Urethral Stricture and Stone: Their Coexistence and Management

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Purpose: The aim of the study was to determine whether the coexistence of urethral stricture and stone influence the treatment modality of each other and to ascertain the best treatment modality for these group of patients. We also tried to speculate whether the stone is an effect or a cause of the stricture.

Materials and Methods: Retrospective analysis of prospectively collected data of 35 male patients with coexistent urethral stricture and stone were done between January 1998 and December 2011. Patients were divided in two groups (1 and 2) - limited stone bulk (group 1, n = 30) and extensive stone bulk (group 2, n = 5). The former group was treated with endourologic procedures and the latter group managed with open staged procedures. We used ureteroscope for endourological management which we think eases the management.

Results: Endoscopic management of both stone and stricture were successful in all patients of group 1. Patients of group 2 have been managed by open surgery in two stages. All of them are urologically asymptomatic after a mean of 28 months of follow up. The principle determinants of treatment modality were the bulk of stone, its location and characteristics of stricture.

Conclusion: Both stone and stricture can be managed successfully by endoscopic method in most of the patients. Bulk, location of the urethral stone and length of stricture is the main limiting factor for the endoscopic management. A stone can be an "effect" as well as the "cause" of strictured urethra.

Keywords: urethral stricture; etiology; surgical procedures; adverse effects; urinary calculi.

INTRODUCTION

The urethral stricture, particularly common in males, is predisposed by urethritis, perineal trauma, endourological treatments or repeated catheterizations.[1,2] The spongiofibrosis as a result of scarring process of spongy erectile tissue of corpus spongiosum leads to anterior urethral strictures. Posterior urethral strictures usually result from a fibro-obliterative process secondary to distraction injuries. Posterior strictures are associated with dense fibrosis interposed between distracted urethral ends. The main complications associated with urethral strictures, are inflammatory periurethral phlegmon, discharging sinuses and fistula, associated urethral calculi, periurethral abscesses and urethral diverticula.

Co-existence of urethral stone along with urethral stricture is infrequently known entity. Often urethral stones are thought to be result from stasis of urine. It usually occurs in the dilated urethra proximal to the stricture segment. Isolated urethral stone account for 2% of the urolithiasis and are common in developing countries,[2] more so in the middle-east.[3] Isolated stone in the urethra is often secondary to migrated stone from the upper tract or the bladder.[4] One of the risk factors for urethral stones is urethral stricture, apart from episodes of urethritis, balanitis xerotica obliterans and long-term supra pubic catheter. Less often, a primary urethral calculus may be formed proximal to strictured segment. It may be associated with a urethral diverticulum, urethrocele or related to hair ball developed after previous graft urethroplasty.

The important determinants of appropriate treatment modality for urethral stricture include the length, location, depth of stricture and degree of spongiofibrosis. Various modalities of treatment of urethral strictures include serial co axial dilation in soft partial stricture, optical internal urethrotomy (OIU) with or without local steroid injection in short segment passable strictures of anterior urethra, end to end anastomosis in non-passable dense strictures, lay opening of urethra or augmentation urethroplasty for long segment urethral strictures.[5-8] Urethral stones can be treated by retrograde manipulation, milking, forceps extraction, extra corporeal shockwave lithotripsy, transurethral litholapaxy and ultrasonic, laser or pneumatic fragmentation.[9-14]

To our knowledge all reports till date about urethral calculi are based on retrospective studies and mostly on few patients as these stones are infrequent. The literature on management of both complexities together is limited and the best treatment option for this dual pathology is still to be determined. The aim of the present study was to describe our experience with technical difficulties encountered and the best treatment modality for these groups of patients when both stricture and stone exist together.

MATERIALS AND METHODS

Prospectively collected data of 35 consecutive patients admitted to our hospital having urethral stricture and stone, between January 1998 and December 2011 were reviewed (Tables 1 and 2). Patients were evaluated with relevant medical history (including any history of urethral trauma or urethral discharge), physical examination (including palpation of the urethra, scrotum, perineum and a digital rectal examination), urine analysis, urine culture when necessary and a plain X-ray of the abdomen including pelvis and entire length of urethra. All patients underwent voiding cystourethrogram and or retrograde urethrography for diagnosis of stricture and the stone in the urethra. Confirmation of the stone was done by urethroscopy per-operatively. Uroflowmetric assessment was done as objective assessment of lower urinary tract symptoms (LUTS) preoperatively and in follow up.

The spectrum of urethral stone bulk was divided into two groups- limited stone bulk (group 1, n = 30) and extensive stone bulk (group 2, n = 5). The extensive stone bulk group included those patients who had more than one stone. In the former group, the location of stone was defined in relation to the site of stricture as proximal, distal or at the site of stricture. Four stones were in distal, 4 at the site of stricture and 22 were in proximal (Table 3). There were 5 patients with multiple stones, all associated with pan anterior urethral stricture. One was associated with a proximal urethral diverticulum and concomitant pan anterior urethral stricture. The number, size, shape and location of the urethral calculi were determined. The limited stone bulk group was managed by endoscopic means (Table 4). A guide wire was passed if negotiable across the stone and the stricture into

Table 1. Patient demographic characteristics.

No. of patients	**35**
Sex	Males
Mean Age, years (range)	32 (9-64)
Mean duration of symptoms, years (range)	1.8 (8 months – 3 years)
No. of naïve patients	29
No. of patients with previous history of urethroplasty	6
Patients with history of urolithiasis	2
Patients with limited stone bulk	30
Patients with extensive stone bulk	5

Table 2. Presenting symptoms and signs.

Symptoms and signs	**Number**
Dysuria	28
Loss of stream	30
Straining	24
Interruption of stream	18
Retention	3
Urethral fistula	1
Palpable urethral mass	2

the urinary bladder, using the ureteroscope. OIU was done using cold knife or holmium laser (200 µ fiber) before managing the stone in cases with stone proximal to the stricture. After dealing with the distal stricture the stones were tried to push back into the bladder followed by litholapaxy. This method was successful in 5 patients. In other patients, it was not possible to manipulate the stone due to its size and the limited space. In those cases, we used an ureteroscope and tried to negotiate a guide wire. If the guide wire was not negotiable, stone was fragmented using a pneumatic lithotripter or by using holmium laser energy via the ureteroscope. Once the stone was fragmented repeat attempt was done to pass the guide wire. Continuous irrigation under pressure by means of a pathfinder was helped to dislodge the fragments easily and creates space for the passage of the guide wire. The same technique was used for stones located distally to the stricture and across which the guide wire could not be passed without fragmentation. The common difficulties encountered during cystoscopy were limited and obscured vision due to impacted urethral stones and less available working space. Hence the use of an ureteroscope and a pathfinder to generate high-pressure irrigation greatly facilitate the procedure. Also the use of holmium laser made it easy to fragment the harder stones which were not easily broken by the pneumatic lithotripter. The stone fragments were pushed up into the bladder using the pushback technique as for the posterior urethral stones and then retrieved at the end of the procedure. A Foley catheter was put in for 7 days and thereafter the patients were explained for self-catheterization weekly for three months. All the strictures associated with the limited stone bulk were amenable for OIU except for one which was managed with end to end anastomosis.

Patients who had extensive stone bulk were managed by staged surgical treatment. Standard lay open of the urethra with stone extraction was performed in all patients. These patients underwent staged urethroplasty after 6-8 weeks. Three patients underwent buccal mucosal graft reconstruction whereas in 2 patients the neourethra was made from a cutaneous flap. Patients were followed up as long as possible during the study with a mean follow up of 28 months.

RESULTS

The mean age of patients presenting with urethral stricture and coexistent urethral stone was 32 years (range 9-64 years) with 1 child (9 years). All 35 patients were males. The chief complaint of all these patients was poor stream (85%), dysuria (80%), straining (68.5%) and interrupted stream (51.4%) and all of them were admitted through the out patients department except 3 patient (8.5%), who was admitted with acute retention in the emergency ward (Table 2). All patients in the study had radio opaque calculi confirmed by radiography. The commonest location of the stricture was the posterior urethra following the distraction injury. Sixteen patients had anterior urethral stricture whereas nineteen patients had posterior stricture. Five patients had a long segment pan urethral stricture. One case was associated with urethrocutaneous fistula along with pan anterior urethral stricture and 1 patient had stone in a diverticulum of the urethra.

In the limited stone bulk group 4 patients had urethral stone distal to the site of the stricture in the penile urethra and 22 patients had calculi proximal to the stricture whereas four patients had stone at the site of the stricture. Therefore, 30 patients had a single calculus, whereas 5 patients had multiple calculi (Figure) and all were associated with pan anterior urethral stricture.

The endoscopic technique was successful in all the cases of the limited bulk group except one which was managed by end to end urethroplasty. Staged reconstruction was done in all patients of extensive stone bulk. None of the patients treated with staged reconstruction developed urethral fistula or incontinence with excellent healing of the donor sites. Spontaneous expulsion methods with no surgery and milking procedures were not successful in any case.

Three patients had gram negative urosepsis in postoperative period and one had a urethral bleeding which subsided with conservative management. One patient who was managed endoscopically had recurrence at an interval of 8 months and was managed simply by OIU.

Table 3. Location of stricture and stone.

Symptoms and signs	Number
Anterior urethra	16
Posterior urethra	19
Diverticula with anterior urethral stricture	1
Stone Location	
Distal to stricture	4
Proximal to stricture	22
At the site of stricture	4

DISCUSSION

Urethral stone constitute of less than 2% of all urolithiasis and considered as a rare disease in literature.[2,15] But urethral stone is not an uncommon disease in northern part of India as we found in our study. Reported literature does not describe any well-defined algorithm for treatment of urethral stone associated with stricture at the same sitting without affecting the ultimate outcome. We subscribe to the common view that treatment is based essentially on the size, shape, location and the bulk of stone present in the strictured urethra. Anterior urethral stone can be milking down with instillation of 2% lignocaine jelly or can be removed by ventral meatotomy or urethroscopic extraction method. Milking is usually avoided in stones which are spiked or are associated with urethral obstruction.[9] Endoscopic forceps extraction should be avoided in such stones. Non operative manipulation was tried in some with no positive results. Good results are reported in literature for the endoscopic pushback method followed by fragmentation provided that the manipulation was done under direct vision.[9] It is ideal for moderate sized calculi located specially in the prostatic urethra. We stuck to the same principles while trying to manipulate the stones into the bladder after OIU for distal stricture and were successful in 5 patients. In cases of urethral stones associated with stricture or impacted urethral stone open urethrotomy with primary or staged urethroplasty has been preferred.[16] However, good results of in situ holmium laser lithotripsy under cystourethroscopic guidance for impacted stones which could not be pushed back into the bladder have been reported.[17,18] Successful management of impacted stones has also been reported with the use of ultrasonic lithotripter. We had satisfactory results in 24 of our patients including those with impacted stones by using lithotripsy (pneumatic or laser). We used an ureteroscope instead of a cystoscope as it gave more space to work with. Continuous irrigation under pressure by means of a pathfinder helped to dislodge the fragments easily and create space for the passage of the guide wire.

Patients with extensive stone bulk have been managed by open surgery. In presence of stricture we used endoscopic modality only in those patients in whom the stone bulk was limited or the stricture length was not long. It is practically impossible to pass the ureteroscope, in patients of extensive stone bulk, as the scarred segment is tight and long. Endoscopic intervention is unlikely to be successful and will lead to high rates of re-stricture as the previous stone bulk has caused long-standing inflammation, infection, fibrosis and ischemia of the urethra. Patients with extensive bulk of stones and stricture are best managed by staged urethroplasty. There was no female patient with urethral calculus in this current study and is similar to the previous reports that females are infrequently involved,[4] although giant urethral

Table 4. Endoscopic management of limited stone bulk group.

Management	Number	Mean follow up, month
Endoscopic intervention		
OIU + Pneumatic lithotripsy	7	36 (18-24)
OIU + Holmium lithotripsy	14	12.2 (8.5-14)
Pneumatic lithotripsy followed by OIU	2	18.8 (14.6-28.8)
Holmium lithotripsy followed by OIU	1	13.2 (13.0-15.8)
OIU + Retrograde manipulation then litholapaxy	5	60.0 (15.0-118.5)

Key: OIU, optical internal urethrotomy.

calculus in females has been reported in literature.[19]

Sharfi[10] and Selli and colleagues[20] has reported that 56% of patients with urethral stones had anatomical abnormalities in their urethra. Hence they have concluded that urethral calculi are mostly associated with anatomical abnormality in the urethra. We also noted similar findings in our study, although Kamal and colleagues did not notice any anatomical changes.[9]

Isolated urethral stones are relatively common in children[4] specially in the developing countries due to higher prevalence of bladder calculi. In contrary to literature, only 1 patient in our study was below 12 years. Acute urinary retention was presenting symptoms in patients with urethral stone in 20% to 90% of patients as reported by El-Sherif and El-Hafi and Sharif.[14,21] In our study the most common presentation of these patients was poor stream (85%) followed by dysuria (80%) as compared to acute urinary retention (8.5%) (Table 2) described classically for urethral stones. None of the patient had acute retention in 14 male patients as reported by Selli and colleagues.[20] Urethral stones has been classified as primary and secondary on the basis of the site of origin. Primary calculi are usually associated with anatomical abnormality of urethra such as stricture and diverticula. Secondary stones are migrated stone from bladder or upper urinary tract.[21] Secondary stones are more common than primary stone and secondary stones usually present with acute onset symptoms such as acute retention, dysuria, severe obstructive flow or dribbling of urine. Primary stones do not cause acute symptoms and usually associated with long history of lower urinary tract symptoms related to primary urethral abnormality. In our study only 3 patients presented with acute retention which may correlates with the primary nature of stone in association with stricture. The etiology of primary stones is related to the concept of urinary stasis, infection and local inflammation. During initial stages of stone formation, obstructed flow and a dependent location in the pre-stenotic dilated segments of urethra causes the stone to be retained. The commonest location of stricture was posterior urethra (66%) and all of them had stones in the posterior urethra. Most urethral stones in our study (65%) were in posterior urethra, as reported previously by others for isolated urethral stones.[2,10,13]

All patients in our study had radio opaque calculi confirmed by uroradiography. This contradicts some earlier reports that most urethral calculi are radiolucent.[13,22] Kamal and colleagues also reported that 98% of the urethral stones in his study were radio opaque.[9] Data on the constituents of urethral calculi are lacking in literature except Kamal and colleagues[9] have reported that calcium oxalate was most common type (86%) followed by struvite (6%) and uric acid (2%) stone. This is probably a limitation of our study that we did not analyzed the composition of stones in our patients routinely.

CONCLUSION

Urethral stone and stricture disease is not an uncommon association. A stone can be an "effect" as well as the "cause"

Figure. Extensive stone bulk in one patient.

of stricture urethra. In these cases of dual pathology the treatment modality is principally guided by the location of stone in relation to the stricture, the bulk of the stone and character of stricture. Lithotripsy including lasertripsy is an effective modality in patients with limited stone bulk and the use of an ureteroscope instead of a cystouretherscope can ease the procedure. Patients with extensive stone bulk are better managed with open staged procedure. Co-existence of both entities may complicate the surgical technique but does not affect the outcome of surgery.

CONFLICT OF INTEREST

None declared.

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