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ORIGINAL ARTICLE

Biochemical Analysis of Urinary Calculi in Patients Undergoing Surgery for Urolithiasis- A Prospective Study

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***ABSTRACT*:**
Background: Kidney stones are defined as solid lumps of varying size that are formed by build up of crystals that have separated from urine on the inner side of kidneys. They are formed by precipitation of ions within the urine. The aim of present study is to study the incidence of urolithiasis at different levels in the urinary tract, determine the biochemical composition of urinary stones extracted after surgery and to suggest measures to prevent recurrence of stones in our patients. **Materials and methods:** The present prospective study was conducted in the Department of General Surgery, Maharaja Agrasen Medical College, Haryana. The study included 100 cases of urolithiasis from Surgical OPD and patients admitted in surgical wards. The study was conducted for a period of 1 year i.e. from November 2015 and December 2016**.** An elaborate history was obtained from all the patients and was correlated with the physical examination. Laboratory evaluation in an acute setting of renal colic generally includes measurement of a complete blood count (CBC), serum electrolytes and renal functions. All the data was arranged in a tabulated form and SPSS software was used for analysis. Pyelolithotomy was done in 33% cases. PCNL and Cystolitholopaxy were used in 1 case. Extraction of stone from urethera was done in 2 cases. **Results:** In 42% of the cases stones were present in Kidney. The next most common site for calculi was ureters i.e. 28.28%. In maximum number of cases i.e. 78% the results were sterile. Only in 22% of the cases, infected results were obtained. Out of these, in 12% cases E. coli was obtained. **Conclusion:** From our study we conclude that stones are predominantly of pure calcium oxalate followed closely by calcium oxalate + uric acid stones being 34%.
Key words: Calculi, renal, Uric acid, Oxalate.

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INTRODUCTION

The problem of urinary stone disease continues to trouble patients and surgeons alike. With westernization of global culture, the site of stone formation has migrated from the lower to the upper urinary tract. In India, approximately 5 -7 million patients suffer from stone disease and at least 1/1000 of Indian population needs hospitalization due to kidney stone disease.[1] A thorough understanding of the etiology, epidemiology, and pathogenesis of urinary tract stone disease is necessary. Various physicochemical derangements have been identified in patients with renal stones, for example hypercalciuria, hyperuricosuria, hyperoxaluria and hypocitraturia.[2] Stones are created by supersaturation by fusion of ions present in solution form to combine with other by the process of nucleation. [3,18,19]. Calcium and oxalate ions arrange themselves on surfaces of other crystals, like uric acid, and these heterogeneous nuclei promote calcium oxalate stones. Factors influencing the formation of renal stones are hereditary and personal and geographic conditions.[3,4,5] Thus, treatment should be designed to correct these urinary abnormalities with a view to reduce the urinary supersaturation and/or increasing the net level of inhibitory activity. More selective approach has been advocated in which specific treatment are chosen for particular causes of stone formation. The aim of present study is to study the incidence of urolithiasis at different levels in the urinary tract, determine the biochemical composition of urinary stones extracted after surgery and to suggest measures to prevent recurrence of stones in our patients.

MATERIALS AND METHODS

The present prospective study was conducted in the Department of General Surgery, Maharaja Agrasen Medical College, Haryana. The study included 100 cases of urolithiasis from Surgical OPD and patients admitted in surgical wards. The study was conducted for a period of 1 year i.e. from November 2015 and December 2016**.** The study was approved by the institutional ethical committee prior to initiation of the study. Patients with

clinical features of urolithiasis with radiological confirmation of calculus disease and undergoing therapeutic cystoscopy or ureteroscopy, cystolithotomy, cystolitolapaxy, ureterolithotomy, pyelolithotomy, nephrolithotomy or percutaneous nephrolithotomy were included in this study. Patients unwilling to undergo the necessary investigations or surgical procedure, pregnant women with urolithiasis and patients not fit for surgery were excluded from the study. An elaborate history was obtained from all the patients and was correlated with the physical examination. Laboratory evaluation in an acute setting of renal colic generally includes measurement of a complete blood count (CBC), serum electrolytes and renal functions. Assessment of urinary pH, identification of nitrites or bacteria and leukocytes by urine dipstick analysis, tests for urine culture, microscopic urinalysis was performed by trained personnel. Diagnostic imaging includes Plain abdominal radiography, abdominal ultrasound, Intravenous urogram (IVU), Non-contrast helical CT scan of kidneys, ureters and bladder (CT KUB) and Magnetic resonance urography (MRU). All the data was arranged in a tabulated form and SPSS software was used for analysis.

RESULTS

Out of total number of stones (n= 100) collected in our study the number of kidney stones retrieved were maximum in age group 30-39 years. The incidences of uretric and bladder stones were high in this age group. The mean age of the study subjects was 41.23 +/- 5.67 years. The male to female ratio in our study was 2.2:1.

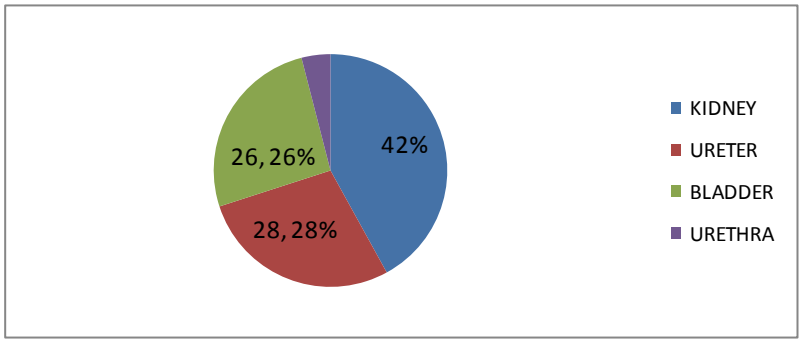
Graph 1 shows the distribution of urinary tract stones according to the site of stone. In 42% of the cases stones were present in Kidney. The next most common site for calculi was ureters i.e. 28.28%. There were 26.26% cases in which stones were present in bladder. In rest of the cases, stones were present in Urethera.

Graph 2 shows the results of urine culture. In maximum number of cases i.e. 78% the results were sterile. Only in 22% of the cases, infected results were obtained. Out of these, in 12% cases E. coli was obtained. In 5% proteus and in 3% klebsiella were seen. There were only 1% cases which showed the presence of pseudomonas.

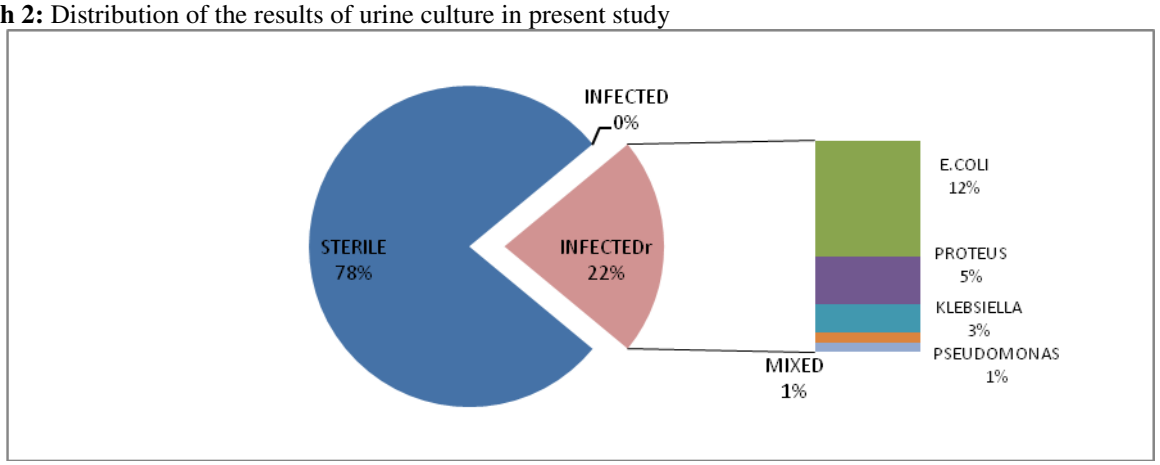
Graph 3 shows the distribution according to the composition of the urinary calculi. Amongst the kidney stones, maximum (n=25) were composed of calcium oxalate. There were 6 kidney stones that were composed of calcium oxalate and calcium phosphate. There were 9 kidney stones composed of calcium oxalate and uric acid. Two amongst them were made of ammonium magnesium phosphate. Majority (n=9)of the ureter stones were made of calcium oxalate and uric acid. There were 3 uretheral stones made of calcium oxalate and 1 made of calcium oxalate, calcium phosphate and ammonium magnesium phosphate.

Table 1 shows the techniques that were applied for the removal of renal calculi. Pyelolithotomy was done in 33% cases. PCNL and Cystolitholopaxy were used in 1 case. Extraction of stone from urethera was done in 2 cases. Cystolithotomy and Ureterolithotomy were done in 27% cases. Nephrolithotomy was done in 6% cases.

Graph 1: Distribution of urinary tract according to the site



Graph 2: Distribution of the results of urine culture in present study



Graph 3: Distribution of Composition of stones

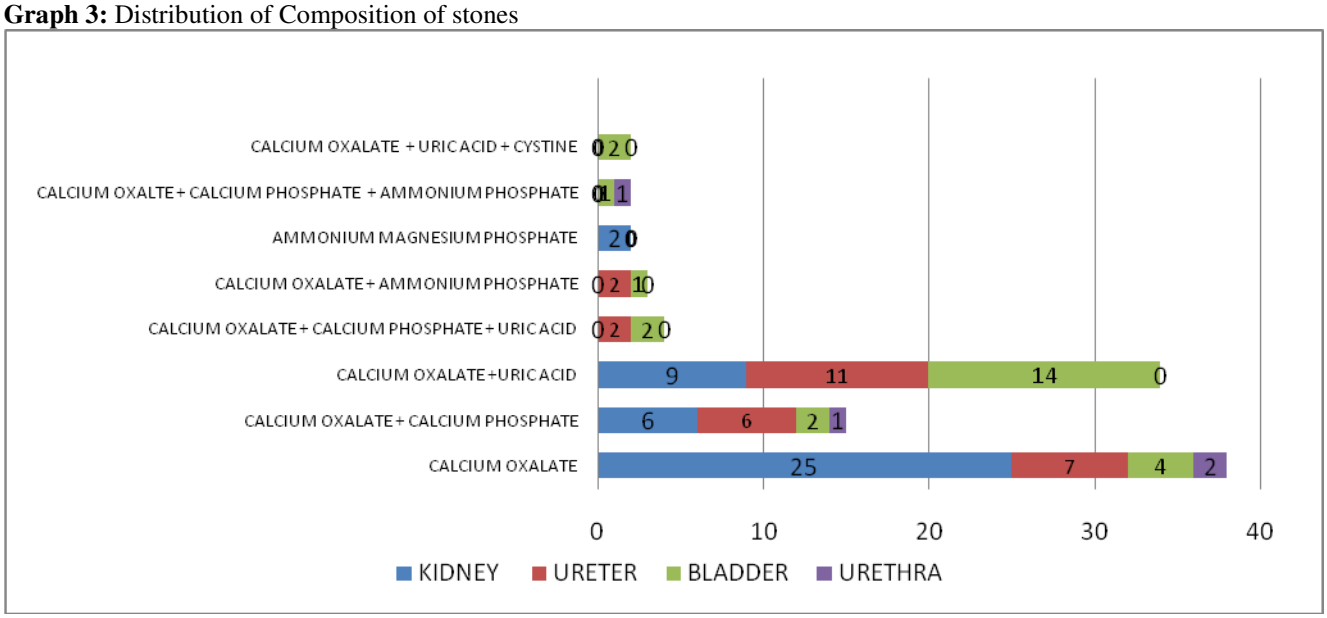


Table 1: Distribution of methods of stone retrieval

	No. Of patients	%age of patients
Ureterorenoscopy (URS)	01	01%
Nephrolithotomy	06	06%
Nephropyelolithotomy	02	02%
Pyelolithotomy	33	33%
Ureterolithotomy	27	27%
Cystolitholopaxy	01	01%
Cystolithotomy	27	27%
PCNL	01	01%
Extraction from urethra	02	02%
Total	100	100%

DISCUSSION

Kidney stones are defined as solid lumps of varying size that are formed by build up of crystals that have separated from urine on the inner side of kidneys. They are formed by precipitation of ions within the urine. Sometimes they are unable to travel through ureter and cause pain, obstruction and blocking the urine flow.[6,7] Methods for diagnosis of these stones include Xray image, urine analysis, ultrasound and intravenous aids. During the recent years, non-contrast helical computerized tomography is regarded as the first line of diagnostic tool.[8,9] Another technology known as crystallographic examination is the most precise and least expensive technique to identify the nature of the stone.[10] The pharmacological treatment modality include the use of Thiazide diuretics, allopurinol, etc but long term use is associated with certain side effects.[11] Therefore, surgery is considered as the only permanent treatament for urolithiasis.[8]. Even after medical and surgical treatment there are chances of recurrence of the renal stones in certain group of patients.[13] It is associated with significant morbidity and can lead to serious chronic renal disease, therefore prevention is an important treatment goal.[14] The present study was conducted to find the incidence of urolithiasis at different levels in the urinary tract, determine the biochemical composition of urinary stones extracted after surgery and to suggest measures to prevent recurrence of stones in our patients. In our study, the incidences of uretric and bladder stones were high in this age group. The mean age of the study subjects was 41.23 +/- 5.67 years.

The male to female ratio in our study was 2.2:1. In a study conducted by Ds Qader et al(2006)[15] the male to female ratio was 2.5:1. In another study conducted by Harpreet et al(2012)[16] the male to female ratio was 3.8:1. In our study, in 42% of the cases stones were present in Kidney. The next most common site for calculi was ureters i.e. 28.28%. There were 26.26% cases in which stones were present in bladder. In rest of the cases, stones were present in Urethera. In a study conducted by Madhusudan et al (2015)[17] most common were uretric calculi followed by renal and bladder or uretheral calculi. According to present study, amongst the kidney stones, maximum (n=25) were composed of calcium oxalate. There were 6 kidney stones that were composed of calcium oxalate and calcium phosphate. There were 9 kidney stones composed of calcium oxalate and uric acid. Two amongst them were made of ammonium magnesium phosphate. Majority (n=9)of the ureter stones were made of calcium oxalate and uric acid. There were 3 uretheral stones made of calcium oxalate and 1 made of calcium oxalate, calcium phosphate and ammonium magnesium

phosphate. In a study conducted by Pushpa Durgawale et al(2010)[18] Mixed stones were seen. The percentages of various stones were magnesium ammonium phosphate (71.2%), Calcium oxalate(68.8%), Calcium carbonate (44.8%) , Cystine (12.8%) ,Xanthine (2.4%) and Fibrin (1.6%). In another study conducted by Kanchan et al (2015)[19] majority of the stones were made of calcium oxalate and phosphate. The knowledge of stone composition is the fundamental basis for treatment, severity of diseases, patient medical history, anatomical abnormalities, and blood and urine analysis are also key factors influencing managing decisions.

CONCLUSION

From our study we conclude that stones are predominantly of pure calcium oxalate followed closely by calcium oxalate + uric acid stones being 34%. On the basis of site, calcium oxalate stones were more predisposed in kidney while calcium oxalate + uric acid stone were found in ureter and bladder. 2 of the mixed cysteine stones were found in bladder. Metabolic risk evaluation and treatments used for recurrence prevention should be individualised

REFRENCES

1. Pearle MS, Calhoun EA, Curhan GC. Urologic diseases in America project: urolithiasis. J Urol 2005; 173(3):848–57.
2. Coe FL. Treated and untreated recurrent calcium nephrolithiasis in patients with idiopathic hypercalciuria, hyperuricosuria, or no metabolic disorder. Ann Intern Med. 1977 ; 87(4):404.
3. Saita A, Bonaccorsi A, Motta M. Stone composition: where do we stand?. Urol Int. 2007;79(S1):16-19.
4. Goldfarb DS. Prospects for dietary therapy of recurrent nephrolithiasis. Adv Chronic Kidney Dis. 2009;16(1):21-9.
5. Grases F, Costa-Bauza A, Prieto RM. Renal lithiasis and nutrition. Nutr J. 2006;5:23-29.
6. Ringold S, Glass T, Richard M. Kidney stones. JAMA. 2005;293(9):1158.
7. 2. Ramello A, Maragella MJ. Epidemiology of nephrolithiasis. J Nephrol. 2000;13(3):45-50.
8. Serio A, Fraioli A. Epidemiology of nephrolithiasis. Nephron. 1999;81(S1):26-30.
9. Khan SR, Glenton PA, Byer KJ. Dietary oxalate and calcium oxalate nephrolithiasis. J Urol. 2007;178(5):2191-6.
10. Lemann JJ. Composition of the diet and calcium kidney stones. N Eng J Med. 1993;328:880-1.
11. Worcester EM, Lingeman JE. Three pathways for human kidney stone formation. N Eng J Med. 2010;38:147-60.
12. Abbagani S, Gundimeda SD. Kidney stone disease: Etiology and evaluation. International Journal of Applied Biology and Pharmaceutical Technology. 2010;1:175-182.
13. Böhles H, Beifuss OJ, Brandl U, Pichl J, Akçetin Z, Demling L. Urinary factors of kidney stone formation in patients with Crohn's disease. J Mol Med.1988;3:87-91.
14. Busby JE, Low RK. Ureteroscopic treatment of renal calculi. Uro Clin North Am. 2004;1:89-98.
15. Qaader D, Yousif S, Mahdi L. Department of Biotechnology, College of Science, Baghdad University. Baghdad Prevalence and etiology of urinary stones in hospitalized patients in Baghdad Iraq. Eastern Mediterranean Health J 2006; 12(6):853-61.
16. Harpreet Kaur , Jagmohan Singh , Minni Verma and Kamaljit Singh. Analysis of biochemical profile of renal stones referred to advanced. Biochemistry laboratory of a multispecialty tertiary care Hospital in Punjab. European Journal of Experimental Biology 2012; 2 (3):543-6
17. Madhusudan A, Mohammed Arif , Ashwin K. Hebbar , Karthavya S L. Epidemiology and chemical composition of upper urinary tract calculi. SAS J. Med 2015; 1(1):1-6.
18. Pushpa Durgawale, Anissa Shariff, Anup Hendre, Sangita Patil, Ajit Sontakke .Chemical analysis of stones and its significance in urolithiasis. Biomedical Research 2010; 21(3):305-210
19. Kanchan Singh, Abhas Kumar Singh, Dr. Aparna Misra,, Dr. Farzana Mahdi, Ajanta Roy . Biochemical Study of Serum Factors in Male Patients of Nephrolithiasis . IOSR Journal of Biotechnology and Biochemistry 2015; 1(5):27-33.

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