

# Management of Urethral Stone Patients in An Endemic Region: A Single Center Experience

## Endemik Bir Bölgede Üretral Taş Hastalarının Yönetimi: Tek Merkez Deneyimi

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### Abstract

**Objective:** Urethral stones are rare among all urinary system stones. There is limited data in the literature on the management of urethral stones. In this study, we aimed to present our experience of patients diagnosed with urethral stone in the light of the literature.

**Methods:** This retrospective study included 24 consecutive patients diagnosed with urethral stone between January 2017 and December 2020. Demographic data, clinical features, primary treatment approaches, peroperative and postoperative data were analysed.

**Results:** Twenty-four patients with a mean age of 44±20 years (2-73) were included in the study. The clinical presentation of the patients was acute urinary retention in 14 (58.3%) patients and lower urinary tract symptoms in 10 (41.6%) patients. The most common stone location was posterior urethra in 13 (54.2%) patients and anterior urethra in 11 (45.8%) patients. The mean stone size was 10±3 (5-15) mm. Fourteen patients had a history of previous stone surgery or stone expulsion. Two patients underwent internal urethrotomy and one patient underwent cystolithotripsy simultaneously. Surgical success stone-free rate (SFR) was 100%.

**Conclusion:** Urethral stones are rarely seen in urological practice. The management of urethral stone is uncertain and depends on personal experience. Holmium laser lithotripsy with URS which is minimally invasive with minimal damage to the urethral mucosa, should be considered as the first choice.

**Keywords:** Urethra, urethral stone, lithotripsy, holmium, acute urinary retention, lower urinary tract symptoms

### Öz

**Amaç:** Üretra taşları tüm üriner sistem taşları arasında nadir görülür. Üretra taşlarının yönetimi ile ilgili literatürde sınırlı veri bulunmaktadır. Bu çalışmada üretra taşı tanısı alan hastalarla ilgili deneyimlerimizi literatür ışığında sunmayı amaçladık.

**Yöntem:** Bu retrospektif çalışmaya Ocak 2017-Aralık 2020 tarihleri arasında üretral taş tanısı konulan 24 ardışık hasta dahil edildi. Demografik veriler, klinik özellikler, primer tedavi yaklaşımları, peroperatif ve postoperatif veriler analiz edildi.

**Bulgular:** Ortalama yaşı 44±20 yıl (2-73) olan 24 hasta çalışmaya dahil edildi. Hastaların klinik prezentasyonu 14 (%58,3) hastada akut üriner retansiyon ve 10 (%41,6) hastada alt üriner sistem semptomları idi. En sık taş lokalizasyonu 13 (%54,2) hastada posterior üretra ve 11 (%45,8) hastada anterior üretra idi. Ortalama taş boyutu 10±3 (5-15) mm idi. On dört hastada daha önce geçirilmiş taş cerrahisi veya taş düşürme öyküsü vardı. İki hastaya internal üretrometri ve bir hastaya eş zamanlı sistolitotripsi uygulandı. Cerrahi başarı taşsızlık oranı (SFR) %100 idi.



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## Öz

**Sonuç:** Üretra taşları üroloji pratiğinde nadiren görülmektedir. Üretra taşlarının yönetimi belirsizdir ve kişisel deneyime bağlıdır. Üretral mukozaya minimal hasar veren minimal invaziv URS ile birlikte holimum lazer litotripsi ilk seçenek olarak düşünülmelidir.

**Anahtar Kelimeler:** Üretra, üretral taş, litotripsi, holmiyum, akut idrar retansiyonu, alt idrar yolu semptomları

## Introduction

Urethral stones are quite rare and constitute less than 1% of all urinary tract stones<sup>(1)</sup>. Treatment approaches for urethral stones vary depending on many factors, including the experience of the urologist, size and location of the stone, anatomical structure of the urethra, and clinical status of the patient. Different methods such as meatotomy, milking with lidocaine, extracorporeal shock wave lithotripsy, and transurethral lithotripsy after catheter or endoscopic retrograde manipulation of the stone into the bladder are used in treatment<sup>(2,3)</sup>.

Despite all these treatment modalities, there is no certain algorithm for the treatment of urethral stones compared with other urinary stone diseases, and treating them as bladder stones is a common method. To the best of our knowledge, all reports on urethral stones to date are based on retrospective studies and are mostly based on case reports and experiences of some case series<sup>(4-12)</sup>.

In this study, we aimed to present our experience in the management of patients diagnosed with urethral stones in light of the literature.

## Materials and Methods

After obtaining the approval of the Local Ethics Committee of University of Health Sciences Turkey, İstanbul Bakırköy Dr. Sadi Konuk Training and Research Hospital (2020-531), the data of 24 consecutive patients operated for urethral stones between January 2017 and December 2020 were retrospectively evaluated. Demographic data and clinical characteristics of the patients [age, body mass index (BMI), American Society of Anesthesiology score (ASA), medical history, presenting symptoms, place of presentation), laboratory data (complete urinalysis, urine culture, creatinine), radiological examinations (kidney, ureter, and bladder (KUB) X-ray and/or non-contrast abdominal computed tomography (CT)), primary intervention and final surgery, perioperative and postoperative data (operation time, hospital stay), postoperative data (success rate), and complications were analyzed.

All patients underwent laboratory tests, including blood count, blood electrolytes and biochemistry, coagulation studies, and urine. Patients with urinary tract infection detected by urinalysis and urine culture were treated before elective surgery. A single dose of third-generation cephalosporin was administered prophylactically in patients who underwent urgent intervention.

## Surgical Technique

**Fragmentation of the stone with a clamp:** A thin pointed mosquito clamp was used to gently remove the stones, especially those located in the fossa navicularis and meatus. In some stones, the stone was extracted in pieces by fragmentation with a clamp.

**Endoscopic lithotripsy:** Pethidine HCl (Aldolan ampoule 100 mg/2 mL, Vem, Turkey) 50 mg intramuscularly was injected as premedication locally performed transurethral surgeries. In addition, vital signs and pain levels were monitored by at least one anesthesiologist during local procedures. A single dose of third-generation cephalosporin was administered prophylactically 1 h before the procedure.

In the lithotomy position, 10 cc of 2% lidocaine gel was administered before endourological intervention, and after waiting for 15 min with a penile clamp to prevent its exit from the urethra, the same amount of lidocaine gel was reapplied to the urethra just before entering the anterior urethra with a cystoscope or ureteroscope (URS). All procedures were performed in a sterile environment using a 19-F semi-rigid cystoscope (Karl Storz, Germany) or a 7.5-F semi-rigid URS (Richard Wolf, Knittlingen, Germany or Karl Storz, Tuttlingen, Germany). Urethral anatomy, possible etiological factors, stone sizes, and localization were recorded by cystourethroscopy. After reaching the urethral stones, a Holmium:Yttrium-Aluminum-Garnet (Ho:YAG) laser device (Litho Quanta System, VA, Italy) was used to push the stones into the bladder. Stones that could not be pushed into the bladder were fragmented in the urethra. The laser energy was adjusted as 10-15 Hz, 1.5-2 J and 365 µ fiber was used. Lower laser energy was used during lithotripsy in the urethra. Stone fragments were removed using foreign

body forceps and an evacuator. At the end of the procedure, cystourethroscopy was performed to determine whether there was any stone residue and finally 14-16 Fr foley catheter was placed. The catheter was withdrawn during discharge. The oral antibiotic ciprofloxacin 500 mg/bid was continued for 24 h. The patients were then followed up every 6 months with KUB X-ray and ultrasonography.

### Statistical Analysis

Categorical data are presented as numbers and percentages. For continuous variables, data are presented as mean and standard deviation (minimum-maximum). Statistical analysis was performed using the Statistical Package of Social Sciences version 21 (IBM SPSS Statistics; IBM Corp., Armonk, NY).

### Results

Twenty-four patients with a mean age of 44±20 years (2-73) were included in the study. The male:female ratio was 22:2. The mean BMI was 22±5 kg/m<sup>2</sup>. Four patients had ASA grade ≥III. Fourteen patients had a history of previous stone surgery or stone expulsion. One patient had a history of internal urethrotomy (IU), one had transurethral resection of the prostate (TUR-P), and one had forced catheterization. One patient had bladder stones and five patients had kidney stones simultaneously. The most common place of presentation was the emergency department in 13 (54.2%) patients and the urology outpatient clinic in 11 (45.8%) patients. The clinical presentation of the patients was acute urinary retention (AUR) in 14 (58.4%) patients and lower urinary tract symptoms (LUTS) in 10 (41.6%) patients. Of the 10 patients with LUTS, 5 had hematuria and 3 had penile/pelvic pain. The mean creatinine value was 0.94±0.24 mg/dL. Fifteen (62.6%) patients had infection in the complete urinalysis. The most commonly used radiological examination was CT in 16 (66.6%) patients and KUB X-ray in 8 (33.4%) patients. The most common stone location was the posterior urethra in 13 (54.2%) patients and the anterior urethra in 11 (45.8%) patients. The mean stone size was 10±3 (5-15) mm. The demographic and clinical characteristics of the patients are shown in Table 1.

The most preferred first intervention method was stone fragmentation and extraction in 17 (70.8%) patients (endoscopic lithotripsy in 13 patients, fragmentation and extraction of the stone with clamp in 4 patients). In the first intervention, percutaneous cystostomy catheter insertion was performed in 1 patient, and the stone was pushed into

**Table 1. Demographic data and clinical features**

<b>Number of patients (n)</b>	<b>24</b>
<b>Age (years)</b>	
Mean ± SD	44±20
Median (range)	49 (2-73)
<b>Gender, n (%)</b>	
Male	22 (91.6)
Female	2 (8.4)
<b>BMI (kg/m<sup>2</sup>)</b>	
Mean ± SD	23±2
Median (range)	24 (18-27)
<b>ASA</b>	
Mean ± SD	2±1
Median (range)	1 (1-3)
<b>Predisposing factor, n (%)</b>	
History of spontaneous stone passage	10 (41.6)
Endoscopic stones urgency	4 (16.6)
IU	1 (4.2)
TUR-P	1 (4.2)
Traumatic catheter insertion	1 (4.2)
Unknown	7 (29.2)
<b>Concomitant urinary system pathology, n (%)</b>	
Urethral stricture	2 (8.4)
Bladder stone	1 (4.2)
Kidney stone	1 (4.2)
<b>Place of admission, n (%)</b>	
Emergency department	13 (54.2)
Urology outpatient clinic	11 (45.8)
<b>Presenting symptom, n (%)</b>	
AUR	14 (58.4)
LUTS	10 (41.6)
Haematuria	5 (50)
Penile pelvic pain	3 (30)
<b>Preoperative creatinin elevel, n (%)</b>	
Mean ± SD	0.94±0.24
Median (range)	0.89 (0.65-1.46)
<b>Urinary tract infection, n (%)</b>	
None	9 (37.4)
Yes	15 (62.6)
<b>Radiological examination, n (%)</b>	
CT	16 (66.6)
KUB X-ray	8 (33.4)
<b>Stone location, n (%)</b>	
Posterior urethra	13 (54.2)
Anterior urethra	11 (45.8)
<b>Stone size (mm)</b>	
Mean ± SD	10±3
Median (range)	10 (5-15)

SD: Standard deviation, BMI: Body mass index, ASA: American society of anaesthesiology score, IU: Internal urethrotomy, TUR-P: Trans urethral resection of prostate, AUR: Acute urinary retention, LUTS: Lower urinary tracts symptoms, CT: Computed tomography, KUB: Kidney, ureter, and bladder

the bladder with a catheter and catheter in 6 patients. In definitive surgery, endoscopic lithotripsy was performed in 20 (83.3%) patients. The most preferred method was Ho:YAG laser lithotripsy with URS in 17 patients. In 13 patients, the procedure was performed under local anesthesia. Two patients underwent internal urethrotomy and one patient underwent cystolithotripsy simultaneously. The mean operation time was 23±8 min. The mean length of hospital stay was 18±11 hours. No intraoperative complications were observed in any patient. The stone-free rate (SFR) was 100%. In the early postoperative period, two patients had transient fever that was controlled with conservative treatment, and in the late postoperative period, two patients had urethral strictures. They were treated with internal urethrotomy and dilatation. Major complications were not observed in any patient. No recurrent urethral stones were observed in any patient during the follow-up period (Table 2).

## Discussion

In Turkey, urinary system stone disease is an endemic disease with a rate of 15% and is observed more frequently in the south and southeast parts of the country<sup>(13)</sup>. Although urinary system stones can be observed in any part of the urinary tract, they are rare<sup>(14)</sup>. The prevalence and incidence

of stones are increasing in both males and females in different parts of the world<sup>(13)</sup>. Similar to the study by Scales et al.<sup>(15)</sup>, urethral stones were observed more frequently in male patients (91.6%) than in female patients (8.4%) in our study. In children, isolated urethral stones are relatively common because of the higher prevalence of bladder stones, especially in developing countries<sup>(16)</sup>. In our series, there were only two female patients and 2 pediatric patients.

Patients with urethral stones may present with different symptoms, including AUR, weak stream, frequent urination, hematuria, urethroragia, dysuria, penile mass, and pain in the penile, rectal, or perineal region<sup>(2,17)</sup>. Another reflection of urethral stones is urinary tract infections<sup>(17)</sup>. The most common clinical presentation of urethral stone is AUR although it has been reported differently in the series in the literature<sup>(2)</sup>. The rate of AUR varies between 45.2% and 89% in the literature<sup>(4-6,12)</sup>. Dysuria, another LUTS, has been reported as the most common reason for presentation in some series<sup>(7-9)</sup>. In the series of Hemal and Sharma<sup>(11)</sup> reported perineal and penile pain in all 26 patients. In our study, the most common symptoms were AUR, dysuria, hematuria, and penile pain. In our study, the most common presenting symptom was AUR (63.4%).

In the etiology of urethral stones, many factors that prevent spontaneous passage of the stone are blamed. Previous endourological interventions, neurogenic bladder, infections, foreign bodies, and anatomical disorders of the urethra are the most prominent of these factors<sup>(2,7)</sup>. Sharfi<sup>(7)</sup> and Selli et al.<sup>(18)</sup> reported that 56% of patients with urethral stones had anatomical abnormalities in the urethra. In contrast, Kamal et al.<sup>(4)</sup> did not notice any anatomical change. Jung et al.<sup>(19)</sup> In their study in which 221 lower urinary tract stone cases were analyzed, it was reported that 63% of 27 patients with urethral stones had concomitant upper urinary tract stones. Similarly, in a study in which 300 patients were analyzed, stones in the upper urinary system were found in 57.9% of 27 patients with urethral stones<sup>(19,20)</sup>. In our series, no anomaly in the urethra was found in any patient except urethral stricture in two patients, and five patients had concurrent kidney stones and one patient had bladder stones. In addition, 14 patients had a history of endoscopic stone surgery or spontaneous stone expulsion, 1 patient had a history of forced catheterization, 1 patient had a history of internal urethrotomy, and 1 patient had a history of TUR-P.

Different localizations have been reported in the literature regarding the most common location of the urethral stone.

Table 2. Operative and post-operative data	
<b>First intervention, n (%)</b>	
Emergency operation	17 (70.8)
Insertion a catheter/cystostomy catheter	7 (29.2)
<b>Operation type, n (%)</b>	
Endoscopic lithotripsy	20 (83.3)
URS-LL	17 (85)
Cystoscopy-LL	3 (15)
Removal or fragmentation with clamp	4 (16.7)
<b>Anaesthesia type, n (%)</b>	
General/spinal anaesthesia	11 (45.8)
Local anaesthesia	13 (54.1)
<b>Operation time (minutes)</b>	
Mean ± SD	23±8
Median (range)	23 (12-40)
<b>Length of hospital stay (hour)</b>	
Mean ± SD	18±11
Median (range)	16 (2-48)
<b>Complication, n (%)</b>	
Fewer	2 (8.3)
Urethral stricture	2 (8.3)
URS: Ureteroscopy, LL: Laser lithotripsy, SD: Standard deviation	

Ahmed and Saeed<sup>(10)</sup> reported that the anterior urethra was the most common localization (71.4%). On the contrary, Kamal et al.<sup>(4)</sup> found the most common stone localization in the posterior urethra with a rate of 88%. Most of the urethral stones in our study (54.1%) were located in the posterior urethra, as reported for isolated urethral stones in support of a previous series<sup>(4,7,10)</sup>.

Many factors, including the patient's age, gender, anatomical status of the urethra, clinical presentations of the patients, general health status, and size and location of the stone, are effective in selecting the correct surgical method for urethral stones<sup>(7,21)</sup>. The first preferred option in the treatment algorithm of AUR due to urethral stone is placement of a suprapubic cystostomy catheter, which was reported by Amin in 1973<sup>(5)</sup>. With this first intervention, AUR will be treated rapidly. However, today, less minimally invasive methods may be preferred with technological advances and miniaturization in endoscopic devices. First, retrograde manipulation of the bladder is the most common procedure for posterior urethral stones. However, it may be dangerous to use a catheter or dilator blindly. However, the procedure is safer under endoscopic vision<sup>(22)</sup>. In our series, stones were most commonly pushed into the bladder by endoscopic visualization.

The most commonly preferred endoscopic lithotripsy is Ho:YAG laser lithotripsy. There are very few studies in the literature on the use of lasers in urethral stones<sup>(3,12)</sup>. Maheshwari and Shah<sup>(2)</sup> reported 100% success and no intraoperative complications when they performed Ho:YAG laser lithotripsy in the urethra in 18 patients who could not undergo retrograde manipulation in their study of 42 patients with urethral stones. Kamal et al.<sup>(4)</sup> reported a success rate of 86% in patients who underwent retrograde manipulation and 80% in patients who did not undergo retrograde manipulation for treating posterior urethral stone. Similarly, Walker and Hamilton<sup>(23)</sup> presented two pediatric patients with impacted urethral stones and reported that holmium laser lithotripsy in the urethra was an effective and reliable method. In our study, URS - Ho:YAG Ho:YAG lithotripsy was frequently preferred for treating posterior urethral stones and was 100% successful. The reason for frequent use of URS is that if the stone cannot be pushed into the bladder in the narrow urethral lumen, it is aimed to fragment the stone with small manipulations without damaging the urethral mucosa.

Meatotomy or urethroplasty is the preferred treatment method for stones located in the navicular fossa and meatus, especially for stones that reach large sizes or have luminal impaction<sup>(4,8)</sup>. For smaller stones, careful forceps removal or milking with a catheter can be used. Similarly, it is dangerous to extract the stone with forceps and milking in anterior urethral stones to avoid damage to the urethral mucosa. Care should be taken in protruding and large stones<sup>(4,22)</sup>. First, El-Sherif and El-Hafi<sup>(24)</sup> reported a success rate of 77.8% with intraurethral application of 2% lidocaine gel in 18 patients with urethral stones smaller than 10 mm in anterior urethral stones. In a study conducted in our country, Kilciler et al.<sup>(8)</sup> reported the success rate of this approach for treating anterior urethral stone as 88.2%. In our series, only four patients had meatus-located stones removed by clamping. Milking with gel was not performed in any patient. No patient in our series required open surgery.

Ho:YAG laser lithotripsy under local anesthesia in patients with comorbidities who cannot receive anesthesia has come to the forefront and has been investigated in limited studies<sup>(25)</sup>. Kara et al.<sup>(26)</sup> performed transurethral cystolithotripsy under local anesthesia in 13 patients with bladder stones with a mean size of 3.6 cm and reported a success rate of 100%. Similarly, bladder stones have been successfully and safely removed under local anesthesia with a Ho:YAG laser<sup>(27,28)</sup>. Atilgan et al.<sup>(12)</sup> reported the results of urethral stone fragmentation with a Ho:YAG laser under local anesthesia in 31 male patients over 65 years of age. They obtained stone-free results in all patients. They reported hematuria shorter than 24 h and not requiring blood transfusion in seven patients, urethrorrhagia in two patients and urinary tract infection in one patient, and they did not observe grade 3 or higher complications<sup>(12)</sup>. Our present results are comparable with those reported in other series. Two patients had fever in the early period, which resolved with conservative treatment, and one patient had a urethral stricture in the late period. In our series, no recurrent urethral stone was observed at the 6-month follow-up. In addition, 7 of 13 patients who could not receive anesthesia due to various comorbidities in our series were successfully fragmented with Ho:YAG laser under local anesthesia.

It is necessary to create an algorithm for urethral stones. If AUR fossa navicularis, it may be tried to extract it gently with a clamp without damaging the mucosa. If the stone cannot be seen, retrograde manipulation of the stone into the bladder with a catheter and catheter may be attempted. If it cannot be passed, a percutaneous suprapubic cystostomy

catheter can be inserted. If urethral stones are in any part of the urethra and are small in size or if there is no primary pathology in the urethra, gentle removal with endoscopic intervention may be considered. Stones in the posterior urethra can be pushed into the bladder with lidocaine or endoscopically and fragmented retrogradely. If there is a large stone, if it is thought to remain for a long time, or if it is protruding and completely obstructive, milking should not be preferred because of mucosal damage. In elderly patients and patients with comorbidities, fragmentation with holmium laser under local anesthesia is a safe and effective method and should be considered.

### Study Limitations

Our study has some limitations. The first is the retrospective design. The second is the small number of patients. The strengths of our study are the presentation of the experiences of patients of all sexes, ages, and surgical methods.

### Conclusion

This study demonstrated that transurethral endoscopic Ho:YAG laser lithotripsy can be used effectively and safely for treating urethral stone randomized, large-scale and prospective studies are needed to establish a common approach for the treatment of urethral stone disease.

### Ethics

**Ethics Committee Approval:** After obtaining the approval of the Local Ethics Committee of University of Health Sciences Turkey, İstanbul Bakırköy Dr. Sadi Konuk Training and Research Hospital (2020-531), the data of 24 consecutive patients operated for urethral stones between January 2017 and December 2020 were retrospectively evaluated.

**Informed Consent:** Written informed consent was obtained from all patients for inclusion in this study.

### Authorship Contributions

Surgical and Medical Practices: K.G.Ş., Y.A., M.B., Concept: E.G., K.G.Ş., Design: Y.A., K.G.Ş., Y.Ç.Ş., Data Collection or Processing: K.G.Ş., Y.A., Analysis or Interpretation: E.G., M.B., Y.Ç.Ş., Literature Search: Y.A., K.G.Ş., E.G., Writing: K.G.Ş., Y.A.

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