RESEARCH PAPER | Microbiology | Volume : 3 | Issue : 8 | Aug 2013 | ISSN - 2249-555X

Bacteriological Profile of Urine in Patients with Urinary Calculi

KEYWORDS: Urine culture, Stone culture, Chemical analysis of Stones

Asha T. Kore
Department of Microbiology, MGM Medical College and Hospital, Sector-18, Kamothe, Navi Mumbai-401506

Gurjeet Singh
Department of Microbiology, MGM Medical College and Hospital, Sector-18, Kamothe, Navi Mumbai-401506, Maharashtra, India

S.G. Pawar
Department of Microbiology, Government Medical College Miraj – 416410, Maharashtra, India

ABSTRACT *Study the bacterial association in urine and urinary calculi and their susceptibility pattern and chemical analysis of urinary calculi. Total 221 cases were studied. Culture of urine sample and stone were carried out. Antibiotic sensitivity pattern of both isolates were studied. Chemical analysis of stones was carried out. From 221 urine cultures 122 (55.20%) shows significant growth. Predominant isolate found in urine was E. coli (24.48 %). From 42 stone cultures 12 (28.57%) showed bacterial growth. Predominant isolate found in stone culture is Pseudomonas aeruginosa. From 42 patients in which both urine and stone culture were done 8 (19.04%) showed growth in both cultures. Predominant urine culture isolate E. coli, were sensitive to gentamycin and nitrofurantoin. Predominant stone culture isolate was Pseudomonas aeruginosa showed sensitivity to amikacin and ciprofloxacin. Most of stones showed the presence of calcium in them. Infection stones with weak or non- urease activity occurred in significant number of patients. Non urease producing microorganisms may accumulate calcium crystals intracellularly and form nidi for calculus formation..*

INTRODUCTION

The association between infection of the urinary tract and urinary calculi is well known and has been documented for many years. Incidence of urinary tract infection in stone patients varies from 7% to 60% reported reported in previous studies [1,3,4,6,7,8,9,10,11,12,13].

Infection favours the formation of urinary calculi. The predominant bacteria found in the nuclei of urinary calculi are Staphylococcus and Escherichia coli. Urea splitting organisms like Staphylococcus and Proteus render the urine alkaline and hence are known to promote stone formation in both clinical and experimental studies [7,8]

Recurrence of urinary tract infection and stone is commonest and major health problem and it is necessary to eradicate infection. For study of etiology and treatment of patients with urinary calculi it is necessary to perform urine and stone culture. Also it is necessary to find out the chemical composition of stone and antimicrobial sensitivity of urine and stone culture isolates.

Most urea splitting bacteria lead to stone formation as hydrolysis of urea increases the carbonate, bicarbonate and ammonium ionic concentration and urinary pH [7,21]. These are the required conditions for the formation of magnesium ammonium phosphate calculi which are generally staghorn. Other bacteria like E. coli commonly observed in urinary infection are not urea splitting [7,21,22].

MATERIAL AND METHODS

1) Urine Culture: Before giving antibiotic treatment preoperative midstream sample of urine was collected in sterile container. Samples were inoculated using calibrated (4mm dia.) loop providing fixed quantity on Blood agar MacConkeys agar.[15] Cultures were incubated at 37oc for 24 hours. Also microscopy and Gram stain of urine samples were performed [1,2,4,9,12,16,17,18].

If no growth observed after 24 hours of incubation samples were considered sterile. If the colony forming units less than hundred was observed then it was considered as significant bacteriuria. And if the colony forming units more than hundred was observed then, it was considered as presence of urinary tract infection [14,15,19]

The growth from culture plate was examined and colony characters were seen. The colony was picked up and inoculated into peptone water, which was used to study the morphology, motility, biochemical test and antibiotic sensitivity. The identification of bacterial isolate was done by using standard biochemical test. Antibiotic sensitivity was done by using disc diffusion (Kirby andBaur) method [15]. The sensitivity of organisms to 14 antibiotics was studied. (Ampicillin, Chloramphenicol, Erythromycin, Kanamycin, Penicillin, Streptomycin, Tretracycline, Gentamycin, Amikacin, amoxicillin, Nofloxacin, Nitrofurantoin, Nalidixic acid and Ciprofloxacin) [14].

2) Stone Culture: Urinary calculus was collected after the operation in a sterile container whenever possible. Culture of calculus by giving 1, 2, 3, 4 washes and finally by crushing the calculus in sterile mortar and pestle with 5 ml sterile saline, was done on Blood Agar and MacConkeys Agar. Cultures were incubated at 37oc for 24 hours. The growth from culture plates were examined for number of colonies from wash and crush fluids of calculus [1,2,4,5,6,9,16].

The colony was picked up and inoculated into peptone water for study of morphology, motility, biochemical reactions. The identification of bacterial isolates were done by conventional methods. Also the antibiotic sensitivity of bacterial isolates was done by using disc diffusion (Kirby Baur) method [15].

3) Chemical analysis of calculi: Some part of calculus was used for chemical analysis. First the physical characteristics of the calculi were seen, such as size, shape, weight, number, colour, surface and consistency.

The chemical analysis of calculi were done by using different qualitative tests. The tests were done to find out inorganic and organic constituents like carbonate, calcium, magnesium, phosphorous, oxalate, ammonia, urate, cystine and fibrin.

RESULTS

A total of 221 patients with a all age groups & either sexes, Clinical diagnosis of urinary calculi were studied. From the 122 (55.20%) showed growth in urine culture & 99 (99%)

Volume : 3 | Issue : 8 | Aug 2013 | ISSN - 2249-555X

were sterile. In total of 42 cases stone cultures were carried out from that 12 (28.57%) showed growth & 30 (71.42%) were sterile. From total of 42 patients in which stone & urine both cultures were carried out from that (19.04%) were positive for both urine & stone cultures. From 6 (14.28 %) cases same microorganisms were isolated & 2 (4.76%) cases different microorganisms were isolated. Positive urine culture & negative stone culture was found in 14 (33.33 %) cases. Negative urine culture & positive stone culture was found in 4 (9.52%) cases. Both urine & stone cultures were negative in 16 (38.09%) cases.

Table No. 1 Showing frequency of organisms isolated from urine cultures.

Name of the Organisms	Total No. (%)
Escherichia coli	36(24.48)
Klebsiella spp.	26(17.68)
Coagulase negative Staphylococcus	25(17)
Pseudomonas aeruginosa	18(12.24)
Citrobacter diversus	16(10.88)
Streptococci	9(6.12)
Citrobacter fruendii 8(5.44)	
Coagulase positive Staphylococcus	6(4.08)
Proteus vulgaris	3(2.04)
Proteus mirabilis	1(0.68)
Klebsiella oxytoca 1(0.68)	
Total	147 (100)

Table No. 2 Showing frequency of organisms isolated from stone cultures.

Name of the Organisms	Total No. (%)
Pseudomonas aeruginosa	5(41.66)
Escherichia coli	2(16.66)
Klebsiella spp.	2(16.66)
Proteus mirabilis	1(8.33)
Citrobacter fruendii	1(8.33)
CoNS	1(8.33)
Total	12 (100)

DISCUSSION

Urine cultures were found positive in 55.20% of patients. This figure is lower than that noted by Bratell S. & Colleagues who reported 60% of patients with positive urine cultures [3]. It correlates well with figure reported by Bratell S. & Colleagues. The figure is more than the figure reported by Lewi H. (48 %) [13] & Hugosson J. & colleages (45.67 %) [5]. In present study E. coli (24.48%) is predominant isolated organism from urine culture. It correlates well with Jennis F. & co- workers, they found E. coli (25.7 %).

In present study stone culture were found positive in 28.57% out of total 42 stones examined. Dewan B. & co-workers found 47% positive stone cultures [2]. In present study Pseudomonas aeruginosa (42.66%) was most frequently isolated from stone culture. Gault M. H. & co-workers found more frequent isolations of Pseudomonas, from the stone culture [4].

Most of the isolates from urine culture & stone cultures were sensitive to gentamycin & fluroquinolone group. But most of the organisms were resistant to routine antibiotics. Failure in therapy, is due to survival of bacteria deep within the calculi which are difficult to eradicate [2]. Also the persistence of stone fragments makes the bacteria difficult to eradicate [7,20].

CONCLUSIONS

Our study showed that for 1m^3 M20 grade of concrete consumption of fine aggregate is 775.96 kg. Here in specimen M-3 we replace fine aggregate by 24.62 kg of crumb rubber for 1m^{3}M20 grades of concrete. So, we can say that up to 15% foundry sand utilized for economical and sustainable development of concrete. Uses of crumb rubber in concrete can reduce the harmfulness to the environment and produce a 'greener' concrete for construction. An innovative supplementary Construction Material is formed through this study.

REFERENCE

[1] Bratell S., Brorson J. E., Grenabo L., Hedelin H., and Petterson S: The bacteriology of operated renal stones. Eur. Urol., 1990; 17: 58-61. | [2] Dewan B., Sharma M., Nayak N., and Sharma S. K: Upper urinary tract stones and Ureaplasma urealyticum. J. Med. Res. 1997; 107: 15-21. | [3] Fowler J. E. Jr. RE:Bacteriology of branched renal calculi and accompanying urinary tract infection. J. Urol. 1985; 133: 292-295. | [4] Gault M. H., Longerich L. L., Crane G., Cooper R., Dow D., Best L, Stockall E. Brown W., Bacteriology of urinary tract stones. J. Urol. 1995; 153: 1164-1170. | [5] Hugosson J., Grenabo L., Hedelin H., Pettersson S. and Seebergs Bacteriology of urinary tract stones. J. Urol. 1990; 143: 965-968. | [6] Nemoy N. J. and Stamey T. A., Surgical, bacteriological and biochemical management of " Infection Stones" JAMA: 1971; 215: 1470-1476. | [7] Simon J., Fuss M., Yourassowki E. Urinary infection in renal stone patients. Eur. Urol. 1980; 6: 129-131. | [8] Rocha and Santos L.C.S . Relapse of urinary tract infection in the presence of urinary tract caiculi. The role of bacteria within the calculi. J. Medical Microbiology. 1969,2: 372-376 | [9] Fowler J.E.Jr. RE: Bacteriology of branched renal calculi and accompanying urinary tract infection. J.Uro:1984, 131:213-215 | [10] Holmgren K.Urinary calculi and urinary tract infection. A clinical and microbiological study Scand. J. Urol. Nephrol. 1986, suppl.98:1-71. | [11] Holmgren K, Danielson B.G, Fellstrom B, Ljunghall S, Niklasson F, and Wikstrom B. T he relation between urinary tract infections and stone compositions in renal stone formers .Scand.J.Urol.Nephrol 1989; 23; 131-136. | [12] Jennis F. Lavan J.N, Neale F.C and Posen S. Staghorn calculi of the kidney, clinical, bacteriological and biochemical features.Brit.J.Urol.1970; 42:511-518. | [13] Lewi H.J.E, White A, Hutehinson A.G, Scott R. The bacteriology of the urine and renal calculi: Urol Res.1984;12:107-109. | [14] Ananthranarayan R, Panikar C.K.J. Textbook of Microbiology, 5th ed. 1996. | [15] Collee. J.G, Fraser, A.G Marnion B.P and Simmons B.P. Makie and McCartney Practical Medical Microbiology, 14th ed . Edinburgh; Churchill Livingstone,1996. | [16] Hadelin H., Brorson J.E, Grenebo,and Pettersson S. Ureaplasma urealyticum and upper urinary tract stones. Brit.J. Urol.1984;56:244-249. | [17] Dajaw A.M, Shehabi A.A.Bacteriology and composition of infected stone.Urology.1983;21:351-353. | [18] Grenabo L., Hedelin. H. and Pettersson S.The severity of infection stones in the upper urinary tract. Scand. J. Urol. Nephol. 1985;19:85-289. | [19] Chakrabarty P.A.A Textbook of Microbiology, 1st ed.1998. | [20] Nickel J.C, Emtage J.and Costerton J.W. U ltrastructural microbial ecology of infection induced urinary stones.J. Urol. 1985;133: 622-626. | [21] Griffith D. P. , Musher D. M. and Itin C.: Urease: The primary cause of infection induced urinary stones. Invest. Urol. 1976;13:346-350. | [22] Griffith D. P. Struvite stones. Kidney Int. 1978;13:372-382.