5) and access sheath would cause more pain.

Those results were confirmed in a multivariate analysis, (Tables 6A and 6B) unprepared ureter and experienced surgeons were more likely to have complications ($P = 0.0042$ and $P = 0.0381$), so is access sheath ($P = 0.0334$). Otherwise, DJS, ambulatory status, age, stone diameter and stone localization were not associated with higher risks.

Discussion

Our study reveals that ureteral stent after URS is not always necessary. Both groups were not similar; DJS group had bigger stone burden and less pre-stent ureter. We cannot certify that not stenting in this population will not increase pain or complications.

Preparing ureter with a DJS before URS may increases postoperative sepsis [10]. As shown in Assimos et al.'s study, it may be interesting to systematically implement a DJS preoperatively. They highlight that DJS before URS increases stone free rates and decreases complications for renal stones [11]. Nevertheless, this would require a first

Table 3 fURS subgroup analysis ($n = 191$).

	Double J stent($n = 152$)	No double J stent($n = 39$)	*P*-value
Maximum stone size (mm)[a]	10 ± 14.61 (2—90)	7 ± 3.08 (3—16)	**< 0.001**
Cumulative stone size (mm)[a]	18 ± 16.12 (2—90)	10 ± 6.28 (5—30)	**< 0.001**
Pre-stent ureter (*n*, %)	93 (61.18)	25 (64.10)	0.88
Access sheath (*n*, %)	148 (97.37)	35 (89.74)	0.056
Stone free (*n*, %)	77 (50.66)	30 (76.92)	**0.005**
Ambulatory (*n*, %)	72 (47.37)	30 (76.92)	**0.001**
Pain (*n*, %)	37 (24.34)	12 (30.77)	0.538
VRS[a]	4 ± 2.16	5 ± 2.4	0.611
Complications (*n*, %)	46 (30.26)	14 (35.90)	0.552
Clavien 1	32 (69.57)	12 (85.71)	
Clavien 2	12(26.09)	2 (14.29)	
Clavien 3a	1 (2.17)	0	
Clavien 3b	1 (2.17)	0	

fURS: flexible ureteroscopy; VRS: Verbal Rating Scale. *P*-value significant (i.e., < 0.05) indicated in bold.
[a] Mean ± standard deviation (range).

Table 4 Pain and complications characteristics ($n = 366$).

	Double J stent	No stent	*P*-value
Pain (*n*, %)	57 (22)	19 (17.7)	0.338
VRS[a]	4.48 ± 2.32	4.8 ± 2.14	0.4450
Complications (*n*, %)	75 (29)	22 (20.5)	0.1181
Clavien 1	53 (20.5)	19 (17.7)	0.17
Clavien 2	20 (7.7)	2 (1.9)	0.145
Clavien 3a	1 (0.4)	0	0.5
Clavien 3b	1 (0.4)	1 (0.9)	0.5
Pain (*n*, %)	57 (76)	19 (86.4)	0.3979
Fever (*n*, %)	14 (18.6)	2 (9)	0.1664
Hematuria (*n*, %)	1 (1.3)	1 (4.5)	0.4998
Urinoma (*n*, %)	2 (2.6)	0	1
Hematoma (*n*, %)	1 (1.3)	0	1
Rehospitalization (*n*, %)	9 (3.5)	3 (2.8)	1

VRS: Verbal Rating Scale. *P*-value significant (i.e., < 0.05) indicated in bold.
[a] Mean ± standard deviation.

intervention with anesthesia and cannot be feasible in routine.

Most studies evaluating postoperative drainage were performed with patients treated for ureteral stones. Song et al. in 2011 conducted a meta-analysis including 15 studies with 1496 patients. Their conclusions were that ureteral drainage should not be used systematically after semirigid URS. Regarding postoperative pain, patients without DJS were less painful. Results are similar for lower urinary tract symptoms (LUTS) with increased risk of dysuria or urgency in DJS group. There was no differences in persistent fragments, stenosis risk, fever and emergency consultations rates [12].

There are few studies on postoperative stent after fURS. Torricelli et al. in 2014 conducted a retrospective study comparing DJS drainage in patients treated with fURS using an access sheath. Their main outcomes were pain evaluated with a visual analogue pain scale and postoperative complications. Patients without DJS were statistically more painful and were more likely to need emergency room care. There were no differences regarding complications. In a subgroup analysis, they also showed that patients without DJS and without prepared ureter were more painful than patients with prepared ureter. They concluded that postoperative stent with DJS reduces pain but may be optional in case of preoperative ureteral preparation by DJS [13].

Recently, a prospective multicenter study, accomplished by the Clinical Research Office of Endourological Society included 10,437 patients who profit from a fURS or a semirigid URS for renal or ureteral stones. The aim was to evaluate risks and benefits of ureteral drainage. For ureteral calculi, postoperative stents decreased both duration of hospital stay and complications. In the other hand, there was more rehospitalizations. For renal calculi, patients with DJS had also fewer complications. In this study, the DJS postoperative rate was 60% after semirigid URS and 80% after fURS. Complications rates were 1.4% for ureterals stones with DJS

Table 5 Postoperative pain risks factors ($n = 366$).

	Pain ($n = 85$)	Painless ($n = 281$)	*P*-value
Age (years)[a]	55.64 ± 13.34 (20–89)	57.72 ± 17.16 (21–94)	0.312
Ambulatory (*n*, %)	55 (64.70)	162 (57.65)	0.301
Double J stent (*n*, %)	64 (75.29)	195 (69.39)	0.361
Pre-stent ureter (*n*, %)	44 (51.76)	202 (71.88)	**0.0008**
Maximum stone size (mm)[a]	9.79 ± 4.27 (3–20)	11.29 ± 11.52 (2–90)	0.067
Cumulative stone size (mm)[a]	15.22 ± 10.02 (3–60)	15.75 ± 13.57 (2–90)	0.695
Access sheath (*n*, %)	64 (75.29)	173 (61.56)	**0.028**

[a] Mean ± standard deviation (range). P-value significant (i.e., < 0.05) indicated in bold.

Table 6A Univariate logistic regression models examining the postoperative complications ($n = 366$).

	Complications ($n = 97$)	No complication ($n = 269$)	*P*-value
Age (years)[a]	54.45 ± 16.72 (19–88)	56.66 ± 16.99 (18–93)	0.2992
Ambulatory (*n*, %)	62 (63.92)	155 (57.62)	0.3349
Double J stent (*n*, %)	75 (77.31)	184 (68.40)	0.1181
ASA (*n*, %)			0.4237
1	38 (39.17)	98 (36.43)	
2	42 (43.3)	117 (43.49)	
3	12 (12.37)	39 (14.49)	
4	2 (2.06)	1 (0.37)	
Lower calix localization (*n*, %)	35 (36.08)	78 (29.00)	0.2021
Pre-stent ureter (*n*, %)	53 (54.64)	193 (71.75)	**0.0025**
Maximum stone size (mm)[a]	9.686 ± 4.337 (2–20)	11.57 ± 12.76 (3–90)	0.8517
Cumulative stone size (mm)[a]	15.40 ± 10.17 (2–60)	15.86 ± 14.51 (3–90)	0.3579
Access sheath (*n*, %)	73 (75.26)	162 (60.22)	**0.0093**
Surgeon (*n*, %)			**0.0172**
Junior	43 (44.33)	158 (58.74)	
Senior	54 (55.67)	111 (41.26)	

ASA: American Society of Anesthesiologists. *P*-value significant (i.e., < 0.05) indicated in bold.
[a] Mean ± standard deviation (range).

Table 6B Multivariate (B) logistic regression models examining the postoperative complications ($n = 366$).

	OR	95% CI	*P*-value
Double J stent	0.7214	[0.3924–1.2964]	0.28
Ambulatory	0.6532	[0.3890–1.0823]	0.102
Unpre-stent ureter	2.07	[1.2569–3.4113]	**0.0042**
No access sheath	0.5427	[0.3048–0.9436]	**0.0334**
Senior	1.6781	[1.03–2.7459]	**0.0381**

OR: odds ratio; CI: confidence interval. *P*-value significant (i.e., < 0.05) indicated in bold.
Multivariate analysis.

and 1.3% without. They were 4.1% and 10.2% for renals stones. Those rates are similar to ours. In this study, postoperative drainage by DJS reduced number of complications after URS [14].

In our study, to minimize ureteral edema, patients received NSAIDs for a few days after the intervention. This may explain the dissonance with the previous study. Despite NSAIDs, we do not find more septics complications.

In addition, outpatient surgery is now properly codified and supervised. It seems feasible without adding risks for the patient. This is consistent with Oitchayomi et al. study in 2016. They found 6% of complications with an ambulatory load failure rate of 2.2% with 100 patients included [15].

In addition, URS development with fewer complications than percutaneous nephrolithotomy leads us to treat more and more voluminous calculi.

We did not investigate DJS impact on LUTS. It must be considered before stenting as they can alter quality of life and sexual activity [6,7]. Bisio et al. evaluated stent-related symptoms after semirigid URS and fURS. They used the Ureteric Stent Symptoms Questionnaire (USSQ). Two hundred and thirty-two patients completed the USSQ. They had 86.6% of urgency and 82.3% of burning mictions. Urinary tract symptoms were a problem for 88.4% of patients and pain disturb life patients in 92.2%. More than 50% were unhappy with the stent. Before using ureteral stent after URS, urologist should wisely think of consequences and inform patients of secondary effects [16]. It is also necessary to keep in mind necessity of stent removal under local anesthesia by fibroscopy. It increase costs and maybe responsible of infections or pain. To overcome this, using DJS with extractor wire can be an alternative. Patients can then remove stents at home alone or with a nurse or during a simple consultation. A recent meta-analysis compares regular DJS and wired DJS. Patient's majority were able to withdraw their stent at home (97%) and was satisfied (75%). They were also less painful than during cystoscopic ablation. Main risk of wired DJS was premature removal (10%), but it did not increased complications [17]. This technique can be intended in chosen patients, after clear information.

Our study is limited because it is a retrospective mono centric study. We analyzed semirigid URS and fURS to maintain important populations. This is responsible of disparate groups but we consider that it does not impact postoperative pain or our results. Furthermore, despite the large number of surgeons, procedures are standardized, decreasing inter-operator variability.

Conclusion

Not stenting after ureteroscopy seems to be safe for patients with centimeter stones and prepared ureter. Using an access sheath and lack of preoperative stenting may impact postoperative pain and complications. Outpatient surgery should be considered as soon as possible.

Disclosure of interest

The authors declare that they have no competing interest.

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