Original Research Article

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Clinical study and management of vesical calculus

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ABSTRACT

Background: Vesical calculus accounts for 5% urolithiasis and is the most common urolithiasis in pediatric age. Although incidence has drastically reduced of late, vesical calculi continue to occupy an important place in everyday urological practice. Hence a study was performed to evaluate the clinical presentation and management of vesical calculus.

Methods: A prospective study was conducted in the Department of General Surgery in a tertiary center between December 2012 to May 2014.

Results: A total of 42 patients with vesical calculi were studied. Males were more affected than females (6:1). Pain abdomen was the most common presentation (71%). Fifty-two percentage patients were using bore well water to drink. Ultrasonography was the most sensitive investigation. All the cases were treated by surgical modality. Fifty percentage cases were treated with transurethral cystolithotripsy using 80-watt holmium laser. Twenty-one percentage cases underwent Percutaneous cystolithotripsy and the remaining 12 (29%) underwent the open suprapubic cystolithotomy. No complication was noted following percutaneous cystolithotripsy. Most of the vesical calculi were of mixed variety with predominant composition being calcium phosphate, calcium oxalate, and uric acid.

Conclusions: Vesical calculus most commonly affects children less than ten years. Most of them present with pain abdomen. Low socio-economic status is more affected. Drinking hard water carries a high risk of vesical calculus. Ultrasonography is the investigation of choice in vesical calculus as it is 100% sensitive.

Keywords: Pain abdomen, Ultrasonography, Urolithiasis, Vesical Calculus

INTRODUCTION

Bladder calculi account for 5% of urinary calculi. It is classified as calculi migrated from upper urinary tract, primary idiopathic, or secondary calculi. Until the 20th century bladder calculi were a prevalent disorder among poor children and adolescent. Because of improved diet, especially in increased protein carbohydrate ratio, primary vesicle calculi are rare.²

The major incidence of urinary lithiasis was bladder calculi in children. As nations increased productivity and moved into industrial age, average income and food quality improved. These events resulted in disappearance of endemic bladder stone disease from previously affected population.³ Although new and effective therapeutic methods to treat urolithiasis have been introduced recently, urinary calculi continue to occupy an important place in everyday urological practice.⁴ In this

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context, the study was performed to evaluate the clinical presentation and management of vesicle calculus.

METHODS

A prospective study was carried out in a tertiary center for 18 months between December 2012 to May 2014. All the patients presented with vesical calculus were included in the study. The patients presenting with calculi only in urethra, ureter, and kidney were excluded. Prasad's BG socioeconomic classification was adopted and modified as per All india Consumer Price Index (AICPI) for the month may of 2014.⁵ An appropriate history was noted, and clinical examination was performed.

Appropriate investigations were done to diagnose the vesical calculi. A midstream sample of urine was collected for analysis for routine, albumin, sugar, microscopy and culture and sensitivity. Apart from routine blood tests, serum calcium, serum phosphates and serum uric acid levels were estimated. Appropriate antibiotics as per urine culture and sensitivity were given. Following this, patient underwent appropriate therapy in the form of open suprapubic cystolithotomy or transurethral cystolithotripsy or percutaneous cystolithotripsy.

Following open cystolithotomy, bladder was closed primarily in all cases with a urethral catheter kept for 4-7 days. In all cases, retropubic drain was kept for 48 hours; sutures were removed after 7 days. The development of thinner and easier to use endourologic instruments has made the transurethral and percutaneous procedures extremely attractive to urologists and patients.

The endourologic classical approach in the treatment of urinary lithiasis is based on the fragmentation and removal of the calculi through the urethra. Fragmentation is obtained from sources of mechanical/ ballistic, ultrasonic, electro-hydraulic or laser energies.

The calculi recovered were subjected to chemical analysis after noting down their physical characteristics. Patients were examined for postoperative complications and documented. They were discharged as per the clinical requirement. Wound infection was defined by CDC guidelines.⁶

RESULTS

A total of 42 patients presented to the Department of General Surgery during the study period. The incidence of vesical calculus was 0.95% (42/4438) for total surgical admissions. Vesical calculus was most commonly found in children less than ten years [24 (57%) patients] (Table 1). The male and female ratio was 6:1 (36 males and 6 female). Majority of the patients belonged to rural area [34 (81%) patients] compared to urban area [08 (19%) patients]. Majority of the patients belonged to socioeconomic class III [20 (48%) patients)] and the least

each in socioeconomic Class I and V [2 (5%) patients] (Table 2).

Table 1: Age distribution of patients with vesical calculi.

Age group	Number (n=42)	Percentage
<10	24	57
11-20	2	5
21-30	3	7
31-40	3	7
41-50	4	10
>50	6	14

Table 2: Socio-economic class of patients with vesical calculi.

Socio-economic class	Number (n=42)	Percentage
I	02	5
II	08	19
III	20	48
IV	10	24
V	02	5

Table 3: Clinical presentation of vesical calculi.

Symptoms	Number	Percentage
Pain abdomen	30	71
Pain radiation to the tip of penis	22	52
Fever	22	52
Burning micturition	10	24
Hematuria	10	24
Difficulty in urination	14	33
Increased frequency	07	17
Retention of urine	12	29
Dribbling of urine	01	2
Poor stream of urine	14	33
Gravel in urine	03	7
Excessive cry	08	19

Table 4: Duration of symptoms.

Duration (month)	Number	Percentage
<1	08	19
1-3	13	31
3-6	12	29
3-6 6-9	07	17
>9	02	5

Pain abdomen was the most common presentation [30 (71%) patients] (Table 3). The duration of presentation varied, with most of the patients [13 (30.95%)] presented after one to three months of complaints (Table 4). Twenty-four (57%) patients were vegetarian and 18 (43%) were mixed diet. Twenty-two (52%) patients were borewell water drinking population, 12 (29%) tank water,

and 8 (19%) patients were consuming river water. Maximum patients were malnourished 29 (69.04%) of patients.

The palpable bladder was the most common clinical finding, seen in 11 (26%) patients. Other findings were phimosis [six (14%)], meatal stenosis [two (5%)], and enlarged prostate [seven (17%)].

Urine analysis

Twenty-four (57%) patients had alkaline urine. Albumin was present in 15 (36%) cases. Pus cells were present in 27 (64%) cases. RBC's were present in 13 (31%) cases (Table 5). Kiebsiella was the commonest [nine (21%)] organism isolated, followed by proteus [seven (16.66%)], *E. coli* [seven (16.66%)], *S. aureus* [one (2%)] and pseudomonas [one (2%)].

Fourteen (33%) patients were anemic. Blood urea and serum creatinine were elevated in 13 (31%) patients. Thirty-nine (93%) patients were diagnosed using x-ray. Three (7%) radiolucent calculi were diagnosed by ultrasonography. Thirty-nine (93%) patients were having solitary vesical calculi and three (7%) patients had multiple calculi in the bladder. Four (10%) had associated ureteric calculi and two (5%) had associated with renal calculi. Ultrasonography detected all vesical calculi and associated ureteric and renal calculi. Twenty-four (57%) patients had vesical calculus measuring 1-3cm in size and 18 (43%) had calculi measuring 3-6cm in size. Eighteen (43%) patients had bladder wall thickness >5mm. Fourteen (14%) patients had hydroureteronephrosis.

Table 5: Urine analysis.

A. ur	ine analysis	Number	Percentage
рН	Acidic	18	43
Р	Alkaline	24	57
Albuı	nin	15	36
PUS	cell	27	64
RBC'	s	13	31

Table 6: Management of vesical calculi and postoperative hospital stay.

Surgery	<5	5-15	16-25	>25	Total
SPCL	0	2	0	0	2
PCL	9	0	0	0	9
TUCL	16	0	0	0	16
SPCL+FP	0	2	0	0	2
TUCL+TURP	0	5	0	0	5
SPCL+M	0	2	0	0	2
SPCL +C	0	6	0	0	6
Total	25	17	0	0	42

SPCL- Suprabpubic cystolithotomy; PCL- Percutaneous cystolithotripsy; TUCL- Transurethral cystolithotripsy; FP-Freyer's prostatectomy; TURP- Transurethral resection of prostate; M- Meatotomy; C- Circumcision

Table 7: Postoperative complications.

Surgery	Wound infection	Seroma	Hematuria	Total
SPCL	1	1	0	2
SPCL+FP	0	0	2	2
TUCL+ TURP	0	0	1	1
SPCL+C	1	0	0	1
Total	2	1	3	6

SPCL- Suprabpubic cystolithotomy; TUCL- Transurethral cystolithotripsy; FP- Freyer's prostatectomy; TURP-Transurethral resection of prostate; C- Circumcision

Cystoscopy was performed in 10 (24%) cases (two-therapeutic; eight- diagnostic). Excretory urography was performed in 14 (33%) of cases who had hydronephrotic changes on USG. Twenty-one (50%) patients underwent transurethral cystolithotripsy (Five of them had an additional transurethral resection of prostate) (Table 6). Twenty-five (60%) patients were discharged within five days of surgery (Table 6).

Two (5%) patients had wound infection, both postsuprapubic cystolithotomy, and both were managed with regular cleaning and dressing. One (2%) patient had wound hematoma, managed conservatively. Three (7%) had hematuria, which on its own. No complication was observed in percutaneous cystolithotripsy (Table 7).

Table 8: Different types of pure or mixed composition.

Composition	Number (n=38)	Percentage
Caph. CaOx, uric acid	8	21
MAP CaOx uric acid	6	16
Caph CaOx Amm. Urate	4	11
CaOx, uric acid	3	8
Caph Uric acid	3	8
CaOx Amm. urate	3	8
Caph CaOx	3	8
Caph MAP uric Acid	3	8
MAP CaOx	2	5
Uric acid	2	5
Amm. urate	1	2

Caph- Calcium phosphate; CaOx- Calcium oxalate; Amm-Ammonium; MAP- Magnesium Ammonium Phosphate

Twenty (48%) calculi were oval in shape, ten (24%) were spherical, 11 (26%) were irregular, and one (2%) was a staghorn calculus. The surface 23 (55%) calculi were granular ten (24%) had a smooth surface, and nine (22%) had a spiky surface. Twenty (48%) calculi were yellow white in color, 11 (26%) calculi were brown, eight (19%) were dark, and three (7%) were yellow brown in color.

Chemical analysis was done in 38 of 42 cases, as in 4 cases the amount of stone was not enough to perform the test. It was observed that, of the basic radical's calcium

was present in 35 (92%) cases, ammonium in 19 (50%) cases, and magnesium in 11 (29%) cases. Phosphate and oxalate radicals were present in 29 (76%) each, uric acid or urate was found in 33 (87%) cases. It was not possible to differentiate between uric acid and urates by the chemical methods employed. Most of the calculi were mixed variety [35 (92%)]. Among them the commonest compositions were calcium phosphate [32 (84%)], calcium oxalate [29 (76%)], uric acid [25 (66%), and Magnesium ammonium phosphate [11 (29%)]. Table 8 shows the various chemical compositions of vesical calculi.

DISCUSSION

The incidence of urolithiasis is less in southern part of India compared to northern region, as northern India has a dry climate, high rate of malnutrition, and usage of hard water.

The incidence of vesicle calculus in this study was 0.11% of total hospital admission and 0.95% of total surgical admissions. It was 0.06% and 0.4% respectively as per Mehdiratta et al.⁷ Fifty-seven percentage of the present study population was less than ten years, which was consistent with Kabra et al who had 58% of their study population in 1st decade of life.⁸ Anderson et al found the peak incidence of vesical calculi at the age of 5 years, while 59% were below ten years, and 69% were below 15 years of age.⁹

Males were more commonly affected in our study (6:1), which was consistent with many studies such as Mehdiratta (2:1), Anderson et al (33:1), Shah et al (29:1), and Pritam Das et al (26:1).^{7,9-11} 48% of the patients belonged to class III Socioeconomic class which indicates that these patients are nutritionally deprived.

The bladder calculi cause pain in the perineum and at the tip of the penis, mostly felt while passing urine. 72% of the patients had this manifestation. 52% of the study population had fever indicating cystitis in calculus disease. The difficulty in urination, and the poor stream of urination was noted in 33% of the patients. Terminal haematuria was noted in 24% of cases. Retention of urine was noted in 29% of cases. Abarchi et al found micturition difficulties in 67% patients, macroscopic haematuria in 37% cases and acute retention of urine in 10% of cases. Fifty-three percentage of the patients were using bore well water, which contain mainly hard water (calcium and magnesium).

Associated diseases of prostate were found in 17%, phimosis in 14%, and meatal stenosis in 5% of cases. 64% of the patients had pus cells in urine indicating the infection as the cause and nidus for stone formation. The urine culture was positive for growth of bacteria (Klebsiella followed by *E. coli*) in 60% of cases which was comparable to Kabra et al.⁸

Ultrasonography of abdomen could detect all vesical calculi whereas x-ray could detect only 93% cases. All the cases were treated by surgical modality. Fifty percentage cases were treated with transurethral cystolithotripsy using 80-watt holmium laser. Twenty-one percentage cases underwent Percutaneous cystolithotripsy and the remaining 12 (29%) underwent the open suprapubic cystolithotomy.

Out of seven prostatomegaly, five were treated with transurethral resection of prostate (TURP) and transurethral cystolithotripsy (TUCL). Two were treated with open prostatectomy. Sixty percentage of patients were discharged within five days. Seventeen patients had to stay in hospital for 5-15 days.

Wound infection was noted in two cases and seroma in one case. All these occurred in patients treated by open surgical method and all of them were managed conservatively. No complication was noted following percutaneous cystolithotripsy.

Among the mixed stones, the combination of Calcium phosphate, Calcium Oxalate and uric acid was the most common, seen in eight (21%) calculi. Gershoff et al found that the commonest mixed form was calcium Oxalate and calcium phosphate.¹³

The commonest combination of vesical calculi in Das study was magnesium ammonium phosphate, calcium oxalate, and uric acid (43%).¹¹

CONCLUSION

Vesical calculus most commonly affects children less than ten years. Most of them present with pain abdomen. Low socio-economic status is more affected. Drinking hard water carries a high risk of vesical calculus. Ultrasonography is the investigation of choice in vesical calculus as it is 100% sensitive. Percutaneous cystolithotripsy is preferred choice for pediatric patients as with this procedure patients will have minimum complication with short hospital stay. Most of the vesical calculi were of mixed variety with predominant composition being calcium phosphate, calcium oxalate and uric acid.

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Institutional Ethics Committee

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