Ureteral Stents: Morbidity and Impact on Quality of Life*

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Abstract

Background: Stents offer a simple and effective drainage method for the upper urinary tract. However, ureteral stents are associated with frequent side effects, including irritative voiding symptoms and hematuria.

Objectives: To determine the side effects associated with ureteral stents and their impact on sexual function and quality of life.

Methods: Symptom questionnaires were administered to 135 consecutive patients with unilateral ureteral stents. The questionnaire addressed irritative voiding symptoms, flank pain, hematuria, fever, loss of labor days, anxiety, sleep impairment, decreased libido, erectile dysfunction, dyspareunia, painful ejaculation, and a subjective overall impact on quality of life. The items were graded from 1 (minimal or no symptoms) to 5 (maximal symptoms). The patients were seen and questionnaires filled at 2 weekly intervals following stent insertion until stent extraction. Following removal of the stent, stent patency, impaction and migration rates were determined. Admissions to hospital and ancillary procedures to retreive stents were noted.

Results: The findings presented refer to questionnaire items scoring 3 or more. Dysuria, urinary frequency and urgency were reported by 40%, 50% and 55% of the patients, respectively. Flank pain, gross hematuria or fever was reported by 32%, 42% and 15% respectively. Among working patients, 45% lost at least 2 labor days during the first 14 days, and 32% were still absent from work by day 30. A total of 435 labor days were lost in the first month. Anxiety and sleep disturbance were reported by 24% and 20% respectively, and 45% of patients reported impairment in their quality of life. Decreased libido was reported by 45%, and sexual dysfunction by 42% of men and 86% of women. Stent removal necessitated ureteroscpoy in 14 patients (10.5%), due to upward migration in 11 (8.2%) and incrustation and impaction in 3. Spontaneous stent expulsion occurred in one patient. Forty-six stents (34%) were obstructed at the time of removal. Obstructed stents were associated with a longer mean dwell time as compared to the whole population, 75 versus 62 days respectively (P = 0.04).

Conclusions: Ureteral stents are associated with frequent side effects and significant impact on patient quality of life. Our findings should be considered when deciding on ureteral stent insertion and dwell time.

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Temporary drainage of the upper urinary tract is commonly provided by internal ureteral stents. In the last two decades ureteral stents have become the most prevalent means for upper tract drainage. Indications have been extended from prevention of a stone street following shockwave lithotripsy to include other clinical conditions such as endopyelotomy and relief of extrinsic ureteral obstruction [1–3]. Stents offer a simple and effective drainage method for the upper urinary tract, and since they are devoid of external devices are perceived as convenient for both the urologist and the patient.

Nonetheless, ureteral stents are associated with frequent side effects, including irritative voiding symptoms and hematuria [4]. Furthermore, failure to remove the stent within a defined time span increases the risk of stent incrustation and fragmentation [5,6]. Several recent reports addressed the issue of side effects associated with indwelling ureteral stents and their impact on patient quality of life [4,7–9]. In the present study we prospectively analyzed the side effects, morbidity, and impact on sexual function and quality of life attributed to ureteral stents.

Patients and Methods

Our study group comprised 135 consecutive patients in whom unilateral ureteral stents were inserted. They were followed prospectively with an interview and a symptom questionnaire completed at 2 weekly intervals until the stents were removed. Patients with debilitating diseases or advanced malignancy were excluded, as were patients with bilateral stents or with a previous history of stenting.

The symptom questionnaire that we used was adapted from a previous validated version of symptoms and quality of life assessment in patients undergoing prostate biopsies [10]. Symptoms were assessed on a Visual Analogue Scale graded from 1 (minimal or no symptoms) to 5 (symptoms of maximal severity). The following items were evaluated: dysuria, urinary frequency, urgency, flank pain during micturition, the occurrence of macroscopic hematuria, and temperature above 37.5°C. Urine cultures were collected at every visit, and the rate of admissions to hospital during the indwelling stent period was monitored for all patients. The functional items included: anxiety attributed to the presence of a stent, sleep impairment, pain during sexual intercourse, erectile dysfunction, loss of libido, dyspareunia, and pain during ejaculation. Also determined were the loss of labor days, the use of analgesics, and the subjective impact of the stent on quality of life.

All stents were removed by cystoscopy and their patency was determined by gently passing a 0.035' hydrophilic coated guidewire (Glidewire) through the stent immediately following its extraction. Upper stent migration or spontaneous stent dislodgement was noted, as was the need for ureteroscopy for stent extraction due to either upward migration or stent incrustation and impaction.

Descriptive statistical methods were applied to analyze the distribution of the various parameters. Student's t-test and Spearman's correlation were used to analyze continuous variables, with $P < 0.05$ considered significant.

Results

The average patient age was 52 years (range 19–91 years); 79 (58.5%) were men. Stents were inserted into the right urinary system in 72 patients (53.3%). The average stent dwelling time was 62 days (range 9–225 days). Indications for stent insertion are shown in Table 1, and the number of patients available for analysis at each follow-up in Table 2. The most common symptoms were dysuria, urinary frequency and urgency, which were of grade ≥ 3 in 40%, 50% and 55% of the patients, respectively. The rate of grade ≥ 3 for irritative voiding symptoms was constant over time.

There was an inverse correlation between patient age and dysuria: $r = -0.21$, $P = 0.01$. No correlation was found between age and urgency, frequency or flank pain. Flank pain during micturition of grade ≥ 3 was reported by a third of the patients. Constant dull flank pain not associated with micturition was reported by 19 patients. Thirty-three (25%) and 28 (23%) patients took analgesics at least once daily for flank pain control during the first 14 and 30 days after stent insertion, respectively. The proportion of patients with flank pain grade ≥ 3 remained constant over time.

At least one episode of macroscopic hematuria was reported in 69 patients (51.1%) on day 14, in 41 (33.8%) on day 30, in 36 (41.8%) on day 45, in 19 (41.3%) on day 60, and in 10 (41.6%) on day 90 after stent insertion.

Anxiety of grade ≥ 3 that was attributed to the presence of the stent was reported by 24% of patients. Sleep disorders, defined as awakening more often than the baseline value before stent insertion, were reported by 20% of the patients. Nocturia was the principal reason for sleep disorders.

Of 80 patients who were working, 36 (45%) lost some labor days during the first 2 weeks after stent insertion. At 30 and 45 follow-up days, 20 of 57 (30%) and 17 of 52 (32%) working patients lost labor days. Cumulatively, 203 and 435 labor days in total were lost during the first 14 and 30 days following stent insertion, respectively. All lost labor days were attributed to symptoms related to the indwelling stents.

Of 75 sexually active patients of both genders, 47 (62.6%) reported an impairment in sexual function of grade ≥ 3. This included pain, erectile dysfunction, decreased libido, and apprehension that intercourse with an indwelling stent may be harmful. Overall, women had a more pronounced sexual impairment than men. Moderate to high decrease in libido was reported

Table 1. Indications for stent insertion

Ureteral stones	43 (31.9)
Renal stones	29 (21.5)
Ureteral and renal stones	7 (5.2)
Following ureteroscopy	17 (12.6)
Following endopyelotomy	17 (12.6)
Ureteral stricture	8 (5.9)
Ureteral injury	5 (3.7)
Ureteropelvic stenosis	3 (2.2)
Hydronephrosis in prgenancy	2 (1.4)
Other*	4 (2.9)

Numbers in brackets are percentages of total.

* Fibroepithelial polyp, ureterovesical junction stricture, edema following percutaneous nephrostolithotripsy (n=2).

Table 2. Total number of patients with indwelling stent who were available for analysis on each follow-up visit throughout the entire study period

Follow-up (days)	Analyzable	Stents removed (total)	Unavailable
0	135	0	0
14	131	4	0
30	121	12	2
45	86	49	0
60	46	79	10
90	24	100	11*

* Stents were extracted from all patients including the 11 who were not available for evaluation on day 90.

by 38% of men and 66% of women. Maximal impact on sexual function was reported by 42% of men (22/53 sexually active) and 66% of women (14/22 sexually active). Erectile dysfunction, defined as insufficient erection for penetration, was reported by 20% of stented sexually active men. Twelve of 22 sexually active women (54%) refrained from having intercourse following stent insertion. This was due to apprehension that such activity may be harmful with a stent, to loss of libido, or to painful attempts to have intercourse. Painful intercourse was experienced by 32% of sexually active men, with 12 men (46%) reporting painful ejaculation of grade ≥ 2. Dyspareunia of grade ≥ 3 was reported by 62% of women.

Overall quality of life impairment of grade ≥ 3 was reported by 41–52% of patients throughout the stent dwell time.

Fever above 37.5°C occurred in 15 patients (11.1%) on day 14, in 17 (14%) on day 30, in 6 (7%) on day 45, in 7 (15%) on day 60, and in 1 patient (4%) on day 90 after stent insertion.

Sixty-nine positive urine cultures were observed in 48 patients (35.5%) throughout the stent dwelling period. The most common pathogens were E*scherichia coli* in 21 cultures and Enterococcus in 20 cultures. Gram-positive cocci (including Enterococcus and Staphylococcus) were cultured in 31 (45%) of 69 cultures.

Two of the 135 patients had their stents removed in other hospitals and data on stent removal were therefore available

in 133 patients. Stent removal necessitated ureteroscopy in 14 cases (10.5%) due to upward migration in 11 (8.2%) and incrustation or impaction with calculi in 3 patients. Spontaneous stent expulsion occurred in one female patient. Forty-six of the 133 examined stents (34%) were obstructed at the time of removal. The average dwell time was 75.4 days in patients with obstructed stents (range 9–225 days) as compared to an average dwell time of 62 days in all 135 patients; $P = 0.04$ (Student t-test). Stent occlusion was not associated with increased lower urinary tract symptoms, hematuria, flank pain, fever, or admission rate [Figure 1].

Twenty-one patients (15%) were admitted to the hospital during the stent dwelling period. The diagnosis at admission was infection in 7, stent migration in 11 and intractible dysuria or flank pain in 3.

Figure 1. Average intensity of lower urinary tract symptoms [A] and flank pain [B] in patients with obstructed versus patent stents

Discussion

Our study provides evidence that a significant proportion of stented patients have bothersome symptoms and side effects, most of which persist during the entire stenting dwell time. Stented patients have functional impairment in many aspects of everyday life, including anxiety, sleep disorders, sexual function and desire, loss of labor days, and a significant impact on patient quality of life.

Lower urinary tract symptoms and hematuria are frequent and are clearly attributed to bladder irritation by a foreign body. Less frequently, stents are associated with a risk for infection, incrustation or migration, all of which may necessitate further invasive manipulations and hospitalization.

The frequency of adverse effects of stents in our study agrees with previous reports. Damiano et al. [11] reported a 37% rate of irritative voiding symptoms, 18% hematuria and 9.5% risk of stent migration. Joshi and colleagues [8] reported similar complaints in stented patients, as well as a 40% risk for sexual dysfunction and an overall 80% quality of life impairment. Wu and team [7] retrospectively reported on 255 patients with ureteral stents. Only 27.5% were asymptomatic, lower urinary tract symptoms were reported by 7.8–42%, hematuria was present in 41.6%, pyelonephritis occurred in 3.5%, and heavy incrustation and upward migration occurred in 5.5% and 9.8%, respectively. Similar findings were reported by others, and stent removal caused prompt relief, thereby linking the symptoms to the presence of stents rather than to the underlying pathology [4]. In a randomized prospective trial where patients with distal ureteral stones were randomized to receive or not to receive a ureteral stent, stenting was clearly associated with increased irritative symptoms [12]. Ureteral stents left in the urinary tract for a prolonged time are associated with worrisome complications of incrustation, infection and fragmentation. The so-called forgotten stent is a major complication that necessitates high endourologic expertise. As with any foreign body continuously exposed to urine, stents become covered with a bacterial biofilm that subsequently calcifies, leading to crustation and frank stone formation [13]. This, in turn, leads to stent entrapment that mandates elaborate endourologic manipulation for retrieval
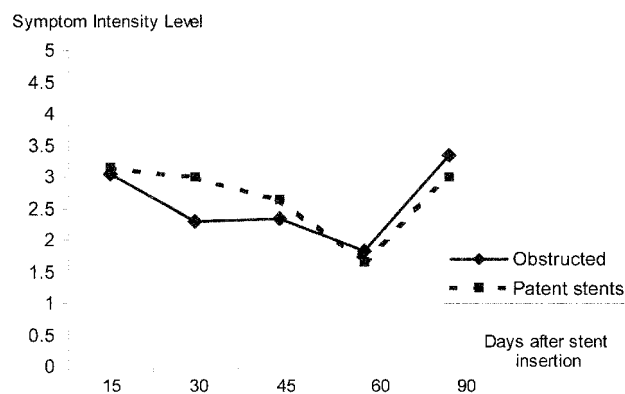
[5,14]. Calcified stents are prone to spontaneous fragmentation that further complicates their removal.

Upper stent migration occurred in 11 of our patients, and lower migration in one. The precise risk factors for stent displacement remain to be defined, but it appears that accurate determination of the appropriate stent length may prevent displacement [15], while the use of a distal suture may help relocate the migrated stent, obviating the need for an invasive procedure.

Stent failure is yet another risk associated with this type of ureteral drainage. It may occur as the result of either stent displacement or obstruction. A third of the stents in our study were obstructed. A stent may become obstructed due to blood clot, calculi fragments or debris getting stuck inside the lumen. Ikeda and team [16] suggested that shockwave lithotripsy may predispose stents to obstruction by increasing debris in the collecting system and that stent calcification and obstruction were inter-related processes. In our series, stent obstruction was not significantly associated with increased lower urinary tract symptoms, flank pain, fever, or admission rate, probably because of unobstructed urinary flow around the stent. Although part of the flow in a stented ureter is extraluminal, i.e., around the stent [17], in certain circumstances when there is a tight obstruction around the stent, its obstruction can imply total obstruction of the stented renal unit. While a significant number of patients have symptoms associated with the stent, some are totally asymptomatic. It is possible that the asymptomatic patients are more prone to neglect or to forget their stent and therefore develop complications that are time-related, such as incrustation, fragmentation and obstruction.

Infection is a serious problem in patients with stents. In this series fever was present in 8–15% of patients and a positive urine culture was found in 20%. The most commonly involved pathogens were *E. coli* and Enterococcus. This is in concert with the findings of Riedl et al. [18] who reported that bacteriuria was present in 30% of patients, stents were colonized with bacteria in 70% of cases, and the most common pathogen was Enterococcus.

While stents have become indispensable in modern urology,

indications for their use are occasionally questioned. Sulaiman and associates [19] advocated the use of ureteral stents to prevent stone street formation following shockwave lithotripsy for stones larger than 20 mm². The role of stents in this setting was, however, questioned by Preminger et al. [20], who showed that while stents do not contribute to the stone-free rate following shockwave lithotripsy, they are associated with considerable side effects. Routine ureteral stenting following ureterscopy has been recommended by several authors [21,22], however others have shown that stenting after ureteroscopy is not mandatory [23,24]. Given the broadening indications for stenting and their more liberal use, one should consider the untoward consequences associated with this device.

Our results may have been subjected to a confounding bias as part of the reported morbidity, and side effects might have been caused by the underlying disease rather than the stent. However, most commonly, symptoms were relieved by stent extraction regardless of the underlying pathology. Furthermore, most of the symptoms persisted throughout the stenting period, suggesting that the presence of the stent rather than the underlying pathology was the cause of symptoms. Additionally, there was no difference in the frequency of side effects of grade 3 or higher between patients receiving stents for different indications. Preminger et al. [20] reported that lower urinary tract symptoms and hemautria were more persistent in a group of stented patients as compared to non-stented controls.

Conclusions

Ureteral stents are a convenient means of drainage for the upper urinary tract. However, their use is not devoid of side effects and bears a significant impact on patients' everyday function and overall quality of life. Occasionally, the morbidity related to the stent may be severe and neccesitate more invasive procedures. The untoward effects associated with ureteral stents must be kept in mind when deciding on stent placement and dwell time.

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> *I have never hated a man enough to give his diamonds back.*
>
> Zsa Zsa Gabor (1922-), actress best known for her lavish spending and many husbands