International Surgery Journal
Ramachandra ML et al. Int Surg J. 2018 Mar;5(3):1004-1007
http://www.ijsurgery.com
pISSN 2349-3305 | eISSN 2349-2902

DOI: http://dx.doi.org/10.18203/2349-2902.isj20180820

Original Research Article

Etiology and pathogenesis in the causation of vesical calculus: a prospective study

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Received: 30 December 2017
Accepted: 30 January 2018

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ABSTRACT

Background: Vesical calculus are the most common manifestation of lower urinary tract stones accounting for approximately 5% of all urinary stone diseases. In pediatric population bladder stones are most commonly due to malnutrition and poor socioeconomic factors. In adults they are most commonly associated with bladder outlet obstruction. In this context we study the different etiological factors and pathogenesis in the causation of vesical calculus.
Methods: This is a prospective study that included 40 patients admitted with clinical diagnosis of vesical calculus at KR Hospital, Mysore from June 2016 to May 2017.
Results: Maximum patients belong to age group of 51-60 years (30%) and minimum numbers belongs to age group of 1-10, 11-20 and 81-90 years age group. Male to female ration in present study is 5:1. In present study patients with bore well as source of water were highest in number i.e., 22 patients. Maximum number of patients i.e., 22 patients (55%) presented with history of pain abdomen and 15 patients (37.5%) with dysuria. Twenty-four patients (60%) had alkaline urine. Urine albumin was positive in 10 patients (25%), urine sugar was present in 8 patients (20%), pus cells were found in urine of 28 patients (70%) and RBCs were present in 24 patients (60). Klebsiella was the commonest organism isolated from the urine of 22 patients (55%) and *E. coli* was isolated in 8 patients (20%). Ultrasonography of abdomen and pelvis detected associated other conditions such as hydroureteronephrosis in 8 patients (20%), cystitis in 10 patients (25%) and benign prostatic hyperplasia in 20 patients (50%).
Conclusions: Bladder calculi are most common in people of old age group indicating obstruction could be the cause for stone formation. They are rarely formed spontaneously. There must be an inciting event namely bladder outlet obstruction or infection to promote the stone formation.

Keywords: Bladder outlet obstruction, Hydroureteronephrosis, *Klebsiella*, Vesical calculus

INTRODUCTION

Vesical calculus is the most common manifestation of lower urinary tract stones accounting for approximately 5% of all urinary stone diseases.[1] Until the twentieth century, bladder stone was a prevalent disorder among poor children and adolescents. Because of improved diet and increased protein-carbohydrate ratio, primary vesical calculi are rare.[2]

In pediatric population bladder stones are most commonly due to malnutrition and poor socioeconomic factors. In adults they are most commonly associated with bladder outlet obstruction, chronic urinary tract infection or the presence of an intravesical foreign body.[3]

A primary bladder stone is one that develops in sterile urine, it often originates in the kidney. A secondary stone occurs in the presence of infections, outflow obstructions,

impaired bladder emptying or a foreign body. Patients with spinal cord injury are at increased risk of developing bladder stones. Bladder stones have occurred in humans since early times. Twenty-three centuries ago Hippocrates cautioned that "to cut through the bladder is lethal".[4] In this context author study the different etiological factors and pathogenesis in the causation of vesical calculus.

METHODS

This is a prospective study that included 40 patients admitted with clinical diagnosis of vesical calculus at KR Hospital, Mysore from June 2016 to May 2017.

The primary data for this study were the history, clinical examination, KUB x-ray, USG abdomen and CT scan of KUB region of the patients.

Inclusion criteria

Cases presenting with stones in urinary bladder are included in present study.

Exclusion criteria

- Cases associated with renal stones.
- Cases associated with ureter stones and urethral stones

Data was collected from the patients that included name, age, sex, occupation, socioeconomic status, residence, source of water, presenting complaints, duration of complaints. The investigations performed in the present study were urine and blood examination. A midstream sample of urine was collected for analysis for routine, albumin, sugar, microscopy and culture and sensitivity.

Blood RBS, blood urea, serum creatinine, serum electrolytes, serum phosphates and serum uric acid levels were estimated.

Urine albumin level estimation done by using heat coagulation technique. Hemoglobin estimation done by using cyanmethemoglobin method. Radiological investigations were plain X-ray KUB, ultrasonography abdomen, cystoscopy and CT abdomen.

Socioeconomic status of the patient assessed using BG Prasad classification. Body Mass Index (BMI) was used to classify individuals as underweight, overweight and obese. After considering above investigations a clinical diagnosis arrived and appropriate antibiotics as per culture and sensitivity were given.

RESULTS

A prospective study consisting of 40 patients with diagnosis of vesical calculus was undertaken at KR Hospital Mysore. The following observations were made in present study.

Table 1: Age wise distribution of cases.

Age group years	Number (n=40)	Percentage
1-10	1	2.5
11-20	1	2.5
21-30	4	10
31-40	3	7.5
41-50	6	15
51-60	12	30
61-70	9	22.5
71-80	3	7.5
81-90	1	2.5

Total 40 cases of vesical calculus of all age groups were included in present study. Maximum patients belong to age group of 51-60 years (30%) and minimum numbers belongs to age group of 1-10, 11-20 and 81-90 years age group (Table 1).

Table 2: Sex wise distribution of cases.

Sex	Number (n=40)	Percentage
Male	34	85
Female	6	15

Male to female ration in present study is 5:1 (Table 2).

Table 3: Distribution of cases according to source of water.

Source of water	Number	Percentage
River	18	45
Bore well	22	55

In present study patients with bore well as source of water were highest in number i.e., 22 patients (55%) when compared to river water as source i.e., 18 patients (45%) (Table 3).

Table 4: Distribution of cases according to mode of presentation.

Symptoms	Number	Percentage
Pain abdomen	22	55
Dysuria	15	37.5
Retention of urine	10	25
Hematuria	6	15
Pyuria	4	10
Poor stream of urine	14	35

Maximum number of patients i.e., 22 patients (55%) presented with history of pain abdomen and 15 patients (37.5%) with dysuria (Table 4).

In this study highest number of patients 24 patients (60%) had alkaline urine. Urine albumin was positive in 10 patients (25%), urine sugar was present in 8 patients (20%), pus cells were found in urine of 28 patients (70%) and RBCs were present in 24 patients (60%) (Table 5).

Table 5: Distribution of cases according to urine analysis.

Urine analysis		Number (n=40)	Percentage
pH	Acidic	16	40
	Alkaline	24	60
Albumin		10	25
Sugar		8	20
Pus cells		28	70
RBCs		24	60

Table 6: Distribution of cases according to urine culture.

Organism isolated	Number (n=40)	Percentage
Klebsiella	22	55
E. coli	8	20
Pseudomonas	6	15
Proteus	4	10

Klebsiella was the commonest organism isolated from the urine of 22 patients (55%) and *E. coli* was isolated in 8 patients (20%) (Table 6).

Table 7: Distribution of cases according to USG findings.

USG findings	Number (n=40)	Percentage
Hydroureteronephrosis	8	20
Cystitis	10	25
BPH	20	50
Stone size		
1-2 cm	22	55
2-4 cms	18	45

Ultrasonography of abdomen and pelvis was done in all the patients and it detected associated other conditions such as hydroureteronephrosis in 8 patients (20%), cystitis in 10 patients (25%) and benign prostatic hyperplasia in 20 patients (50%).

Twenty-two patients (55%) had stone size of 1-2 centimeters and 18 patients (45%) had stone size of 2-4 centimeters (Table 7).

DISCUSSION

Vesical calculus comprises 5% 0f urinary tract stones. Generally, they occur in the presence of bladder outlet obstruction. Urinary tract infection and in presence of foreign bodies. They are more common in male patients than female patients.

In Mahdiratta et al series the maximum incidence 56% has been found in the age group below 10 years.[5] In Anderson et all series 59.4% of patients were below 15 years.[6]

Robert et al has reviewed 100 cases in which 71% were between sixty and seventy-nine years of age.[7] In 88 patients there were some type of bladder outlet obstruction in the form of benign prostatic hyperplasia, prostatic carcinoma, and urethral stricture were found.

In present study maximum number of patients belong to age group above 50 years and this result are similar to study conducted by Robert et al study. Vesical calculus is more common in male patients. In Anderson et al study male to female ratio was 33:1 and Mahdiratta et al study it was 2:1. In present study male to female ratio is 5:1. Reasons for low incidence of vesical calculus in female patients may be short and wide urethra so that small stones are passed before they give symptoms.[8]

In this study vesical calculus most commonly seen in patients who uses bore well as source of water as bore well water is hard water and it is more prone to develop stones because of its mineral content like calcium and magnesium.

Maximum number of patients presented with history of pain abdomen and difficulty in micturition reason may be vesical calculus blocking the internal urethral meatus. In Abarchi et a1 series the cases with vesical calculi were presented with micturational troubles in 67% cases, macroscopic hematuria in 37% cases and acute retention of urine in 10% of cases.[9]

Urine analysis shows presence of pus cells in 70% of the cases, this shows that in majority of patients infection was the cause and nidus for stone formation. Klebsiella was the commonest organism isolated from the patient's urine which was comparable to Kabra et al series.[10]

Ultrasonography of abdomen detected other associated condition such as benign prostatic hyperplasia, hydroureteronephrosis and cystitis. Benign prostatic hyperplasia causes bladder outlet obstruction and urinary stasis which results in the formation of vesical calculus. Cystitis and HUN are due to pathological effects of stone in the bladder.

CONCLUSION

Bladder calculi are most common in people of old age group indicating obstruction could be the cause for stone formation. They are rarely formed spontaneously. There must be an inciting event namely bladder outlet obstruction or infection to promote the stone formation.

Funding: No funding sources
Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Ramachandra ML, Kumar PHD. Etiology and pathogenesis in the causation of vesical calculus: a prospective study. Int Surg J 2018;5:1004-7.