World Journal of Urology (2019) 37:201–207
https://doi.org/10.1007/s00345-018-2376-6

ORIGINAL ARTICLE

How bothersome double-J ureteral stents are after semirigid and flexible ureteroscopy: a prospective single-institution observational study

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Received: 4 March 2018 / Accepted: 12 June 2018 / Published online: 19 June 2018

Abstract

Purpose To evaluate in details the actual extent of double-J stent-related symptoms after semirigid (URS) and flexible (RIRS) ureteroscopy using a validated questionnaire.

Methods We asked to complete the Ureteric Stent Symptoms Questionnaire (USSQ) to all stone patients undergoing URS or RIRS with stent placement from 2010 to 2015. Stent-related symptoms' prevalence, severity, and impact on daily life were analyzed using descriptive statistics and five-order Likert scales. Subgroups analyses were performed.

Results 232 patients completed the USSQ. Stents had a deep impact on urinary symptoms (daily frequency ≥ 1 per hour 59.1%, ≥ 1 nocturnal micturition 90.1%, urgency 86.6%, burning 82.3%) that represented a problem for 88.4% of patients. 83.2% complained of pain, mostly in the kidney (67.9%) or in the bladder area (31.3%), particularly during physical activity (72.9%) and micturition (77.0%). Pain interfered with everyday life in 92.2%. General health, working, and sexual activity were also affected. 62.0% of patients would be dissatisfied (51.6% unhappy or terrible) if further ureteral stenting was proposed in future. Younger patients and females were more affected. Limitations include observational design and lack of baseline evaluation.

Conclusions Ureteral stents are responsible for significant urinary symptoms and pain after semirigid and flexible ureteroscopy. They also considerably affect general health, working and sexual activity. Urologists should consider it carefully before stenting, inform patients about stent-related symptoms, and minimize stent indwelling time.

Keywords Lower urinary tract symptoms · Pain · Stents · Ureteroscopy · Urinary calculi

Electronic supplementary material The online version of this article (https://doi.org/10.1007/s00345-018-2376-6) contains supplementary material, which is available to authorized users.

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Introduction

Patients usually complain of discomfort and worsening of quality of life due to the presence of a double-J ureteral stent [1]. Although randomized prospective trials have proved that routinary stenting after uncomplicated ureteroscopy is not necessary [2–4], in clinical practice the great majority of urologists prefer to place a stent at the end of ureteroscopy as a kind of insurance toward possible complications [5, 6]. This is particularly true for procedures performed in 1-day surgery and after flexible ureteroscopy with the use of ureteral access sheath, because of the increased risk of ureteral wall injuries [7–9].

The true extent of stent-related symptoms after ureteroscopy and their impact on quality of life are thus of particular interest. The Ureteric Stent Symptoms Questionnaire (USSQ) is a reliable and complete self-administered questionnaire expressly created to evaluate the overall impact of ureteral stents on different aspects of life in a standardized and reproducible way [10]. The use of the USSQ has been encouraged in all clinical trials dealing with stent-related symptoms and validated in many different languages [11–15]. Nevertheless, the USSQ has not been used in many large studies and it has been used mainly to compare different types of stent or to evaluate the efficacy of different drugs [16, 17].

So far, to our knowledge, too little attention has been paid to evaluate stent-related symptoms in details and their impact on quality of life in a standardized way in patients undergoing routine semirigid (URS) and flexible (RIRS) ureteroscopy for stone treatment. In our opinion, this is of particular interest because the worldwide spread of flexible ureteroscopy as renal stones treatment should be intended to increase efficacy but not morbidity. The objective of our study was thus (1) to determine the prevalence and severity of stent-related symptoms after URS and RIRS and (2) to evaluate their impact on all aspects of daily life in a wide and homogeneous series of stone patients, through the USSQ.

Subjects and methods

All consecutive patients undergoing a URS or RIRS for urolithiasis ending with double-J stent placement were asked to participate in a prospective single-institution observational study. Patients were operated at the Stone Centre of "Città della Salute e della Scienza—San Giovanni Battista—Molinette" Hospital in Turin between January 2010 and December 2015. Exclusion criteria were: ureteral stenosis, extrinsic neoplastic ureteral compression, upper tract malignancy, ureteropelvic junction obstruction, preexisting indwelling ureteral stent, urinary tract infection, significant residual fragments, ureteral lesion PULS (Post-Ureteroscopic Lesion Scale) [8, 9] grade ≥ 2, concomitant percutaneous nephrolithotomy, and bilateral stent placement. All endoscopic procedures were performed under antibiotic prophylaxis. In case of ureteral stones, a URS was performed. In case of renal stones, first a URS was done, then a 10.7–12.7 or 11–13 or 12–14 F access sheath was introduced, and finally a RIRS was performed. A 30-W Holmium laser was used for lithotripsy. Stone fragments were extracted with a basket. A retrograde pyelography was performed and a double-J stent was placed at the end of the operation. The length of the stent was based on patient's height. The diameter and type of the stent were decided based on hospital supply and availability at the time of surgery. An incompliant ureter, a significant oedema of ureteral mucosa, impacted stones, and operations performed in 1-day surgery were indications for stenting at the end of URS. The use of the access sheath was the indication for stenting at the end of RIRS. At discharge, analgesics were given at request and no antibiotics were routinely prescribed. Patients were pre-operatively informed about the risk of suffering from stent-related symptoms and were asked to complete the validated Italian version of the Ureteric Stent Symptom Questionnaire (USSQ) 3 weeks after surgery before stent removal. Double-J stents were removed 3–4 weeks after surgery, according to our internal protocol. The USSQ consists of six different sections plus two conclusive questions, exploring urinary symptoms, body pain, general health, work performance, sexual matters, additional problems, and general satisfaction.

Statistical methods

Primary endpoint of the study was patients' general satisfaction rate investigated by question GQ of the USSQ. Secondary endpoints were: (1) rate and severity of each different symptom investigated by the USSQ and (2) USSQ items by type of procedure (URS vs. RIRS), by age, and by gender.

All the results for continuous variables were expressed as median (interquartile ranges—IQR), while for categorical variables by their frequency. The associations between categorical variables were analyzed by Fisher's exact test, while the Mann–Whitney and Kruskal–Wallis tests were used for continuous variables. Subgroups analyses were performed. Patients were stratified by three different variables: type of procedure (URS vs. RIRS), age (≤ 40 vs. 41–60 vs. > 60), and gender (M vs. F). Each USSQ item was analyzed according to these variables. Symptoms severity was presented also through five-order Likert scales [18].

Table 1 Characteristics of the 232 stented patients, stones, operations and double-J ureteral stents

	Median [IQR]
Patients	
Age (years)	53 [43, 63]
Height (cm)	169.5 [162, 175]
Patient's height/stent length ratio	6.62 [6.46, 6.81]
	Number (%)
Patients	
Sex	
Males	146 (62.9%)
Females	86 (37.1%)
Employment status	
Full time	106 (47.7%)
Part time	15 (6.8%)
Not working	101 (45.5%)
Stones	
Size (mm)	
0–5	17 (8.4%)
6–10	107 (53.0%)
11–15	54 (26.7%)
16–20	24 (11.9%)
Ureteroscopies	
Semirigid	84 (36.2%)
Flexible	148 (63.8%)
Double-J ureteral stents:	
Type	
Polaris™ Ultra Boston Scientific	72 (31.2%)
Integral Rusch—Teleflex Medical	129 (55.8%)
Others[a]	30 (13.0%)
Length (cm)	
22	5 (2.2%)
24	83 (35.8%)
26	114 (49.1%)
28	28 (12.1%)
30	2 (0.9%)
Diameter (French)	
4.7–4.8	9 (3.9%)
5	29 (12.5%)
6	176 (75.9%)
7	17 (7.3%)
8	1 (0.4%)

[a]Vortek® Coloplast Porges; Inlay Optima® Bard; Sof-Flex® Cook Medical; Percuflex® Boston Scientific

All the reported *p* values were obtained by the two-sided exact method at the conventional 5% significance level.

The study was conducted according to the principles of the Helsinki Declaration. According to Italian law, an Institutional Review Board approval was waived due to the prospective observational nature of this research.

Results

281 consecutive patients were asked to participate in the study. 232 patients fulfilled the inclusion and exclusion criteria, completed, and returned the questionnaire. The detailed characteristics of patients, stones, operations and ureteral stents are presented in Table 1.

General question (GQ)

At the sentence "In the future, if you were advised to have another stent inserted, you would feel…" 62.0% (137) of patients answered they would be at least dissatisfied and 51.6% (114) unhappy or terrible. Figure 1 shows the detailed answers to the GQ.

Urinary symptoms

A daily urinary frequency ≥ 1 per hour was present in 59.1% (137) of patients. During the night, 90.1% (209) passed urine at least once and 56.0% (130) twice or more. 86.6% (201) complained of urgency and 36.6% (85) of urge incontinence. A feeling of incomplete bladder emptying was reported by 81.0% (188). 82.3% (191) experienced burning at voiding. 68.5% (159) had episodes of macroscopic hematuria and urine was heavily blood stained with or without clots in 27.6% (64).

88.4% (205) of patients stated that their urinary symptoms represented a problem and 47.0% (109) quite a bit or an extreme problem. 79.3% (184) would feel mostly dissatisfied, unhappy, or terrible if they had to spend the rest of their life with their urinary symptoms.

Figure 1 shows detailed answer to question U11 and Likert scales on urinary symptoms. Table S1 shows in detail the prevalence and severity of urinary symptoms.

Body pain

The ureteral stent was the cause of pain or discomfort in 83.2% (193). The most common sites of pain were kidney area at voiding (67.9%, 131) and bladder area (31.1%, 60). Median Visual Analogue Scale (VAS) score was 5 [2, 7]. 72.9% (167) complained of pain during physical activities. Pain was responsible for sleep interruption in 43.9% (101) and was present at voiding in 77.0% (177). 56.5% (109) of patients with pain required analgesics and 92.2% (178) reported that pain interfered with everyday life.

Table S2 shows in detail the characteristics of body pain and discomfort.

General health

81.5% (189) of patients felt tired and worn out while having the stent. 50.0% never or rarely felt calm and peaceful. 26.7% (62) never enjoyed social life and 50.0% (116) needed extra-help from family members or friends. 82.5% (189) had difficulty in performing heavy physical activities and 55.2% (128) also light physical activity. Detailed impact of the stent on general health is reported in Table S3.

Work performance

Stent-related symptoms kept patients in bed all or most of the day for a median of 2 [0, 4] days. Patients cut down their routine activities for a median of 5 [1, 10] days. 52.4% (54/103) of patients worked for short periods or took frequent rests. 41.2% (42/102) had to make some changes in their usual work. 44.6% (45/101) did not work their regular number of hours. Detailed results about work performance are presented in Table S4.

Sexual matters

40.4% (61/151) of patients having an active sexual life before stent placement stopped it after insertion of the stent. 55.7% (34/61) of them stopped it because of stent-related problems. 38.9% (35/90) of patients having an active sexual life had pain during sexual intercourses. Detailed results about sexual matters are presented in Table S5.

Additional problems

55.2% (123) of patients felt they may be suffering from a urinary tract infection. 31.4% (71) needed to take antibiotics, 20.7% (47) needed to seek help of a health professional, and 12.4% (28) needed to visit the hospital.

Subgroups analyses

Likert scales after stratifications are reported in Fig. 1. Association test p values after stratification are reported in Table S6.

Stratification by type of procedure

Patients felt they might be suffering from a urinary tract infection ($p = 0.043$) and needed to visit the hospital due to stent-related problems ($p = 0.026$) more frequently after RIRS than after URS.

Stratification by age

Younger patients experienced macroscopic hematuria ($p < 0.001$), burning at voiding ($p = 0.025$), and feeling of incomplete bladder emptying ($p = 0.012$) more often than older patients. Body pain or discomfort affected mainly younger patients ($p = 0.013$) and interfered more with their life ($p = 0.002$). Younger patients reported a higher median VAS score ($p = 0.001$), experienced more commonly pain during micturition ($p < 0.001$), especially in the kidney area ($p = 0.018$), and required painkillers more frequently ($p = 0.001$). Younger patients also felt more often tired and worn out ($p = 0.001$), found it more difficult to perform light physical activities ($p = 0.014$), and more frequently stopped their sexual life ($p < 0.001$) due to stent-related problems ($p = 0.011$). Older patients reported nocturia more frequently ($p < 0.001$).

Stratification by gender

Women experienced urge incontinence ($p = 0.029$) and sleep interruptions ($p = 0.018$) more frequently than men and required more painkillers ($p = 0.042$). Women also found it more difficult to perform light physical activities ($p = 0.003$), needed more often extra-help from their family members and friends ($p < 0.001$) and from health professionals ($p = 0.015$). Finally, women enjoyed less of their social life ($p = 0.035$) and reported more commonly pain during sex ($p = 0.008$).

Discussion

The results of our study show that double-J ureteral stents placed at the end of URS and RIRS deeply affect all aspects of daily life. We found that ureteral stents were responsible for urinary symptoms and pain, and were associated with worsening of working activity, sexual activity, and general health. Patients needed to visit the hospital due to stent-related problems more often after RIRS than after URS. Younger patients and women were more affected by symptoms than older patients and men.

To investigate the potential influence of different type and length of stents on symptoms severity, we tested it by a series of different logistic multivariate models. There was no significant association among the stent different type and length and all outcomes.

Stent-related symptoms have already been investigated, but most studies share some limitations. First of all, samples are numerically limited and heterogeneous. Patients undergoing stenting for different indications were usually considered together [2, 19, 20], including those undergoing surgery on the excretory system. Moreover, symptoms were

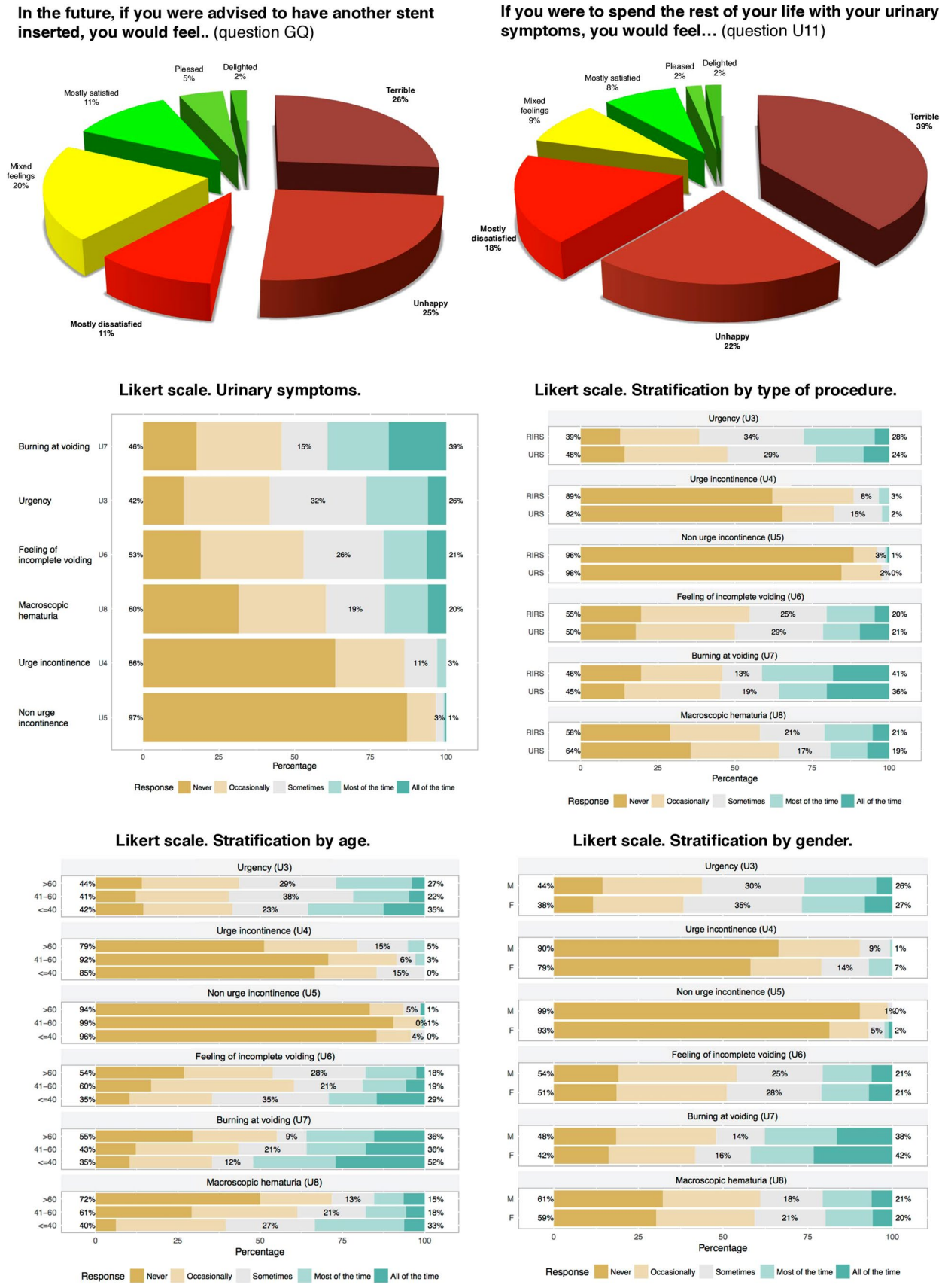

Fig. 1 Answers to questions GQ and U11 of the USSQ and Likert scales

often investigated by non-specific questionnaires, such as IPSS [21, 22].

The USSQ is the only specific and validated questionnaire to assess the wide spectrum of stent-related symptoms and their impact on QoL [10, 21, 22].

The prevalence of stent-related symptoms was first reported by Joshi et al. on 62 patients with unilateral indwelling ureteral stents that completed the USSQ during its validation phases 4 weeks after stent insertion and removal. The authors showed that the differences between the prevalence of stent-related symptoms compared to post-stent status reached statistical significance. Symptoms were also significantly worse compared to the non-stent groups [1].

In our study for the first time, we tested the USSQ on a wide homogenous group of patients undergoing URS and RIRS for urolithiasis and we presented symptoms in details through Likert scales to make them easier to read and understand. To our knowledge, the cohort of our trial is by far the largest in the literature. A widespread use of the USSQ has been advocated both to standardize symptoms evaluation and to confirm its usefulness. The use of the USSQ we made on a large cohort with different geographical origins and indications for stenting compared to Joshi's studies [1, 10] represents a further step in enhancing the USSQ as a valuable tool for analysis of stent-related symptoms.

The lack of symptoms' assessment before stenting and after stent removal might represent a limitation of our study. Nevertheless, the USSQ proved to have a good sensitivity compared to stent post-removal status [1, 10]. Although the quite long stent indwelling time could be considered a limit of our study, the evaluation of symptoms after a comparable indwelling time was used also in the validation study of the USSQ [1, 10]. Furthermore, stent-related symptoms seem not to be influenced by indwelling time and can be considered as an overall evaluation of the indwelling period [1, 23].

In our opinion, our study represents an important step forward in the characterization and evaluation of the extent of stent-related symptoms after ureteroscopy. The implications of our study in clinical practice are relevant also because URS and RIRS represent frequent but controversial indications for stenting [24–26]. Although ureteral stenting could probably be avoided after uncomplicated ureteroscopy [26], most urologists place a stent after most URS and RIRS [5]. This is especially true when ureteroscopy is performed in 1-day surgery, as in our case, and patients are discharged few hours after surgery. This is also true after RIRS as stenting after ureteral access sheath use has been proved to reduce postoperative complications and visits [27]. As RIRS has become more and more common, urologists should care about the overall satisfaction of patients that might not appreciate it because of stent-related symptoms. Before stenting at the end of ureteroscopy, urologists should carefully consider the prevalence and severity of symptoms highlighted by our study and their influence on QoL.

Although alpha-blockers can be used to reduce symptoms, in our opinion they should not be considered the answer to such an avoidable iatrogenic problem. In fact, the solution should be stenting only when absolutely needed and leave stents in place as short as possible. Options such as leaving overnight ureteral catheters or stents with extraction strings should be considered to allow an early removal in uncomplicated cases. In this respect, a clear agreement on the definition of "uncomplicated ureteroscopy" would be desirable to identify the cases in which stenting could be safely avoided both after URS and RIRS [26, 28]. Further research is desirable also to define evidence-based minimal stent indwelling times [29], to identify symptom-related variables and to produce better tolerated stents [28].

In conclusion, our study highlighted that double-J ureteral stents use at the end of URS and RIRS is associated with severe symptoms deeply affecting QoL. Urologists should consider it carefully before stenting, inform patients about stent-related symptoms, and minimize stent indwelling time.

Author contributions AB: protocol development, data collection and management, data analysis, manuscript writing. EA, ED, DP, and SA: data collection and management. AB, PD, RP, and PG: protocol development and data analysis.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

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