Research Article

Pamukkale Medical Journal
doi:https://dx.doi.org/10.31362/patd.1339270

# Ureteral stent-related symptoms in 4.0 Fr versus 4.8 Fr double J stents: a questionnaire-based comparative study

## *Üreteral stent ilişkili semptomlarda 4.0 Fr'e karşın 4.8 Fr double J stentler: ankete dayalı karşılaştırmalı bir çalışma*

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Received:07.08.2023 Accepted:11.09.2023

**Abstract**

**Purpose:** The aim was to investigate the difference in Ureteral Stent-Related Symptom Questionnaire (USSQ) scores with the use of different stent diameters (4.0 Fr versus 4.8 Fr).

**Materials and methods:** Between August 2022 and January 2023, patients with double J stent insertion after endoscopic ureteral stone and retrograde intrarenal surgery in two different centers were included in the study. The patients were divided into two groups according to stent size of 4.0 Fr and 4.8 Fr. All of the patients were called for check-ups in the 2nd week after discharge and were questioned using the USSQ.

**Results:** A total of 228 patients, 112 in the 4.0 Fr group and 116 in the 4.8 Fr group, were included in the study. At the 2nd week visit, the total USSQ scale scores were 73.9±8.9, and 80.0±9.8 for the 4.0 Fr and 4.8 Fr groups, respectively ($p$<0.001). Stent dislocation was detected in 10 (8.1%) patients in the 4.0 Fr group and in 3 patients (2.5%) in the 4.8 Fr group ($p$=0.049). The symptom score scale was analyzed separately based on subdomains. The mean value for the urinary index score was 24.5±3.6 for the 4.0 Fr group and 27.6±3.4 for the 4.8 Fr group ($p$<0.001). Body pain index score was 16.4±3.8 and 18.6±3.8 for the 4.0 Fr and 4.8 Fr groups, respectively ($p$<0.001). The general health index score, work performance index score, and sexual matter score were not statistically significantly different between the groups.

**Conclusion:** Our study reported that ureteral stent-related symptoms favor the 4 Fr ureteral stent. In contrast, 4 Fr ureteral stents had a higher migration rate.

**Keywords:** Ureteral stents, stent-related symptoms, USSQ score, urolithiasis, quality of life.

Anıl H, Unal U, Guzel A. Ureteral stent-related symptoms in 4.0 Fr versus 4.8 Fr double J stents: a questionnaire-based comparative study. Pam Med J 2023;16:610-616.

**Öz**

**Amaç:** Farklı üreteral stent çaplarının (4.0 Fr-4.8 Fr) kullanımıyla Üreteral Stentle İlişkili Semptom Anketi (USSQ) skorlarındaki farkı araştırmaktır.

**Gereç ve yöntem:** Ağustos 2022 ile Ocak 2023 tarihleri arasında iki farklı merkezde endoskopik üreter taşı ve retrograd intrarenal cerrahi sonrası double J stent takılan hastalar çalışmaya dahil edildi. Hastalar 4.0 Fr ve 4.8 Fr stent boyutlarına göre iki gruba ayrıldı. Hastaların tamamı taburcu olduktan sonraki 2. haftada kontrole çağrıldı ve USSQ ile sorgulandı.

**Bulgular:** Çalışmaya 4.0 Fr grubunda 112, 4.8 Fr grubunda 116 olmak üzere toplam 228 hasta dahil edildi. 2. hafta kontrolünde toplam USSQ ölçek puanları 4.0 Fr ve 4.8 Fr grupları için sırasıyla 73,9±8,9 ve 80,0±9,8 idi ($p$<0,001). 4.0 Fr grubunda 10 (%8,1), 4.8 Fr grubunda 3 (%2,5) hastada stent dislokasyonu saptandı ($p$=0,049). Belirti puan ölçeği alt alanlara göre ayrı ayrı analiz edilmiştir. İdrar indeks skorunun ortalama değeri 4.0 Fr grubu için 24,5±3,6 ve 4.8 Fr grubu için 27.6±3.4 idi ($p$<0,001). Vücut ağrı indeksi skoru 4.0 Fr ve 4.8 Fr grupları için sırasıyla 16,4±3,8 ve 18,6±3,8 idi ($p$<0,001). Genel sağlık indeksi skoru, iş performansı indeks skoru ve cinsel hususlar skoru gruplar arasında istatistiksel olarak anlamlı farklılık göstermedi.

**Sonuç:** Çalışmamız üreteral stent ilişkili semptomların 4 Fr üreteral stent lehine olduğunu bildirmektedir. Buna karşılık 4 Fr üreteral stentler daha yüksek migrasyon oranına sahipti.

**Anahtar sözcükler:** Üreteral stentler, stent ilişkili semptomlar, USSQ skor, ürolitiyazis, yaşam kalitesi.

Anıl H, Ünal U, Güzel A. Üreteral stent ilişkili semptomlarda 4.0 Fr'e karşın 4.8 Fr double J stentler: ankete dayalı karşılaştırmalı bir çalışma. Pam Tıp Derg 2023;16:610-616.

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## Introduction

Ureteral stents are widely used in urology practice with the advancement of endoscopic treatments in recent years [1]. The primary purpose of using ureteral stents is to provide uninterrupted urine flow between the kidney and bladder [2]. After endoscopic ureteral stone treatment, it is recommended to insert a double J (DJ) stent in the presence of residual stones, suspected perforation, and bleeding [3]. In addition, these stents can be used in pregnancy-induced hydronephrosis, obstructive pyelonephritis, for pain relief, and after reconstructive urological procedures. Patients complain of irritative symptoms such as bleeding in the urine, flank pain, dysuria, and pollakiuria after DJ stent placement [4]. These adverse events impair the patient's quality of life, while they increase health-related costs [5]. In order to evaluate these complaints objectively, Joshi et al. [6] developed the Ureteral Stent-Related Symptom Questionnaire (USSQ) in 2003.

Many studies in the literature showed that ureteral stent-related symptoms are associated with stent material, design, size, and position [5]. Studies focusing on stent size evaluated stents between 4.7 Fr and 7 Fr with symptom scores [7, 8]. The general opinion in these studies is that as the stent diameter decreases, ureteral stent-related symptoms decrease [9, 10]. However, a randomized prospective study showed that small-diameter stents did not reduce stent-related symptoms; on the contrary, they involved more dislocation [11]. Studies in the literature include comparisons of 4.7 Fr and larger diameter stents. After a literature review, comparative studies using the 4.0 Fr DJ stent were not found, to the best of our knowledge.

In this study, we first hypothesized there would be a difference in USSQ symptom score between stent diameters (4.0 Fr versus 4.8 Fr). Second, we investigated whether smaller stent diameter is associated with higher rate of stent dislocation.

## Materials and methods

### Patient cohort

Following approval of the local ethics committee between August 2022 and January 2023, patients with double J stent insertion after endoscopic ureteral stone and retrograde intrarenal surgery in two different centers were included in the study. Informed consent was obtained from all patients. The data for the patients were collected prospectively and analyzed retrospectively. Patients with a previous history of URS, bilateral stones, using anticoagulants, under 18 years of age, with pregnancy, ureteric stenosis, renal failure, obstructive pyelonephritis, pyelonephrosis, malignancy, pre-stenting, and α-blocker therapy were excluded. In addition, the symptom score scale was not filled in by patients with stent migration after URS. The patients were divided into two groups according to stent size as 4.0 Fr and 4.8 Fr. Stone size and localization of the patients were determined by computed tomography.

### Surgical technique

URS or flexible URS was used for all patients. Before the procedure, 2nd generation cephalosporin was administered to all patients as prophylaxis. The procedure was performed under general or spinal anesthesia in the lithotomy position with an 8/9.8 F fiber ureteroscope (Richard Wolf), 273 micron fiber and holmium laser. Flexible URS was performed with a 7.5 Fr fiber-optic flexible ureteroscope (Storz FLEX-X2) after a ureteral access sheath (9.5/11.5 F) was inserted under general anesthesia. A DJ stent was placed in the presence of bleeding, ureteral injury, clinical suspicion, and residual stone after the procedure. DJ stent was not inserted after uncomplicated URS. The collecting system was visualized by retrograde pyelography before DJ stent placement. All DJ stents were placed under fluoroscopy according to ureter size (24-26-28cm). During DJ stent placement, the upper end was placed so a full turn was in the renal pelvis and the lower end was placed so that it did not exceed the midline of the bladder. Polyurethane hydrophilic (Plastimed©) DJ stents were used in all procedures.

### Postoperative evaluation

All patients were discharged on the same day or on the 1st postoperative day after being prescribed a non-steroidal anti-inflammatory (75 mg diclofenac). In order to evaluate patient symptoms during follow-up, the USSQ score, translated into Turkish by Tanidir et al. [12], and validated in Turkish by A.D., was used. This

questionnaire consists of 6 subdomains: urinary symptom index score, body pain score, general health index, work performance index, sexual matter score, and additional complaints. In our study, each subdomain score was recorded. All of the patients were called to the clinic in the 2nd week after discharge and were questioned using the USSQ. All stents were removed 3 weeks postoperatively. The presence of stent dislocation and hydronephrosis were evaluated with plain abdominal X-ray and ultrasonography before DJ stent extraction.

The primary endpoint of the study was completion of the USSQ symptom scale 2 weeks postoperatively. The secondary endpoint was the evaluation of the presence of stent dislocation by imaging methods.

### Statistical analysis

Continuous variables are presented as mean ± standard deviation, and categorical variables as n (%). Normal distribution was evaluated with the Shapiro-Wilk test. Categorical variables were compared between the two groups with the chi-square test, and continuous variables were evaluated with the Student t-test. A value of $p<0.05$ was considered statistically significant. All analyses were conducted using IBM SPSS Statistics for Windows, version 22.0 (IBM Corp., Armonk, NY) and GraphPad Prism 8.0.2.

### Results

A total of 228 patients, 112 in the 4.0 Fr group and 116 in the 4.8 Fr group, were included in the study. The mean age of the patients was 42.0±12.1 and 42.1±11.7 years for the 4.0 Fr and 4.8 Fr groups, respectively ($p=0.951$). There was no statistical difference between the groups in terms of preoperative clinical and demographic characteristics of the patients (Table 1). The stone-free rate for patients was 93.7% in the 4.0 Fr group and 92.2% in the 4.8 Fr group ($p=0.655$). The stent lengths inserted in the 4.0 Fr and 4.8 Fr groups showed similar distribution ($p=0.941$).

**Table 1.** Preoperative clinical characteristics of the patient cohort

| | 4.0 Fr group | 4.8 Fr group | *p* value |
|---|---|---|---|
| **No. of patients** | 112 | 116 | |
| **Age , mean ± sd** | 42.0±12.1 | 42.1±11.7 | 0.951 |
| **Female/Male** | 40/72 | 42/74 | 0.938 |
| **BMI (kg/m²), mean ± sd** | 29.1±4.1 | 28.7±3.9 | 0.451 |
| **Lateralization (Left/Right)** | 54/58 | 57/59 | 0.889 |
| **Stone location, n (%)** | | | 0.659 |
| **Proximal** | 26 (23%) | 32 (28%) | |
| **Middle** | 35 (31%) | 31 (26%) | |
| **Distal** | 51 (46%) | 53 (46%) | |
| **Stone size (cm), mean ± sd** | 9.6±2.1 | 10.1±3.1 | 0.156 |
| **Operation type, n (%)** | | | 0.772 |
| **URS** | 83 (74.1%) | 84 (72.4%) | |
| **Flexible URS** | 29 (25.9%) | 32 (27.6%) | |
| **Length of the ureteral stent** | | | 0.941 |
| **24 cm** | 34 (30.3) | 37 (31.9) | |
| **26 cm** | 37 (33.0) | 39 (33.7) | |
| **28 cm** | 41 (36.7) | 40 (34.4) | |

After discharge and before the first visit, 5 patients (4.4%) in the 4.0 Fr group and 9 patients (7.7%) in the 4.8 Fr group were admitted early due to ureteral stent complaints ($p$=0.300). At the 2nd week visit, the total USSQ scale scores were 73.9±8.9 and 80.0±9.8 for the 4.0 Fr and 4.8 Fr group, respectively ($p$=0.001). The symptom score scale was analyzed separately by subdomains. The mean value for the urinary index score was 24.5±3.6 for the 4.0 Fr group and 27.6±3.4 for the 4.8 Fr group ($p$=0.001). Body pain index score was 16.4±3.8 and 18.6±3.8 for the 4.0 Fr and 4.8 Fr groups, respectively. This difference was found to be statistically significant in favor of 4.0 Fr ($p$=0.001). General health index score, work performance index score and sexual matter score did not have statistically significant difference between the groups. Comparisons of patients between groups according to USSQ subdomains at the 2-week visit are summarized in Figure 1. Stent dislocation was detected in 10 (8.1%) patients in the 4.0 Fr group and in 3 (2.5%) patients in the 4.8 Fr group ($p$=0.049). No fever or complicated urinary tract infection was observed during the follow-up of the patients. Daily analgesic use was 2.2±1.9 tablets per day in the 4.0 Fr group, and 2.6±1.1 tablets in the 4.8 Fr group ($p$=0.133). The USSQ symptom score values and additional complaints for the patients are summarized in detail in Table 2.

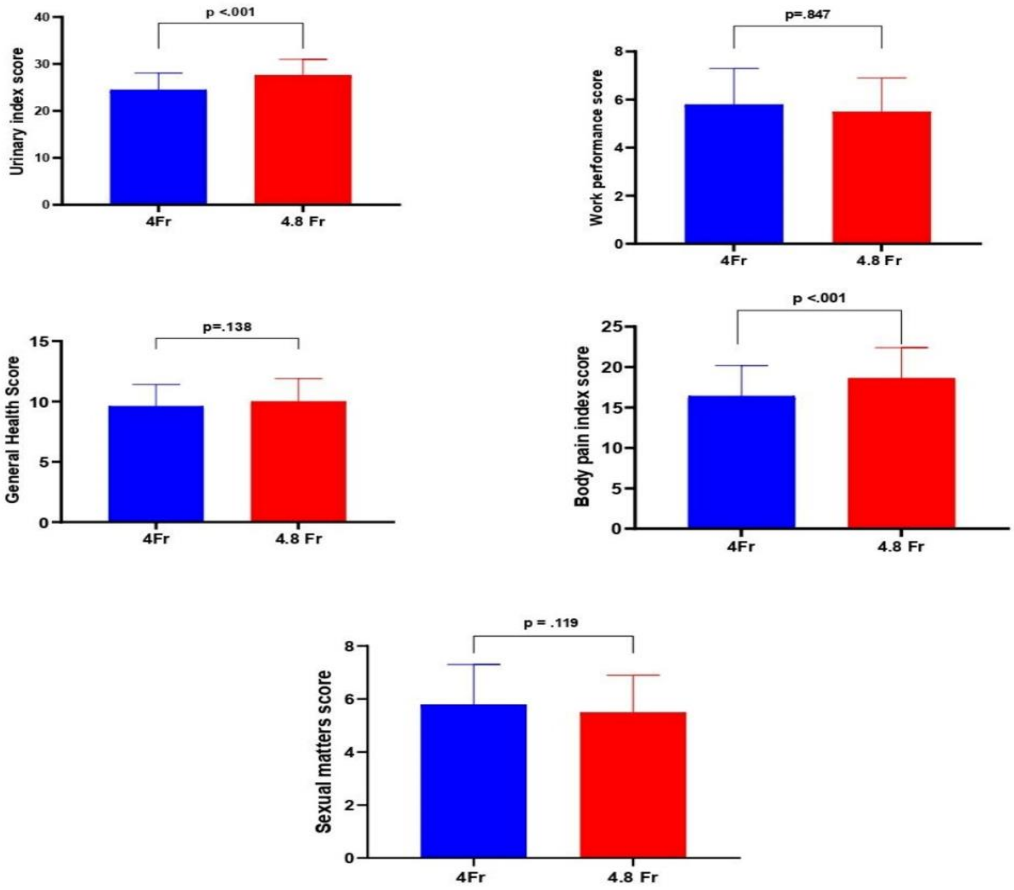


**Figure 1.** Comparison of domain scores between the two groups

**Table 2**. Comparison of subdomain scores and postoperative data of patients

| | 4.0 Fr group | 4.8 Fr group | *p* value |
|---|---|---|---|
| **USSQ Urinary index score (U1-U12)** | 24.5±3.6 | 27.6±3.4 | <0.001 |
| **USSQ body pain index score (P3-P9)** | 16.4±3.8 | 18.6±3.8 | <0.001 |
| **Overall pain score (P3, VAS)** | 6.9±3.8 | 7.1±4.4 | 0.714 |
| **USSQ general health index score (G1-G6)** | 9.6±1.8 | 10.0±1.9 | 0.138 |
| **USSQ work performance score (W5-W7)** | 7.6±1.7 | 7.7±2.0 | 0.847 |
| **Sexual abstinence due to stent (n, %)** | 24 (21.4) | 32 (27.5) | 0.280 |
| **USSQ sexual matters score (S3-S4)** | 5.8±1.5 | 5.5±1.4 | 0.119 |
| **USSQ stent related-additional problems (A1-A4)** | 5.4±1.7 | 5.7±1.8 | 0.197 |
| **Global quality of life with the stent in situ (GQ)** | 4.6±2.1 | 4.9±1.9 | 0.258 |
| **Stent migration ratio*, (%)** | 10/121 (8.1) | 3/119 (2.5) | 0.049 |
| **Analgesic usage per day** | 2.2±1.9 | 2.6±2.1 | 0.133 |

## Discussion

Ureteral stent placement is one of the interventions most commonly performed by urologists. In addition to this common use, 80% of patients complain of some symptoms [13]. These side effects cause problems for both urologists and patients, such as deterioration in patient quality of life, loss of labor and increased health-related costs. In order to reduce these complaints, recent studies focused on stent material structure and stent diameter. The main finding of our study demonstrates that ureteral stent-related symptoms decrease as the stent diameter decreases.

The most appropriate approach to prevent ureteral stent-related symptoms is not to insert a DJ stent. Neither the EAU guidelines nor the AUA guidelines routinely recommend ureteral stent placement. In addition, EAU guidelines recommend DJ stenting after URS in suspected cases and to avoid stressful emergencies. In their study, Muslumanoglu et al. [1] reported that ureteral stenting significantly reduced postoperative complications compared to those without ureteral stent insertion. The predictive factors for stent placement were the presence of impacted stones, duration of surgery, presence of solitary kidney, stone size, and age. Routine stenting is not performed in our own clinic. A ureteral stent is inserted in suspicious cases, with ureteral bleeding, suspected residual stone and perforation.

The USSQ score consists of urinary symptom score, body pain score, work performance score, general health score, sexual matter and additional complaints. Randomized prospective controlled studies with this scale in recent years show that small diameter stents reduce ureteral stent-related symptoms. In their study using the USSQ scale, Çubuk et al. [9] reported that 4.8 Fr ureteral stents had statistically significantly lower score than 6 Fr ureteral stents. In this study, subdomain scores were not included separately, and the total USSQ score was shared. Nestler and colleagues compared three different sizes of stents (4.7 Fr, 6 Fr, 7 Fr). They found that the USSQ score for the 4.7 Fr group was statistically superior to the 7.0 Fr group for all subdomains. In the comparison of 4.7 Fr and 6 Fr groups, they reported that the only statistically significant difference was for the urinary symptom score [10].

Contrary to this, Damiano et al. [11] reported that there was no difference between stent diameters in terms of urinary symptoms. In our study, we found that the urinary system symptom score and body pain index score among the USSQ subdomains were statistically significantly lower in the 4.0 Fr ureteral stent group. Study performance score, general health index score, sexual matter score and additional complaints did not differ statistically between the groups.

Although small diameter stents are superior in terms of ureteral stent complaints, they are controversial in terms of drainage efficiency and stent migration. Damiano et al. [11] reported a higher rate of migration for 4.8 Fr ureteral stents compared to 6 Fr. In a series of 1258 patients, the stent migration rate was reported to be 5.6% for 4.7 Fr urethral stents [14]. In our study, the stent migration rate was 8.1% in the 4.0 Fr ureteral stent group and 2.5% in the 4.8 Fr group.

Our study has some limitations. The first is that it had retrospective design. Secondly, some of our patients were asylum seekers and their native language was not Turkish. For this reason, some patients were questioned by a hospital translator. Third, a control group was not included in the study. However, the number of subjects was sufficient compared to other studies in the literature, and the data were prospectively recorded in the system.

In conclusion, in our study comparing two different stent sizes (4.0 Fr versus 4.8 Fr), 4.0 Fr ureteral stents had fewer urinary system complaints. Similarly, overall body pain scores were in favor of the 4.0 Fr ureteral stent. However, 4.0 Fr stents had higher migration rate.

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

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**Ethics committee approval:** Ethics committee approval was obtained from Adana City Training and Research Hospital (date of permission: 27.04.2023, file number: 125/2530).

**Authors' contributions to the article**

H.A. constructed the main idea and hypothesis of the study. A.G. developed the theory and arranged/edited the material and method section. U.U. has done the evaluation of the data in the Results section. Discussion section of the article written by H.A. and U.U.

A.G. reviewed, corrected and approved. In addition, all authors discussed the entire study and approved the final version.