

ORIGINAL RESEARCH

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A rare cause of acute urinary retention: Anterior urethral stones

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Abstract

Anterior urethra stones are extremely rare causes of acute urinary retention. The data of 34 adult patients who presented with acute urinary retention between August 2011 and September 2017 and treated with anterior urethra were evaluated retrospectively. Their ages, sizes of stones, locations, etiological factors, physical examination findings, treatment modalities, operation period and complications were analyzed. All the patients were male and the mean age was 46.9 ± 17.88 years. All of the stones evaluated in the study were single and the mean stone size was 12.17 ± 3.23 (6-19) mm. Location of the urethral calculi was fossa navicularis in 12 (35.3%) patients, bulbar urethra in 7 (20.6%) patients and penile urethra in 15 (44.1%) patients. A total of 20 patients had urinary calculi located in the other parts of the urinary system at the time of presentation. Stone of the 7 patients with fossa navicularis localized had been treated by intraurethral instillation of 2% lidocaine gel, the other 5 patients had been treated with ventral meatotomy. Urethral stone of the 7 patients with penile and bulbar urethra located was taken by the help of direct forceps without requiring any fragmentation operation. Other stones were treated with endoscopic holmium laser lithotripsy. As a result of surgery operations, urinary tract infection in 3 patients, urethrorrhagia in 2 patients and hematuria in 5 patients were observed. We consider that it is very important to keep anterior urethral stones in mind among differential diagnosis especially in male patients admitted with acute urinary retention.

Keywords: Acute urinary retention, urethral stones, penile pain

Introduction

Urinary system stone disease constitutes an important part of the administrations to the emergency clinics. Although there is not enough statistical data in our region, it is known that in the USA more than one million administrations related to urolithiasis to the emergency clinics per year [1]. Findings in urinary system stone disease show changes depending on age and the general status of the patient, the location, the size and formation time of the stone. However, a large part of the cases are presented emergency units with complaints of renal colic [2-5].

Urethral stones disease is the least frequently seen urinary system stone disease. Its incidence is less than 1% and it has a quite different symptom from the upper urinary tract stone disease. Patients with urethral stone may administer with very different

findings such as acute urinary retention, hematuria, difficulty in urination, dysuria, penile or perineal pain [6]. Although urethral stones emerge in small sizes, yet they are rarely observed in stone structures reaching large dimensions resulting in very difficult treatment processes [6,7]. There are two essential factors determining the clinical status of the cases in urethral stones. These are the urethral lumen structure and the size of the stone. In a natural urethral lumen, a stone that reaches large dimensions can make acute urinary retention, and it should be kept in mind that natural structure of a small stone may deteriorate and may cause the same effect in a narrowing of the urethra. In addition to all these, researches made in past years it is known that the most frequent complaints of patients who administered to clinics with urethral stones are acute urinary retention [8,9].

Acute urinary retention is a urological emergency which is characterized by a sudden loss of urine output and a distended bladder [10]. Mostly, there is a strong pain in the lower abdomen. However, rare cases of pain may not be observed in cases accompanied by neurological disorders [11]. This case should not

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be confused with anuria observed in acute renal failure. While there is a pathology in the urine production in patients with renal failure, there is a problem in the urinary excretion of the bladder in acute urinary retention. Acute urinary retention may appear depending upon disorders that occur on detrusor muscle such as spinal cord injury, diabetic neuropathy, central nervous system tumors. But is often secondary to the pathologies of urinary flow. To these pathologies many clinical cases such as benign prostatic hyperplasia, urethral stenosis, pelvic organ prolapses, pelvic traumas, prostate, bladder neoplasms may be given as examples [12-15]. The main aim of the treatment is to provide drainage of the urinary tract with proper catheterization and to protect the patient from pathologies that may arise secondary to urinary retention such as upper urinary tract damage, renal failure and urinary tract infections [14,15].

When the articles in the literature of the past years are examined, it is observed that urethral stones are rare and most of the manuscripts are case reports or small series. There is no detailed information about risk factors, diagnosis, treatment and follow-up approaches compared to other patients with acute urinary retention. In this retrospective study, 34 patients who administered to our clinic with acute urinary retention and whose anterior urethral stones were treated and followed-up were discussed by our results.

Material and Methods

The files of 34 adult patients who presented with acute urinary retention between August 2011 and September 2017 and treated with the diagnosis of anterior urethral stone were evaluated retrospectively. Preoperative evaluation was performed with a medical history form recorded by the physician, urine analysis, routine hematological, biochemical examinations, kidney-ureter-bladder (KUB) and non-contrast abdominal tomography. Age, presentation complaints, stone size, location, physical examination findings, etiologic factors, treatment modalities, duration and complications of the patients were analyzed retrospectively. Patients whose data were not complete were excluded from the study.

Percutaneous suprapubic cystostomy catheter was applied to all patients after the first clinical evaluation. Urinary ultrasonography was performed to all patients before catheterization. No pathology was observed in any patient to prevent suprapubic catheterization such as bladder cancer and inadequate bladder fullness. A urine culture was taken from each patient and a broad-spectrum antibiotic was started. Performed treatment procedures were shaped according to the size and location of the stone. All procedures were performed under sterile conditions. Stones smaller than 1 cm and with smooth surfaces that could be observed by fossa navicularis localized inspection were aimed to be taken out with physical manipulations under local anesthesia applied with 2% lidocaine gel. On the other hand, ventral meatotomy was performed on the stones which did not have a smooth surface or had more than 1 cm and fossa navicularis localized. Endourologic interventions were preferred in the treatment of all penile and bulbar urethral stones. When the procedures of application of endourological interventions are examined, lidocaine 2% gel was applied into the urethra in the lithotomy position. Cystourethroscopy was performed using a 0-degree lens passed into a 19.5 Fr or 22 Fr endoscope. In addition to the patients who had urethral stenosis during cystourethroscopy,

urethral pathologies were treated by surgical intervention. After the urethra stones were reached, and stones with the smooth surface smaller than 1 cm were taken out with the help of forceps. Other urethra stones were planned to advance to the bladder to perform holmium laser lithotripsy. In-situ holmium laser lithotripsy was applied to the stones that could not be advanced to the bladder. Holmium: Yttrium-Aluminum-Garnet laser device (Lisa Laser Spihinx 60, Germany) was used as lithotripter. During lithotripsy, different probes 272 μ and 550 μ were preferred depending on the size of the stone. In all endourological interventions, sterile 0.9% NaCl solution was used for fluid irrigation. All applied meatotomy or endourologic procedures were performed under general or spinal anesthesia.

Statistical Evaluation

SPSS (Statistical Package for the Social Sciences in PASW Statistics, SPSS Inc., Chicago, IL, USA) version 18.0 software was used for data analysis. Continuous data of patients were expressed as the mean $\pm$ standard deviation (minimum-maximum) whereas categorical data were expressed as frequencies and percentages (%). The Pearson chi-square test or Fisher's exact test was used to comparing proportions for detected microorganisms and location of the urethral calculi. Fisher's exact test was used when the expected value in one or more cells was less than 5.0 in the crosstab. A p value of less than 0.05 was considered statistically significant.

Results

34 patients with acute urinary retention and those who were diagnosed by anterior urethral stones were included in the study. All the patients were male and the mean age was 46.9 ± 17.88 (18-78) years. All the stones were radiopaque and as a result of the genitourinary system examination it was revealed that 15 (44.1%) of the stones were palpated in the urethra. In 34 patients whose main complaint was acute urinary retention and in addition to this complaint, high fever at 4 of these 34 patients and renal failure at 3 of them were observed. Urinary tract infection was detected in 15 (44.1%) cases. The most commonly detected microorganism was *Escherichia coli* (66.6%; $p < 0.001$) (Table 1).

Table 1. Numbers and percentages of isolated microorganism

Pathogen	n	%	*P value
<i>Escherichia coli</i>	10	66.6	
<i>Klebsiella Pneumoniae</i>	2	13.3	
<i>Acinetobacter Baumannii</i>	1	6.7	
<i>Enterococcus Faecalis</i>	1	6.7	<0.001*
<i>Candida Albicans</i>	1	6.7	

+: Fisher exact test, *statistically significant
Urine culture was positive in 15 (44.1%) patients

All of the stones evaluated in the study were single and the mean stone size was 12.17 ± 3.23 (6-19) mm. Location of the urethral calculi was fossa navicularis in 12 (35.3%) patients, bulbar urethra in 7 (20.6%) patients and penile urethra in 15 (44.1%) patients. There was no statistically significant difference between the proportions of the location of the urethral calculi ($p < 0.115$; Table 2). A total of 20 patients had urinary calculi located in the

other parts of the urinary system at the time of presentation. Of these 20 patients; 12 had renal calculi, 5 had bladder stones, 2 had distal ureteral stones, and 1 patient had both kidney stones and bladder stone. When the anamnesis forms were evaluated in details, 2 patients had endoscopic cystolithotomy, 3 patients underwent ureterorenoscopy, 1 patient had percutaneous nephrolithotomy, 4 patients had transurethral resection of the prostate and 2 patients had the frequent urethral infection.

Tablo 2. Stones in the urethra

Site	n	%	^b P value
Penile urethra	15	44.1	0.115
Fossa navicularis	12	35.3	
Bulber urethra	7	20.6	

^b: Chi square test

Considering our treatment approaches, stones of the 8 patients without urethral meatal stenosis and whose fossa navicularis localized were smaller than 1 cm in size and the surface area was evaluated as smooth were decided to take out by physical manipulations following lidocaine gel application. While the stones of the 7 patients were successfully removed, 1 patient underwent ventral meatotomy. In addition, fossa navicularis localized stones of the 4 patients whose size was larger than 1 cm or had no smooth surface were also removed by ventral meatotomy. Cystourethroscopy was performed in all patients and urethra lumens were evaluated in detail. No pathological findings were recorded in the other parts of the urethra in these 12 patients treated without endourologic methods. On the other hand, the penile and bulbar urethra stone of 7 patients, whose size was less than 1 cm in size, and the surface area were observed properly, was taken by the help of forceps. Urethral stones of the remaining 15 patients with penile and bulbar were planned to be advanced into the urethral stone bladder for fragmentation. In a total of 9 patients the urethral stone was successfully advanced into the bladder. Using holmium laser lithotripsy, the stones in the bladder were successfully fragmented and taken out with the help of forceps or evacuator. A total of 6 patients underwent in-situ holmium laser lithotripsy since the urethral stones could not be advanced into the bladder. All stones were successfully fragmented and taken out with the help of forceps.

When all procedures were evaluated, urethral stenosis was detected in 19 (55.9%) patients. During the preoperative evaluation, 2 patients were found to have ureteral stones, and these patients additionally received ureterorenoscopy. Similarly, 6 patients had bladder stones. Endoscopic cystolithotomy was performed in these patients. The fragmentation of the stones was performed by holmium laser lithotripsy. The operation time was determined by subtracting the time used for these specified endourologic procedures from the recorded time for the total surgical procedure. The mean operative time was recorded as 18.67 ± 5.40 minutes. When the complications of the procedure were examined, urinary tract infection was detected in 3 patients, urethrorrhagia in 2 patients, and hematuria was observed in 5 patients lasting less than 24 hours and did not require blood transfusions.

Discussion

Acute urinary retention, which is defined as the inability to make a sudden urination, is much more observed in the male population and the risk of encounter increases with age. Approximately while 10% of males in the 70s report acute urinary retention at least once, this rate reaches up to 33% in 80s [16]. Acute urinary retention, mostly known as the disease of advanced elderly men, is rarely seen in children and women [15-18]. Previous studies have reported that the overall incidence of acute urinary obstruction in men with USA citizens is 4.5 to 6.8 per 1000 men [15]. The publications made in the female population are quite limited and it is estimated that it is observed in 7 out of 100,000 women annually [18].

The most common cause of acute urinary retention is a prostate disease, which is observed in an increasing prevalence in the aging population. However, etiologic factors show differences between sex and age groups. The development of acute urinary retention is mainly focused on two mechanisms. The first one is the resistance that increases the urine flow by mechanical or dynamic means, and the other is the deteriorations of the detrusor muscle [13,15]. In this context, although urethra stones were extremely seen, they may cause obstruction in the urethral lumen due to mechanical causes.

Urinary stone diseases are among the oldest known diseases in human history [19]. Its incidence varies in relation to many factors such as geographical region, dietary habits, gender, genetic and socio-cultural status [20]. In our country, in the study by Akinci et al [21], the prevalence of urinary stone disease was reported to be 14.8% and the incidence was 2.2%. The prevalence of lifelong urinary stone disease in Tokat, the province where the study was conducted, was reported as 11.42% in previous studies [22]. In routine clinical practices, urethral stones are among the most rare group of urinary tract stone diseases. Epidemiological studies in the past years indicate that urethra stones are more common in the Middle and Far Eastern countries rather than in the Western world [6,7]. Urethral stones can be seen as primary, urinary tract stones can also be seen as secondary urethral stones by migrating stones at different localizations [23]. In relation to this study, when Koga et al [24], examined the patients with 56 urethral stones, the incidence of stone in the upper urinary tract with urethral stone was reported to be 32%. In another study, Kiciler et al [25], had found this rate as 47.1%. In a retrospective multicentre study done by Jung et al [26], it was reported that upper urinary tract stones and/or hydronephrosis had increased the urethral stone risk 3-fold. In our study 58.8% of patients were found to have a stone in another localization of the urinary system along with urethral stone. In addition to this information, it has been known that in urethral stone formation, many etiological factors such as urinary tract infections, urethral strictures, urinary schistosomiasis, history of endourologic intervention, pelvic trauma, forgotten foreign bodies, urethral diverticulum and fistulas play a role [6,8,24-26]. Urethral stone diseases are predominantly seen in the male population. In this context, Ameen et al. [27] 72 patients with urethral stones were evaluated and only 8.6% of the patients were reported to be women. Al Ansar et al. [28] in their study, only 3.1% of the 64 patients with lower urinary calculi reported that they were women. This is directly related to the anatomy of the urethra.

Normal adult male urethra diameter is 30 Fr and it allows natural stones that are smaller than 10 mm to be expelled from the body naturally [29]. Any pathology that may occur in the urethral lumen is a predisposing factor for the formation of stones in the urethra. In a study of 41 patients with urethral stones, urethral pathology was detected in 41.5% of patients [8]. In another study by Kiciler et al [25], it was found that 35.3% of urethral pathology was found in patients with urethral stones. In a similar study of 36 patients with urethral stones, pathology was detected in 47% of patients. In the same study, the most common disorder in patients with urethral pathology was reported as 88.2% urethral stricture [30]. In our study, urethral pathology was observed in 55.9% of patients.

The first step in the treatment of urethral stones causing acute urinary retention is the placement of suprapubic cystostomy catheter [8]. It should always be kept in mind that persistence of urethral catheter application in these patients may lead to pathologies that are extremely difficult to treat in the urethra. Treatment procedures of anterior urethral stones must be evaluated according to the stone size, localization, anatomical structure of urethra, age and sex of the patient. Many different methods such as milking, ventral meatotomy, forceps extraction, extracorporeal shockwave lithotripsy, transurethral lithotripsy have been used in the treatment [22,23,30-34]. In a clinical study conducted on 18 patients with urethral stones smaller than 10 mm, and without urethral stricture, it was decided to take out urethral stones as conservatively with the help of physical manipulation with 2% lidocaine gel application into the urethra. In their study, they reported that 14 patients were completely treated of urethral stones and their success rate was 77.8% [32]. In our study, the similar procedure had been applied to 8 patients with fossa navicularis stone and the success rate had been observed as 87.5%. But it is appropriate to prefer the extremely limited case with small volume characteristics with smooth surfaces. Insistence on this method is faulty and may cause damage to the urethra. Therefore, these patients should have different surgical options on the agenda of clinicians such as urethroplasty, diverticulectomy and meatotomy [35]. Ventral meatotomy was among the preferable treatments for large size or lumen implanted fossa navicularis stones. In our study, a total of 5 patients with similar features underwent ventral meatotomy and the success rate was recorded as 100%. It is seen that similar results have been obtained in the publications in previous years [25]. The use of endoscopic treatment methods that provide direct vision in the treatment of all the stones in the other parts of the urethra is very important in terms of the least damage to the treatment procedures of the urethral mucosa [8,9]. During the transurethral lithotripsy process, very different lithotriptors can be used. However, the use of holmium laser in the endourology in parallel with technological innovations appears to be prominent. According to previous studies, Maheshwari and Shah [34] reported that they achieved 100% success in in-stu holmium laser lithotripsies with dimensions ranging from 7 to 22 mm in 18 urethral stones and they did not follow major intraoperative complications. In our study, holmium laser lithotripsy was applied successfully in all patients with low complication rates in the fragmentation of urethral stones.

Study Limitations

There are some limitations exist with this study such as retrospective nature, limited numbers of subjects and absence of

biochemical analysis of stones that were managed.

Conclusion

When the past year studies were examined, there was a limited number of publications on anterior urethral stones and no detailed information about clinical approaches was found as in other urinary stone diseases. In the patients with acute urinary retention, we think that the application of correct treatment algorithms among the differential diagnosis of urethral stones is extremely important in protecting the cases against the damage to the difficult urethra diseases.

Competing interests

The authors declare that they have no competing interest.

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Ethical approval

Consent of ethics was approved by the local ethics committee.

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