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Evaluation the Pattern of Urosepsis and Bacteriuria after PCNL and URS in BSMMU, Dhaka, Bangladesh

Faruk Hossain[1*], Selina Rahman[2], Mst. Habiba Khatun[3], Kazi Monisur Rahman[4], Col. Md. Ashif Chowdhury[5]

[1]Associate Professor, Department of Urology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh
[2]Assistant Professor, Department of Radiology & Imaging, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh
[3]Associate Professor, Department of Radiology & Imaging, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh
[4]Associate Professor, Department of Gastroenterology, Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh
[5]Classified Specialist in Surgery (Urology), CMH Jashore, Bangladesh

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***Corresponding author:** Faruk Hossain

Abstract **Original Research Article**

Introduction: In recent year, the incidence of sepsis and urosepsis has even increased, but the associated mortality has decreased suggesting improved management of patients. It is proven that the larger the stones, the greater the chance of acquiring infection (6%-10%), as well as an increased chance of postoperative sepsis. ***Objective:*** To assess evaluation the pattern of urosepsis and bacteriuria in patients undergoing PCNL and URS. ***Methods:*** This cross sectional study was carried out in Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh during the period of January 2018 to December 2019. Sampling technique was purposive and sample size was 71. Among them 24 patients for PCNL and 48 patients for URS were selected by selection criteria. Data were collected by interview of the patients, clinical examinations and laboratory investigations using the research instrument. Data were processed and analyzed using software SPSS (Statistical Package for Social Sciences) version 19.0. Incidence of bacteriuria and urosepsis were measured according to urine and blood culture report. Sensitivity pattern was also observed. ***Results:*** According to this study, the incidence of bacteriuria and urosepsis were (16.90%) and (5.6%) respectively, Of the 71 patients, 12 (16.90%) exhibited bacterial growth on urine culture, These 12 patients were then subjected to blood culture and 4(33.3%) of them were found positive. Most (83.4%) of the urine and blood infections (75%) were caused by E. coli. Some widely used antibiotics like moxicillin, Cephalexin and Ciprofloxacin were found 100% resistant in urine culture. Few sensitive antibiotics were Tobramycin (100 %), Amikacin and Ceftazidime (75%). Almost same sensitivity pattern was found in blood culture. In urosepsis, as in other types of sepsis. Urosepsis after PCNL and URS is an important and potentially catastrophic complication. Percuteneousne phrolithotomy (PCNL), Ureterorenoscopy (URS) occurs frequently in this institution. Conclusion: Although the incidence of urosepsis and bacteriuria with resistant organism is low, but it is a burning issue in management inurology practice. The apparent increase in ciprofloxacin resistant organisms appears to be associated with the increased rate of ciprofloxacin resistant organisms are observed in the general population.

Keywords: Percuteneous Nephrolithotomy (PCNL), Ureterorenoscopy (URS), Urinary Tract Infection (UTI).

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I INTRODUCTION

In recent year, the incidence of sepsis and urosepsis has even increased, but the associated mortality has decreased suggesting improved management of patients. It is proven that the larger the stones, the greater the chance of acquiring infection (6%-10%), as well as an increased chance of postoperative sepsis. Percuteneous nephrolithotomy (PCNL) is done for removal of large and complex renal calculi or sometimes removal of proximal ureteric calculi. Ureterorenoscopy (URS) is done for removal of mid or lower ureteric stone or evaluates the causes of ureteric obstruction. Urosepsis due to manipulation during percuteneous nephrolithotomy (PCNL) or URS can be catastrophic despite sterile preoperative urine and prophylactic antibiotic coverage [1, 2]. Percuteneous nephrolithotomy (PCNL), Ureterorenoscopy (URS) occurs frequently in this institution. Although the incidence of urosepsis and bacteriuria with resistant organism is low, but it is a

burning issue in management in urology practice. Urosepsis is associated with bacteriuria [3]. Urolithiasis is one of the most common urological diseases; it can be lethal if urinary tract infection associated with obstructed uropathy due to urinary tract calculi results in bacteremia and sepsis [1, 2]. In recent year, the incidence of sepsis and urosepsis has even increased, but the associated mortality has decreased suggesting improved management of patients [4, 5]. It is proven that the larger the stones, the greater the chance of acquiring infection (6%-10%), as well as an increased chance of postoperative sepsis. Risk of post PCNL sepsis increased by 4 times in patients with HDN and stones >2 cm despite sterile MSU (Mid-Stream Urine) and standard prophylactic antibiotics [6]. But sometimes URS and PCNL may precede urosepsis and bacteriuria which may cause life threatening condition. Urosepsis after PCNL and URS is an important and potentially catastrophic complication [7]. The overall incidence of fever (25%), bacteremia (23%), and endotoxemia (34%) is noted, but septicemic shock occurs in 0.3%-2.5% of patients [8]. Urosepsis and shock result from the intravasation of bacteria or endotoxins into bloodstream, which in turn increases with prolonged surgery, degree of hydronephrosis (HDN), bacterial load in the renal pelvis, and presence of infected stones [9, 1, 2]. It is proven that the larger the stones, the greater the chances of acquiring infection (6%-10%), as well as an increased chance of postoperative sepsis [10, 11]. Risk of post PCNL sepsis increased by 4 times in patients with HDN and stones >2 cm despite sterile MSU and standard prophylactic antibiotics [12, 13]. The leading cause for developing uroseptic shock in urological patients was urinary obstruction in 78% and uropathies with significant impact on urodynamics in 22% [14]. A total of 17% of patients develop urosepsis after urological interventions Obstructive diseases of the urinary tract leading to obstructive pyelonephritis are caused by ureteral stones in 65%, by tumors in 21%, by pregnancy in 5%, by anomalies of the urinary tract in 5% and following operations in 4% [15]. In another study, from 205 analyzed case histories of urosepsis, 43% resulted from urolithiasis, 25% from prostatic adenoma, 18% from urologic cancer and 14% suffered other urologic diseases complicated by urosepsis [3].

II MATERIALS AND METHODS

This cross sectional study was carried out in Bangabandhu Sheikh Mujib Medical University (BSMMU), Dhaka, Bangladesh during the period of January 2018 to December 2019. Sampling technique was purposive and sample size was 71. Among them 24 patients for PCNL and 48 patients for URS were selected by selection criteria. All patients were enrolled after considering all selection criteria. Urine for C/S was done in all patients. After the procedures urine sample was collected from each patient before institution of antibiotic therapy. The collected sample then sent for Culture and Sensitivity and observed the patient for sign and symptoms of urosepsis. If Organism found in urine culture then blood sample were sent for C/S and broad spectrum injectable antibiotic with supportive treatment were started.

Inclusion Criteria:

- Stag horn calculi to be treated by PCNI.
- A stone larger than 2.5cm for PCNL.
- Patient with non-breakable stone by ESWL.
- Proximal ureteric stone undergoing push back stenting for PCNL or ESWL.
- Stone in mid or lower ureter which causes partial obstruction for URS.

Exclusion Criteria:

- Pelvic kidney.
- Horse shoe kidney.
- Morbid obesity.
- Stone in Caliceal diverticula.
- Bleeding disorder.
- Existing urinary tract infection.
- Immunosuppressed patient.
- Presence of structural heart disease.
- Indwelling catheter in situ.
- Patients who refused to give informed consent.

Bleeding disorder and other pathology were excluded. Antithrombolytie drug was withdrawn 7 days before PCNL or URS. Urine was made sterile according to culture sensitivity report. After proper preparation, consent and counseling of the patient, PCNL or URS was done under standard procedure. Data were collected by interview of the patients, clinical examination and laboratory investigations using the research instrument, a written questioners. Statistical analysis of the result was performed by using window based computer software device with statistical packages for social science (SPSS-19.0) (SPSS Inc, Chicago, IL, USA). The results were presented in tables, figures, and diagrams. Chi square test were used for calculating the significance of difference. A p-value <0.05 was considered as level of significance.

III RESULTS

Seventy one (71) patients were included in the study. (Fig-1) shows the distribution of patients by age. Mean age was 36.97 years with a SD of ± 13.48 years. Age group <30 years lead the tally with about 43% representation. The next leading age group was 45-55years (31.4%). The pie chart below depicts the distribution of the patients by sex. Oct of respondents 69% (49) were male and the rest 31% (22) were female (Fig-2). There were 24 stones dealt with PCNL procedure. Almost half (50.0%) stones were Stag-horn calculi and more than 30% stones were inferior caliceal stones. About 22% stones situated at the middle calyx which were large type (Table-1). There were 48 stones dealt with URS procedure. Most (70.83%) stones were lower ureteric stone and about one-fourth (25.0%)

stones were presented at vesico-ureteric junction. Only 4.16% stones were middle ureteric stone (Table 2). Clinical history revealed that frequency of micturition was predominant complaint (76.05%) followed by dysuria (57.75%), nocturia (29.58%), urgency (29.58%), fever with chill and rigor (23.94%) and haematuria (21.12%). A small proportion of patients mentioned hesitancy and shivering (Table-3).

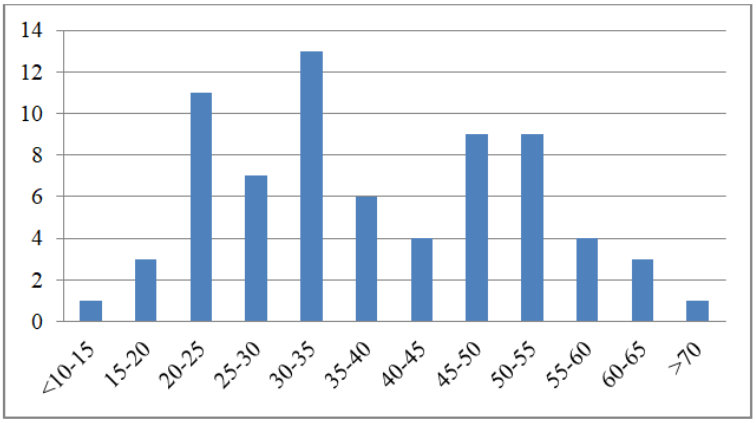

Fig-1: Histogram showing the distribution of patients by age.

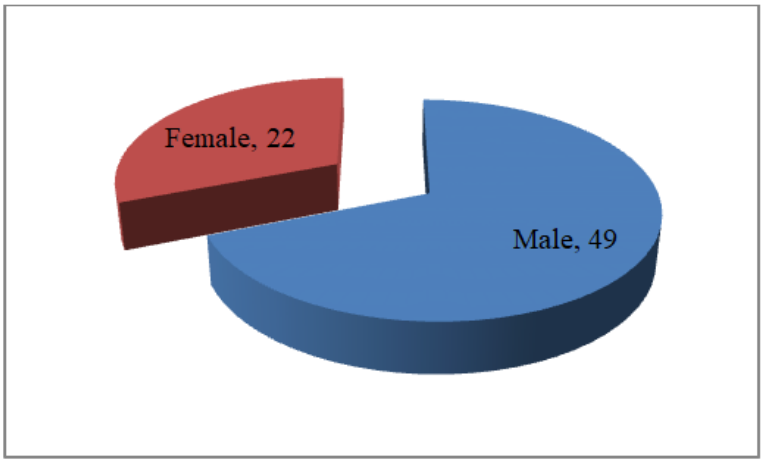

Figure 2: Pie chart showing the distribution of patients by sex.

Table 1: Type and location of Stone for PCNL.

Type and location of stone for PCNL	Frequency	Percentage
Stag-horn calculi	12	50.0
Large stone present at middle calyx	4	16.66
Inferior caliceal stone	5	20.83
Proximal ureteric stone-PCNL After push bang	3	12.5
Total	24	100.0

Table 2: Type and location of Stone for URS.

Type and location of Stone for URS	Frequency	Percentage
Lower ureteric stone	34	70.83
Middle ureteric stone	2	4.16
Stone at VUJ	12	25.0
Total	47	100.0

Table-3: Distribution of patients by clinical history.

Clinical history	Frequency	Percentage
Frequency of mietunition	54	76.05
Dysuria	41	57.75
Nocturia	21	29.58
Urgency	21	29.58
Fever with chill and rigor	17	23.94
Haematuria	15	21.12
Hesitancy	8	11.26
Shivering	3	4.22

Table-4: Distribution of patients by investigations.

Investigations		Frequency	Percentage
Bacterial growth on urine culture (n=71)	Positive	12	16.90
	Negative	59	83.09
Bacterial growth on blood culture (n=12)	Positive	04	33.3
	Negative	08	66.7

Table-5: Distribution of patients by pathogens isolated (urine culture).

Pathogens isolated	Frequency	Percentage
E. coli	10	83.4
Pseudomonas aeruginosa	1	8.3
Proteus	1	8.3

Table-6: Distribution of patients by pathogens isolated (blood culture).

Pathogens isolated	Frequency	Percentage
E.coli	03	75.0
Pseudomonas aeruginosa	01	25.0

Table-7: Distribution of patients by Sensitivity pattern (urine culture).

Name of antibiotics	Sensitivity pattern	Frequency	Percentage
Amikacin	Sensitive	9	75.0
	Resistance	3	25.0
Amoxycillin	Resistant	12	100.0
Cefepime	Sensitive	8	66.7
	Resistant	4	33.33
Cefixime	Sensitive	1	8.3
	Resistant	11	91.7
Ceftazidime	Sensitive	9	75.0
	Resistance	3	25.0
Ceftriaxone	Sensitive	1	8.3
	Resistant	11	91.7
Cephalexin	Resistant	12	100.0
Cephradine	Sensitive	2	16.7
	Resistant	10	83.3
Ciprofloxacin	Resistant	12	100.0
Cotrimoxazole	Sensitive	7	58.3
	Resistant	5	41.7
Gentamycin	Sensitive	8	66.7
	Resistant	4	33.3
Nitrofurantoin	Sensitive	10	83.3
	Resistant	2	16.7
Tobramycin	Sensitive	12	100.0

Table-8: Distribution of patients by Sensitivity pattern (blood culture).

Name of antibiotics	Sensitivity pattern	Frequency	Percentage
Amikacin	Sensitive	3	75.0
	Resistance	1	25.0
Amoxycillin	Resistant	4	100.0
Cefepime	Sensitive	2	50.0
	Resistant	2	50.0
Cefixime	Sensitive	0	0.0
	Resistant	4	100.0
Ceftazidime	Sensitive	1	25.0
	Resistance	3	75.0
Ceftriaxone	Sensitive	1	25.0
	Resistant	3	75.0
Cephalexin	Resistant	4	100.0
Cephradine	Sensitive	1	25.0

Total percentage did not correspond to 100% because of multiple responses. Of the 71 patients, 12(16.90%) exhibited bacterial growth on urine culture. These 12 patients were then subjected to blood culture and 4(33.3%) of them were found positive. Thus a total of 4 patients (5.6%) out of 71 developed urosepsis. Table 5 shows that most (83.4%) of the urine infections were caused by E. coli. Only one instance of Pseudomonas aeruginosa and Proteus infection was reported. Table 6 shows that about three-fourth of the blood infections were caused by E. coli, and the remaining 25% by Pseudomonas aeruginosa. Sensitivity pattern of microorganisms demonstrates that out of 12 urine culture positive patients. 100% was sensitive to Tobramycin 75% to Amikacin and Ceftazidime. 66.7% 10 Celepime and Gentamycin 58.3% to Cotrimoxazole Ceftriaxone Cephradine and cefixime was last sensitive (16.7% and 83%respectively) (Table-7). Amoxicillin Cephalexin and Ciprofloxacin were not at all sensitive. Sensitivity pattern of microorganisms demonstrates that out of 4 culture positive patients, 100% were sensitive to tobramycin, 75% to Amikacin and Gentamycin and Nitrofurantoin, 50% to Cefepime and Cotrimoxazole. Ceftazidime, Ceftriaxone, Cephradine were least sensitive (25% each) while Amoxycillin, Cefixime and Ciprofloxacin were 100% resistant (Table-8).

IV DISCUSSION

Urolithiasisis one of the most common urological diseases, it can be lethal if urinary tract infection associated with obstructive uropathy due toupper urinary tract calculi results in bacteremia and sepsis [1]. Urosepsis due to manipulation during percutaneous nephrolithotomy (PN) or ureterorenoscopy (URS) can catastrophic despite prophylactic antibiotic coverage [1].Dan some chronic disease increase the rate of urosepsis. In thisonly one patient developed urosepsis after PCNL who was diabetic Peronneous nephrolithotomy (PCNL) is done for removal of large and complex renal calculi or sometimes proximal ureteric calculi. Ureterorenoscopy (URS) is done for removal of mid or lower uretericone or evaluates the causes of ureteric obstruction. But sometimes URS and PCN may precede urosepsis and bacteriuria which may cause life threatening condition. This is very challenging for urologists. The prevalence of urosepsis in urological patients with nosocomial UTI was high and was in one study on average about 12%, whereas in patients with nosocomial UTl treated in other specialties the prevalence for severe sepsis was 2% and for septic shock 0.3%. Wagenlehner, Pilatz and Weidner et al., [3] patients were included in this study according to selection criteria. Meenage was 36.97 years with a SD of±13.48 years and peak incidence was found in young adult whose age 30 or less. Out of 71 patients 24 stones dealt with PCNL and 48 patients dealt with URS. In this study there were 24 stones dealt with PCNL procedure. Almost half (50.0%) of the stones were Stag-horn calculi and more than 30%stones were inferior caliceal stones. About 22% stones which presented at the middle calyx were large type. 3 patients (12.5%) present with proximal ureteric stone where push bang stenting was done before ESW Lor PCNL. There were 48 stones dealt with URS procedure. Most (70.83%) stones were lower ureteric stone and about one-fourth (25.0%) stones were presented at vesico-ureteric junction. Only (4.22%) stones were middle ureteric stone. Of the 71 patients, 12 (16.90%) exhibited bacterial growth on urine culture. These 12 patients were then subjected to blood culture and 4 (5.6%) of them were found positive. Thus a total of 4 patients (5.6%) out of 70developed urosepsis. This result correlates with international study. Most (83.4%) of the urine and blood (75%) infections were caused by E.coli. This finding was identical with a lot of international studies [5, 16]. Overall it consists of about 50% E. coli, 15%Proteusspp, 15% Enterobacter and Klebsiella spp., 5% P. aeruginosa and 15% Gram-positive organisms, according to different surveillance studies. If host defense is impaired, less virulent organisms such as enterococci, coagulase-negative staphylococci or P. aeruginosa may also cause urosepsis. In almost every case of urologic sepsis the microorganisms isolated from blood were the same as those isolated from the urine. Injudicious use of anti-microbial agents is a growing concern all over the world. This was also depicted in our study findings. Some widely usedantibiotics like Amoxicillin, Cephalexin and Ciprofloxacin were found100% resistant in urine culture. Few sensitive antibiotics were Tobramycin

(100 %), Amikacin and Ceftazidime (75%). Almost same sensitivity pattern was found in blood culture. These findings supportedby few international studies as well [17]. Almost same sensitivity pattern was found in blood culture. In urosepsis, as in other types of sepsis. Urosepsis after PCNL and URS is an important and potentially catastrophic complication. Percuteneous nephrolithotomy (PCNL), Ureterorenoscopy (URS) occurs frequently in this institution. Although the incidence of urosepsis and bacteriuria with resistant organism is low, but it is a burning issue in management in urology practice. The apparent increase in ciprofloxacin resistant organisms appears to be associated with the increased rate of ciprofloxacin resistant organisms are observed in the general population.

V CONCLUSION

During the procedure of ureterorenoscopy (URS) and percutaneous nephrolithotomy (PCNL), urosepsis may occur. Urosepsis can be catastrophic despite prophylactic antibiotic coverage. In recent years, the incidence of sepsis and urosepsis were increased, but the associated mortality has decreased suggesting improved management of patients. In this study, out of 70 patients, 12(17.1%) patients developed bacteriuria and among which 4(5.7%) patients developed urosepsis. This result correlates with many international studies. Surprisingly the apparent increase in ciprofloxacin resistant organisms was seen in the general population. New strain of E.coli is very alarming uropathogen and is found to be positive in many cases of urosepsis and are resistant to many conventional antibiotics.

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