International Urology and Nephrology (2019) 51:1949–1953
https://doi.org/10.1007/s11255-019-02262-7

UROLOGY - ORIGINAL PAPER

Intravesical stent position as a predictor of quality of life in patients with indwelling ureteral stent

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Received: 16 June 2019 / Accepted: 17 August 2019 / Published online: 22 August 2019

Abstract

Purpose The internal drainage provided by a ureteral stent helps with the relief and prevention of ureteral obstruction. By definition, correct stent placement is one with a complete loop in both the renal pelvis and bladder. This prevents stent migration proximally or distally despite urinary flow, patient movement, and ureteral peristalsis.

Methods We performed a comparative prospective cross-sectional study assessing the impact of intravesical stent position on the quality of life in 46 patients with a ureteral stent. This is done using the Ureteral Stent Symptom Questionnaire (USSQ).

Results 52.5% of patients had an ipsilateral positioned intravesical stent, while the remaining had their stent positioned contralaterally. Intravesical stent position significantly influenced the quality of life. The USSQ score was worse for the contralateral group. Subscore analysis found that urinary symptoms and body pain index contribute significantly to the morbidity. Majority of patients in the ipsilateral group reported no discomfort as compared to the contralateral group.

Conclusions To the best of our knowledge, this is the first study assessing the impact of intravesical stent position on the quality of life in the Asian population. Intravesical stent position has a significant influence on patient's morbidity and quality of life in particular towards their urinary irritative symptoms and body pain. It is imperative to ensure correct distal placement of ureteric stent that does not cross the midline to the contralateral site. We believe that the USSQ should be used in daily clinical practice in assessing the symptoms related to indwelling ureteric stents.

Keywords Ureteric stones · Ureteral stent · Stent irritation · Patient's satisfaction · Ureteral Stent Symptom Questionnaire

Introduction

Ureteral stent insertion is the bread and butter of a urologist. The internal drainage provided by the ureteral stent helps with the relief and prevention of ureteral obstruction. The pigtail catheter provides self-retaining capability due to a double-coil design at proximal and distal ends that work to securely anchor the stent in the upper urinary tract and the bladder.

By definition, correct stent placement is one with a complete loop in both the renal pelvis and bladder [1]. This prevents stent migration proximally or distally despite urinary flow, patient movement, and ureteral peristalsis [2]. Complications associated with ureteral stents have been documented. Joshi et al. developed the Ureteral Stent Symptom Questionnaire (USSQ) to evaluate the symptoms and impact on the quality of life of patients following ureteral stent insertion [3, 4].

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The pain of voiding, flank soreness and lower urinary tract symptoms (LUTS) caused by stent placement is due to multiple factors. These include mechanical stimulus from the stent causing local irritation of the bladder and ureteric mucosa, smooth muscle spasm and high-pressure ureteric reflux [2, 5]. The use of α-blockers and anticholinergic may control LUTS by relaxing the smooth muscles, thus decreasing bladder outlet resistance and voiding pressure, thereby decreasing renal reflux [7].

Ad hoc analysis from studies assessing medical therapy on stent-related symptoms showed that stent-related symptoms were significantly related to midline crossing of intravesical stent position [6, 7]. Longer intravesical stents might cause more problems as it may cause irritation to bladder neck and trigone [8]. Patients might be reluctant to undergo another stent insertion due to the negative symptoms experienced. We prospectively analysed the intravesical position of ureteral stent in relation to patients' quality of life.

Materials and methods

This is a comparative prospective cross-sectional study assessing the impact of intravesical stent position on the quality of life in patients with a ureteral stent. This is a single center study conducted at a teaching university hospital in Malaysia. Ethics approval was obtained before the start of this study from the university's research ethics committee. Written informed consent was taken prior to study commencement. Patient recruitment took place before stent removal in a daycare setting. Adults above 18 years of age with a unilateral indwelling ureteral stent were included. We excluded patients who are pregnant, having transplanted kidneys or reconstructed urinary system, having a metallic stent or with ureteral strings attached, having urinary obstruction due to malignancy as well as patients where the stent was inserted after open renal procedures. The study period was 6 months in total.

At the end of the ureteral stent wear-time, which was prior to ureteral stent removal, patients were interviewed using the validated USSQ by a single interviewer. The USSQ contained six sections to evaluate the impact of stents on health-related quality of life that included urinary symptoms, body pain, general health, work performance, sexual matters and additional problems. Simple sums were obtained to derive an index score for each section of the USSQ. There was no single score for the whole questionnaire as each section scores represent separate domains and characteristics of the stent experience. Demographic data on age, ethnicity, body mass index (BMI), employment status, indication for stent insertion, site of stent placement, intravesical stent position and their indwelling time were recorded.

The ureteric stents used were open tip ureteral stent sized 6 Fr, 24 cm in length (Allwin Medical Devices, USA) for all patients. All ureteral stent insertions were performed under fluoroscopy guidance. Plain radiographs of the kidney, ureters and urinary bladder are performed just prior to the stent removal procedure, at the end of the stent wear-time, to assess the intravesical stent position. Intravesical stent position was classified into two categories depending on the location of the distal loop: ipsilateral or contralateral. A perpendicular line is drawn through the midline gap of the pubic symphysis on the plain radiograph performed to determine whether the intravesical stent position is ipsilaterally or contralateral (Figs. 1, 2). Findings were documented in the patient's data collection sheet. All data obtained entered into SPSS data sheet for analysis and review. Data were analysed using SPSS version 24. The differences between responses were tested for statistical significance. A p value of < 0.05 is taken as significant.

Results

Of the 50 patients assessed for eligibility, four patients were excluded. Two patients refused to undergo plain radiographs as part of the study protocol, one patient had a concomitant

Fig. 1 Plain radiograph of the kidney–ureter–urinary bladder showing the intravesical position of the stent that is ipsilateral

Fig. 2 Plain radiograph of the kidney–ureter–urinary bladder showing the intravesical position of the stent that is contralateral (crossing the midline)

retained fractured ureteric stent, and the other patient did not complete the questionnaire.

Baseline characteristics of patients' age, gender, BMI, employment status and sexual activity did not differ significantly between groups. The median duration of the indwelling ureteral stent before stent removal was 2 and 3 weeks in the ipsilateral and contralateral group, respectively. The indication for ureteral stent insertion was evenly distributed within the ipsilateral group as opposed to the contralateral group, whereby most of the stents were inserted following endoscopic lithotripsy surgery. In both groups, most of the stones were located within the pelvicalyceal system. Their demographics and clinical characteristics are summarised in Table 1.

Twenty-four patients (52.2%) had an ipsilateral positioned intravesical stent, while the remaining had their stent positioned contralaterally. Intravesical stent position significantly influenced the quality of life. The median USSQ total score was worse for the contralateral group with a median of 64 (IQR 55–80) as compared with 47 (IQR 32–62) for those with ipsilateral stents ($p = 0.003$). Subscore analysis found that urinary symptoms ($p = 0.002$) and body pain index ($p = 0.013$) contribute significantly to the morbidity. There were no significant difference between the USSQ subscores for general health ($p = 0.056$), work performance ($p = 0.285$), sexual matters ($p = 0.132$), and additional problems ($p = 0.128$) between the two groups. The influence of intravesical stent position on USSQ total score and subscore according to the respective domains is listed in Table 2.

Table 1 Patients demographics and characteristics

Variables	Ipsilateral	Contralateral	*p* value
Stent position	24 (52.2)	22 (47.8)	0.087
Age (years)	55 (47–76)	52 (43–66)	0.282
Gender			
Male	14 (58.3)	16 (72.7)	0.364
Female	10 (41.7)	6 (27.3)	
BMI (kg/m^2)	24 (23–28)	27 (24–28)	0.406
Ethnicity			
Malay	14 (58.3)	18 (81.8)	0.021
Chinese	10 (41.7)	2 (9.1)	
Indian	0 (0.0)	2 (9.1)	
Employment status			
Employed	8 (33.3)	12 (54.5)	0.336
Unemployed	4 (16.7)	2 (9.1)	
Retired	12 (50.0)	8 (36.4)	
Sexual activity			
Active	8 (33.3)	3 (13.6)	0.118
Inactive	16 (66.7)	19 (86.4)	
Stent duration (weeks)	2 (2–5)	3 (3–4)	0.060
Stent indication			
Stone obstruction	13 (54.2)	4 (18.2)	0.012
Post-intervention	11 (45.8)	18 (81.8)	
Stone location			
Pelvicalyceal	11 (45.8)	14 (63.6)	0.042
Ureter	7 (29.2)	8 (36.4)	
Vesicoureteric	6 (25.0)	0 (0.0)	

Values are presented as numbers (%) and median (IQR)

The difference in body pain and discomfort was significant between the two groups ($p = 0.005$). 41.7% of patients in the ipsilateral group reported no discomfort as compared to the contralateral group (13.6%). Bladder pain was experienced in half the patients in the contralateral group (50.0%).

Table 2 The influence of stent position on USSQ score and domains

USSQ domains	Ipsilateral	Contralateral	*p* value
Urinary symptom	22 (19–26)	28 (24–38)	0.002
Body pain	11 (0–16)	18 (11–22)	0.013
General health	8 (6–11)	9 (7–15)	0.056
Work performance	0 (0–4)	0 (0–7)	0.285
Sexual matter	0 (0–2)	0 (0–3)	0.132
Additional problems	4 (4–6)	5 (4–6)	0.128
Total score	47 (32–62)	64 (55–80)	0.003

Score for each domain in median (interquartile range)

Table 3 Site of body pain and discomfort in association with stent position

Body pain	Ipsilateral	Contralateral	*p* value
Pain site			0.005
No discomfort	10 (41.7)	3 (13.6)	
Kidney front	0 (0.0)	1 (4.5)	
Bladder	2 (8.3)	11 (50.0)	
Kidney back (loin)	8 (33.3)	7 (31.8)	
Penis	4 (16.7)	0 (0.0)	

Values presented as numbers (%)

Table 4 Attitude towards future stent insertion

Attitude	Ipsilateral	Contralateral	*p* value
Future stent			0.017
Satisfied	3 (12.5)	7 (31.8)	
Mixed	11 (45.8)	2 (9.1)	
Dissatisfied	10 (41.7)	13 (59.1)	

Values presented as numbers (%)

The site of body pain and discomfort in association with stent position are listed in Table 3.

There was a significant difference in attitude towards future stent insertion ($p=0.017$). In both groups, the majority of patients expressed dissatisfaction and hesitance towards future stent insertion. There were mixed feelings of having a ureteral stent in situ in the ipsilateral group (45%) as opposed to the contralateral group (9.1%). Only a minority is willing to have another ureteral stent inserted should it be necessary in the future. These are summarised in Table 4.

Discussion

This study examined the influence of intravesical stent position on the quality of life using the USSQ specifically designed to assess ureteral stent symptoms. Assessment of intravesical stent position towards the end of the stent indwelling time was used as it would take into account the stent's predominant position better than the early postoperative period. This also allows patients to have enough time to experience the effect the stent may have on their daily activities.

Flank pain was experienced equally in both our study groups. The contributing factors and pathophysiology of urinary irritation and pain symptoms related to the stent are attributed to the high pressure transmitted to the renal pelvis during micturition, causing vesicoureteric reflux and flank soreness [9]. The renal pelvis pressure significantly increases during the voiding phase following stenting [10]. However, the increase in pressure is not influenced by intravesical stent position as represented in our study. It is important to note that half of the patients in this study who had distal part of the stent positioned contralaterally experienced pain in the bladder. This stent-associated pain and urinary frequency are related to lower ureteral spasm and local bladder trigone irritation. The sensory afferent fibres are located mainly at the bladder neck and trigone area, where the intravesical part of the stent causes local irritation [11].

Patient with stone obstruction was more in the ipsilateral group as compared to the contralateral group. Despite this, body pain is still significant among those with contralaterally positioned intravesical stent ($p=0.013$). This finding showed that the presence of ureteral stone was not a body pain contributor once ureteral stent was inserted. Instead, intravesical stent position was a significant factor for body pain. It is interesting to note, however, that only the ipsilateral group experienced penile pain, which is not seen in the contralateral group.

The influence of stent position on sexual matters was found to be insignificant. Most of the patients interviewed are either not sexually active or do not engage in sexual activity following stent insertion. There was also an insignificant difference in general health and work performance. These results were consistent with a previous study done [12]. The effect in general health and work performance might be tolerated given the short indwelling duration. However, they might pose a significant problem if the stent is kept for a longer duration [12].

Patients were offered to provide their opinions relevant regarding ureteral stent inserted; more than 50% of patients preferred to be given pre-ureteral stent counselling for better mental and physical preparation. In a study by Grunewald et al., patients who underwent ureteroscopy with ureteral stent insertion were given advanced counselling, including a thorough review of the accompanying handout. They found that it significantly reduced patients' postoperative concern and their utilisation of resources for normal sequelae of ureteroscopy and stent-associated complications [13].

The majority of patients within the contralateral group had a stent inserted following endoscopic lithotripsy surgery. The necessity of postprocedure ureteral stent insertion is debatable, as preventive strategies in reducing morbidity include avoiding ureteral stent in uncomplicated cases. This is in line with the 2007 Guidelines for the Management of Ureteral Calculi from the joint committee of EUA/AUA Nephrolithiasis Guideline Panel. The indications for ureteral stent insertion after the completion of the procedure are ureteral injury, stricture, solitary kidney, renal insufficiency or large residual stone burden [14]. However, stent inserted following endoscopic lithotripsy surgery remained a common practice in this region.

To the best of our knowledge, this is the first comparative cross-sectional study assessing the impact of intravesical stent position on the quality of life in the Asian population. We believe that USSQ is a reliable and sensitive tool in assessing the symptoms related to indwelling ureteric stents, and it can be used in our daily clinical practice. There are a few limitations to this current study. The modest sample size might not truly reflect the actual influence of stent position. Patients with lower urinary tract symptoms caused by other causes such as benign prostate enlargement in male patients might confound the result as well.

Conclusion

Intravesical stent positions have a significant influence on patient's morbidity and quality of life in particular towards their urinary irritative symptoms and body pain. It is imperative to ensure correct distal placement of ureteric stent that does not cross the midline to the contralateral side. We believe that the USSQ should be used in daily clinical practice in assessing the symptoms related to indwelling ureteric stents.

Source of funding None.

Compliance with ethical standards

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

Ethical approval All procedures performed in this study were in accordance with the ethical standards of the institutional research committee (The National University of Malaysia Research Ethics committee, reference number UKM PPI/111/8/JEP-2016-453) 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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