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ORIGINAL RESEARCH

Assessment of bacteriological profile of bladder stones

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ABSTRACT

Background: Urinary stone disease (USD) is an increasing clinical problem in both children and adults. The present study was conducted to assess bacteriological profile of bladder stones.

Materials & Methods: 80 patients of urinary stones of both genders were included. Midstream urine specimen was collected from each patient before surgical stone removal and cultured using calibrated (4mm dia.) loop providing fixed quantity on CLED agar, MacConkey agar (MA) and Blood agar plate (BA) (HiMedia Laboratories) for isolation of bacterial pathogens. Cultures were incubated at 37oC for 24 hours. Urinary pH was noted using pH test strip and color change was documented comparing with the provided color chart.

Results: Out of 80 patients, males were 46 and females were 34.UTI was seen in 56 and stone core culture infection in 24. Urine pH was acidic in 52 and alkaline in 28. The difference was significant (P< 0.05). Bacteriological profile in UTI and stone core culture was staphylococcus aureus in 24 and 12, E. coli in 16 and 6, Klebsiella aerogenes in 4 and 3, Pseudomonas aeruginosa in 6, mixed organisms in 4 and 3 and proteus mirabilis in 2 respectively. The difference was significant (P< 0.05).

Conclusion: The most common type of organism associated was E. coli. This study highlights the importance of microbiological analysis of stones for complete sterilization of urinary system and prevention of recurrence.

Key words: bacteriological, bladder stones Urinary disease

INTRODUCTION

Urinary stone disease (USD) is an increasing clinical problem in both children and adults. One in ten individuals will experience a urinary stone, yet the mechanisms responsible for

urinary stones remain largely unknown. Bacteria have long been recognized to contribute to struvite urinary stones; however, the role of bacteria in the development of the more common calcium oxalate (CaOx) and calcium phosphate (CaPhos) stones has not been extensively investigated.[1] However, several findings do indicate a possible association between urinary stones and bacteria, including the high rate of urinary tract infections (UTI) in urinary stone patients and multiple case series of culture-positive urinary stones, including stones composed of CaOx or CaPhos.2

The association between urinary tract infection and urinary calculi is common and the incidence varies from 7% to 60% as documented in previous studies. Urea-splitting bacteria like Proteus spp., Staphylococcus aureus, Klebsiella spp., Providencia spp., and Urea plasma urealyticum are commonly responsible for struvite stones.[3] The pre-dominant bacteria found in the nuclei of urinary calculi are Staphylococcus and Escherichia coli. Urea splitting bacteria lead to hydrolysis of urea increasing the concentration of carbonate, bicarbonate and ammonium ions, thereby increasing the urinary pH rendering the urine alkaline and hence promoting stone formation in both clinical and experimental studies.[4]The antimicrobial agents are unable to invade, where these bacteria lie within the interspaces of stones in urinary tract.[5] This causes progressive expansion of stonesdue to persistent infection over a period of weeks or months.[6]The present study was conducted to assess bacteriological profile of bladder stones and find the concordance between urine and stone bacteria.

MATERIALS & METHODS

The present study comprised of 80 patients of urinary stones of both genders. All gave their written consent for participation in the study.

Data such as name, age, gender etc. was recorded. Midstream urine specimen was collected from each patient before surgical stone removal and cultured using calibrated (4mm dia.) loop providing fixed quantity on CLED agar, MacConkey agar (MA) and Blood agar plate (BA) (HiMedia Laboratories) for isolation of bacterial pathogens. Cultures were incubated at 37oC for 24 hours. Also microscopy and Gram stain of urine samples were performed. Using the semi-quantitative method, 105 colony-forming units per milliliter (CFU/ml) of urine was considered as significant bacteriuria. Urinary pH was noted using pH test strip and color change was documented comparing with the provided color chart. Preoperative urine culture and postoperative stone culturewere performed. Data thus obtained were subjected to statistical analysis. P value < 0.05 was considered significant.

RESULTS

Table I Distribution of patients

Total- 80		
Gender	**Males**	**Females**
Number	46	34

Table I shows that out of 80 patients, males were 46 and females were 34.

Table II Assessment of parameters

Parameters	Variables	Number	P value
Infection	UTI	56	0.02
	Stone core culture infection	24	
Urine pH	Acidic	52	0.01
	Alkaline	28	

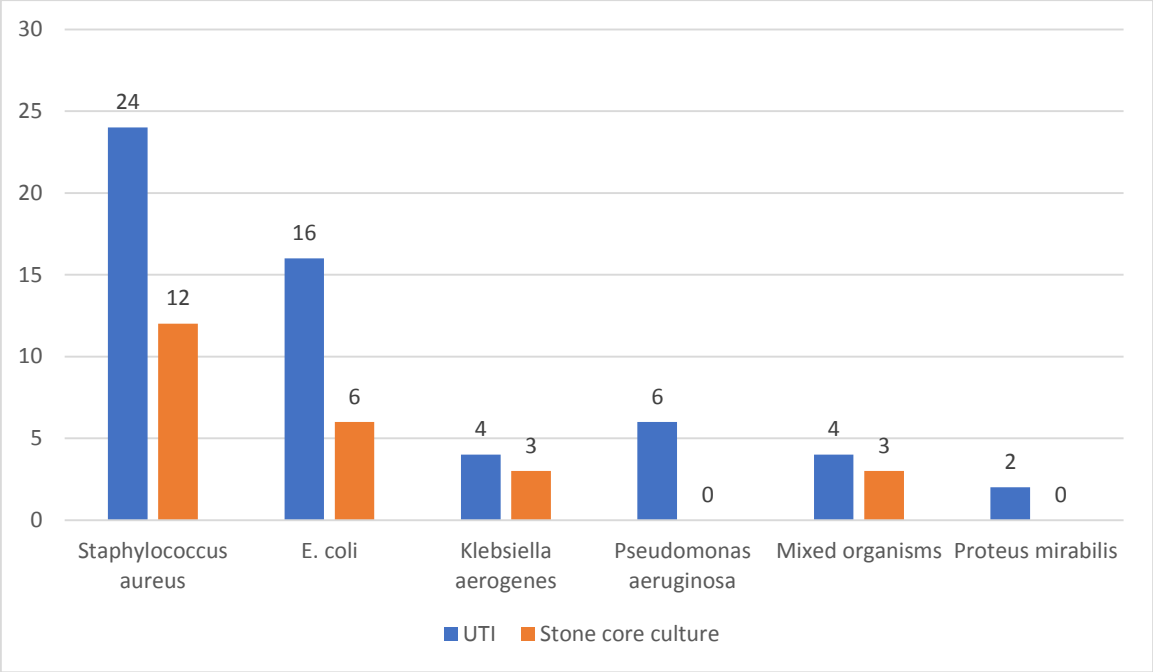
Table II shows that UTI was seen in 56 and stone core culture infection in 24. Urine pH was acidic in 52 and alkaline in 28. The difference was significant (P< 0.05).

Table III Bacteriological profile

Bacteriological profile	UTI	Stone core culture	P value
Staphylococcus aureus	24	12	0.05
E. coli	16	6	0.03
Klebsiella aerogenes	4	3	0.12
Pseudomonas aeruginosa	6	0	0.05
Mixed organisms	4	3	0.94
Proteus mirabilis	2	0	0.82

Table III, graph I shows that bacteriological profile in UTI and stone core culture was staphylococcus aureus in 24 and 12, E. coli in 16 and 6, Klebsiella aerogenes in 4 and 3, Pseudomonas aeruginosa in 6, mixed organisms in 4 and3 and proteus mirabilis in 2 respectively. The difference was significant (P< 0.05).

Graph I Bacteriological profile



DISCUSSION

Approximately 10% of people will have a urinary stone during their lifetime.[7,8] The United States health care burden from USD is immense with 185,000 hospitalizations, 2 million outpatient visits and 2.1 billion dollars expended annually for management.[8] Historically, a key component in urinary stone formation is supersaturation, a process by which the concentration of substances in urine, such as calcium and oxalate, exceed the limits of their solubility. However, considerable overlap in urine chemistries exists between individuals with and without USD.[9] Furthermore, supersaturation with calcium oxalate (CaOx) or calcium phosphate (CaPhos) is not different in recurrent USD patients compared to controls. Thus, although supersaturated urine is a risk factor, alone it is insufficient for stone formation.[10,11] This conclusion is supported by the knowledge that treatment with dietary modifications, increased fluid intake, citrate salts and/or thiazide diuretics to reduce urine CaOx supersaturation only moderately improves recurrence rates.[12]The present study was conducted to assess bacteriological profile of bladder stones and find the concordance between urine and stone bacteria.

We found that out of 80 patients, males were 46 and females were 34.Chaurasia et al[13]evaluated the bacteriological profile of bladder calculi and its association with urinary

tract infection. A sample size of 100 (61 males and 39 females, presenting with bladder calculi) was calculated. Urinary tract infection was present in 53% cases which included 26 males and 27 females. The mean age of patients was 42 ± 6.2 years. In majority of cases the reaction of urine was acidic (76%). The most common organism isolated in urine culture was E. coli (28%), followed by Staphylococcus aureus(8%), Pseudomonas aeruginosa (4%), Klebsiellaaerogenes (3%), Proteus mirabilis (2%) and mixed organisms (8%). On bladder stone core culture growth was observed in 50% cases including 22 males and 28 females. The most common organism isolated was E. coli (28%), followed by Staphylococcus aureus (6%), Klebsiellaaerogenes (8%) and mixed organisms (8%). E. coli was the predominant organism found both in urine and core culture of stone

We found that UTI was seen in 56 and stone core culture infection in 24. Urine pH was acidic in 52 and alkaline in 28. Ranjit et al[14]found out the urine bacteriological profile of patients with kidney stones.Among 107 patients, kidney stones were more common in males and most of the patients were in their 2nd to 4th decade. Female patients 45 (42.05%) had more predilections towards the urinary tract infection. Among 15 (14.01%) positive cultures, Escherichia coli 10 (67%) was the most common organism isolated followed by Klebsiella; 4 (27%), and Pseudomonas; 1 (6%).

We observed that bacteriological profile in UTI and stone core culture was staphylococcus aureus in 24 and 12, E. coli in 16 and 6, Klebsiella aerogenes in 4 and 3, Pseudomonas aeruginosa in 6, mixed organisms in 4and 3 and proteus mirabilis in 2 respectively. Jan et al[15]determine incidence of renal stone disease in patients with urinary tract infection. All 100 patients were between age ranges of 15-60 years (Mean age 37.5 years). Infection was present in 79% of cases. The commonest organisms isolated according to culture report were E. Coli (30%), Proteus (19%), Klebsiella (11%), Pseudomonas (7%), Staphylococcus aureus (3%) etc. The frequency of renal stone disease in patients with urinary tract infection was 18.98%. (12.6% in male and 6.3% in female). Mean age of patients with renal stones was 31.26 years and male to female ratio was 1.5:1.

The limitation the study is small sample size.

CONCLUSION

Authors found that the most common type of organism associated was E. coli. This study highlights the importance of microbiological analysis of stones for complete sterilization of urinary system and prevention of recurrence.

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