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Original Research Article

Evaluation and management of urethral calculi

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ABSTRACT

Background: To evaluate the presentation, management and outcome of patient with urethral calculi in addition to determine the most common type of calculi encountered in those patients and the chemical composition of those calculi to prevent their recurrence.
Methods: Sixty-nine patients with urethral calculi, 63 males and six females were included in this study at Al-Yarmouk teaching hospital, Bagdad, Iraq from April 2016 to April 2017. The diagnosis of urethral calculi was based mainly on the clinical presentation and cystoscopy evaluation in addition to the history, examination and investigations.
Results: All together Sixty-nine patients were recruited in this study [63 male (91.3%) and 6 females (8.6%)], regarding sex distributions of patients the largest number of patients with urethral calculi were found in male between 21-40 years old, the most common presenting symptom was dysuria (60.8%), the presentation of pediatric urethral calculi was different (any suspicion of urethral mass on palpation gave high index of suspicion of urethral calculi).
Conclusions: Nephrolithiasis especially renal calculi represent a widespread problem, recurrent UTI is one of the leading risk factor in urinary calculi and should be vigorously treated and any case should be in investigated carefully and chemically analysed to prevent further attacks and recurrence in future. Unbalanced diet with poor hygiene especially for the urethral calculi plays an additional role in the pathogenesis of urethra calculi.

Keywords: Calculi, Urethral calculi, Urethra

INTRODUCTION

Urolithiasis represents a major problem met within urological practice.[1] it affects 10-12% of the populations, the incidence of calculus diseases is quite variable in relation to age, sex, occupation, geographical locations, season, climate, social class, dietary fluid intake and racial differences are also noted (black people appears to suffer less frequently than white).[2,3]

Urinary calculi are the third most common affliction of the urinary tract, exceeded only by UTI and pathological conditions of prostate.[3]

Renal and ureteral calculi account for more than 87% of the total calculi and 10% in the urinary bladder while ureteral calculi account for about 1.7-3% of all urinary calculi.[5-7]

Male urethra about 20 cm in length and extends from the neck of the bladder to the external meatus on the glans penis, Male urethra is divided into posterior and anterior urethra, posterior urethra is further divided into 3 parts:

- Preprostatic portion; measure up to 1 cm in length and it runs from the bladder neck to the prostate

- Prostatic urethra; is about 3 cm long, it traverses the prostate and emerges on its anterior aspect a little above the apex where it becomes continuous with the membranous urethra. It is the widest and most dilatable part of the entire urethra[8-10]
- Membranous urethra; it extends from the apex of the prostate through the pelvic floor musculature until it joins the bulbous urethra. It is the narrowest part of the urethra.

The anterior urethra is further divided into 3 parts:

- Bulbous urethra; at the base of the penis (3 cm)
- Penile urethra; along the base of the penis (10 cm)
- Glanular urethra; traverses through the glans penis (2 cm).

Female urethra it is about 3.8 cm in length and extends from the neck of the bladder to the vestibule where it opens about 2.5 cm. below the clitoris.[11-13] The etiology of renal calculi there are many theories include:

- Nucleation theory
- Calculus matrix theory
- Crystal inhibitor theory.

The main etiological factors of urolithiasis are:

- Dietary factor (e.g. insufficient vitamin A)
- Climatic factor
- Decrease urinary output of citrate: as citrate act as chelating agent for calcium
- Renal infection. e.g. Staph and *E. coli* infection
- inadequate urinary drainage as in obstruction
- prolonged immobilization
- Hyper parathyroidism

The most common metabolic disorder is hypercalciuria 37.3%. Bladder calculi constitute about 10% of all urinary calculi; it is usually a manifestation of an underlying pathology. The causes of bladder calculi include;

- Voiding dysfunction: including urethral stricture, benign prostatic hyperplasia (BPH), bladder neck contracture, flaccid or spastic neuropathic bladder all of which result in stasis of urine
- foreign bodies such as Foley's catheter and forgotten double-J, urethral catheters can serve as a nidus for calculi

Urethral calculi usually originate from the bladder and rarely from the upper tracts. So, it is either primary urethral calculi which arise proximal to urethral strictures or associated with urethral diverticulum and urethrocele or secondary from bladder or renal calculi. Primary urethral calculi are very rare in females and if present they are almost always associated with underlying genitourinary pathology (stricture, diverticulum).[14-16]

In male, the commonest location of urethral calculi is the posterior urethra and if it occurs in anterior urethra it is usually associated with urethral diseases (strictures, diverticulum, or urethrocele).[17-19]

In female development of urethral calculi is very rare due to their short urethra and a lower incidence of bladder calculi. The main lines of management of urethral calculi are;

- Retrograde manipulation into the bladder with litholopaxy
- Urethrotomy for associated stricture
- Urethrolithotomy
- Meatotomy
- Conservative, waiting for spontaneous passage
- Suprapubic cystolithotomy

Recently other methods of treatment had been used which include:

- holmium laser lithotripsy: It is a safe and effective procedure for the treatment of impacted urethral calculi.
- ESWL; It is mainly used in case of multiple, large. Bulbous urethral calculi especially in those patients who can't tolerate for cystoscopy position e.g. paraplegic patients. Three thousand shock waves are enough to fragment the stone.[20,21]

METHODS

The diagnosis of urethral Calculi was based mainly on clinical presentations and cystoscopic evaluation in addition to history, examination and investigations including urine analysis, urine culture sensitivity, complete blood cell count, blood urea, serum creatinine and serum uric acid.

Radiological assessment by plain abdominal film intravenous urography abdominal ultrasound in addition to voiding cystourethrogram group and retrograde urethrography. Chemical analysis was done to all calculi and this method of analysis was done because it cheap, quick and has less percentage of errors (2%).

Post-extraction urethral catheterization was done for those male patients who had a urethral calculus in association with urethral pathology in which the total number of them were 8 (all of them were males), 5 had primary calculi (4 of them in association with urethral strictures and one with urethral diverticulum). And the remaining 3 patients were with a history of optical urethrotomy.

RESULTS

Urethral stone has been seen most commonly in male in 63 patients (91.3%) and only in 6 female patients (8.6%).

According to the age groups, urethral calculi was common in male at age of 30-39 years old in 36 patients (57.1%) and less common in children at age less than 10-years-old in 3 patients (4.7%). While in female patients the urethral calculi have been seen in 3 patients at age of 20-29 years old and in 3 patients above sixty-year-old. As in Table 1.

Table 1: The distribution of urethral calculi according to age and sex.

Age groups (years)	Males		Females	
	No.	%	No.	%
<10	3	4.76	-	-
10-19	6	9.52	-	-
20-29	12	19.06	3	50
30-39	36	57.14	-	-
40-49	6	9.52	-	-
50-59	-	-	-	-
≥60	-	-	3	50
Total	63	100%	6	100%

The most common presentation was dysuria in 42 patients (60.8%), gross hematuria in 6 patients (8.69%), retention in 6 patients (8.69%), urethral swelling in 6 patients (8.69%), frequency in 3 patients (4.3%) and postvoiding dribbling in 3 patients (4.3%). While it was asymptomatic and diagnosed accidently in 3 patients (4.3%), as in Table 2.

Table 2: Presenting symptoms of urethral calculi.

Symptoms and signs	No.	%
Dysuria	42	60.8
Gross haematuria	6	8.69
Retention	6	8.69
Urethral mass	6	8.69
Frequency	3	4.3
Post voiding dribbling	3	4.3
Asymptomatic	3	4.3
Total	69	100%

Table 3: The site of urethra in male patients affected by stones.

Site of calculus		No.	%
Posterior urethra	Per-prostatic		
	Prostatic	27	42.8
	Membranous	9	14.28
Anterior urethra	Bulbar urethra	6	9.52
	Penile urethra	12	19.04
	Glanular urethra (meatal)	9	14.28
Total		63	100

Urethral calculi have been seen mostly in the prostatic urethra in 27 patients (42.8%) and less commonly in the Bulbar urethra in 6 patients (9.5%), as in Table 3. The size of the urethral stone ranged between 0.4 x 1.5 cm and 1.0 x 2 cm.

DISCUSSION

In this study, the urethral calculi were more common in male patients (91.3%) and less common in female patients (8.6%) due to the short urethra in female that is compatible with study of Charles DS et al who also found that urethral calculi occur more in male (58.6%) than in female (41.4%).[22]

Urethral calculi have been found mostly in patients between age of 30-39-years-old (57.1%). While Charles et al study show that urethral calculi occur more at age between 47-48-years-old (95%) and Thomas EN et al study found that urethral calculi occur more in age between 16-20 years old (77%).[22,23] This differences in age prevalence may be due to the differences in life style and the nutritional habits.

The most frequent presentation of urethral calculi in this study was dysuria (60.8%) while Kamal BA et al study show that the most frequent symptom is acute urine retention (78%).[9]

The most common site of urethral stone impaction was in the prostatic urethra (42.8) and less common in Bulbar urethra (9.5%) which may be due to the diameter of the bulbar urethra is more than the diameter of the prostatic urethra. This is compatible with Kamal BA et al study which found that posterior urethral calculi occur in (88%), while Ahmed A et al found that anterior urethra is the common site for urethral stone (71.4%).[9,16]

The size of the stone was ranging between 0.4 x 1.5 cm and 1.0 x 2 cm, this size is look similar to the size of the urethral stone that studied by Ahmed A et al and Gali BM.[9,16]

The classical treatment was used in this study. 70% of calculi of 0.4 x 1.5 cm are passed spontaneously, post-extraction urethral catheterization done for those male patients with urethral calculi associated with other urethral pathology like urethral stricture and urethral diverticulum.

Urethrolithotomy regardless of the surgeon's skill. Incisional surgery for calculus removal always results in higher patient morbidity. Incision of urethra by urethrotomy has higher risk of periurethral scaring.

Open surgery in current study (urethrolithotomy) was done as an emergency measure with supra-pubic diversion of urine that patient was complicated by urethra-cutaneous fistula; this operation was done because of uremia.

A major postoperative complication of the surgical removal of urethral calculi is the formation of urethra-

cutaneous fistula to avoid this complication preoperatively the flaccid skin of the penis itself is pushed proximally, the incision is made ventrally into the penis and urethra, the calculus can then be removed and the closure of the wound allowing the penile skin to assume its natural position, the benefit of this procedure is to avoid two overlying suture lines and greatly reducing the chance of fistula formation.[9]

Regarding the pediatric age group in this study, only one of the three patients presented with sudden attack of retention of urine and swelling of the penis and scrotum with bluish discoloration of the penile skin for 5 days duration, the main line of treatment of this child was percutaneous cystotomy and meatotomy was done and calculus was extracted, this was followed by dramatic response and the swelling subsided, the urine leak ceased and renal function test returned to normal. While the other two children presented with classical symptoms and treated by push back maneuver and cystolithotripsy.

The management of urethral calculi varies according to site, size, and any associated lower urinary tract diseases. Retrograde manipulation into the urinary bladder is the most frequent procedure for posterior urethral calculi. It is dangerous to use a metallic sound or catheter to relieve acute urinary retention. Irrigation during endoscopic procedure expands the urethra and facilitates the return of the calculus to the urinary bladder. And then either litholopaxy or ultrasonic lithotripsy (if available) is done.

It is dangerous to attempt to milk out the anterior urethral calculi or extract them with forceps because of potential damage to the urethral mucosa. So endoscopic procedure is the safest and any lower urinary tract pathology should be treated to prevent calculus recurrence.

CONCLUSION

Nephrolithiasis especially renal calculi represent a widespread problem all over the world including our country. Recurrent urinary tract infection is one of the leading risk factor in urinary calculi, so it should be vigorously treated once it is diagnosed. Any calculus extracted should be analyzed to know its composition to prevent its recurrence. Unbalanced diet with poor hygiene especially for the urethral calculi plays an additional role in the pathogenesis of urethral calculi.

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