COMPARATIVE STUDY OF CULTURE AND SENSITIVITY PATTERNS OF PRE OPERATIVE MID STREAM URINE WITH RENAL PELVIC URINE AND STONE TO PREDICT UROSEPSIS FOLLOWING PERCUTANEOUS NEPHROLITHOTOMY: A PROSPECTIVE CLINICAL STUDY

K. Bhargava Vardhana Reddy[1], R. Malleswari[2], Sridevi S[3]

[1]Associate Professor, Department of Urology, Santhiram Medical College, Nandyal, Andhra Pradesh.
[2]Associate Professor, Department of Anesthesia, Santhiram Medical College, Nandyal, Andhra Pradesh.
[3]Associate Professor, Department of Microbiology, Santhiram Medical College, Nandyal, Andhra Pradesh.

ABSTRACT: INTRODUCTION: Percutaneous nephrolithotomy (PCNL) is the most frequently performed surgery for stone disease at our institution. Nearly 100 PCNL procedures are being performed in a year at our institution. Septicemia following PCNL can be catastrophic despite sterile preoperative urine and prophylactic antibiotics. Infected stones, obstructed kidneys, and comorbidity have been held responsible. In this study we analyzed various culture specimens, namely Mid-stream urine (MSU), renal pelvic urine and crushed stones.

MATERIALS AND METHODS: We performed a prospective clinical study in all our patients undergoing PCNL between January 2013 and December 2014. MSU was sent for culture and sensitivity testing (C&S) one day prior to surgery. Percutaneous access into the ipsilateral pelvicaliceal system is achieved under image intensification using a fine, 14 gauge Kellet needle. Urine from the pelvicaliceal system is first aspirated and sent as pelvic urine C&S. Stone fragments are collected to be proces0sed for C&S. The data collected were divided into 3 main groups, that is MSU C&S, pelvic urine C&S and stone C&S.

RESULTS: A total of 83 patients were included in the study, of this MSU C&S was positive in 9/83 (10.8%) patients, Pelvic C&S in 10 /73 (13.7%) patients and Stone C&S in 25/83 (30.1%) patients. Out of 25 cases of stone culture positive patients 17 patients developed Systemic Inflammatory Response Syndrome (SIRS) but only 2 patients developed SIRS in MSU C & S positive patients.

CONCLUSIONS: The results of our study suggest that positive stone C&S is the better predictor of potential urosepsis than MSU. Stone culture is available only after surgery but appears to be the best guide for antibiotic therapy in case of sepsis. So the routine collection of stone for C&S will be beneficial.

KEYWORDS: Stone culture, PCNL, Urosepsis.

HOW TO CITE THIS ARTICLE: K. Bhargava Vardhana Reddy, R. Malleswari, Sridevi S. "Comparative study of Culture and Sensitivity Patterns of Pre-operative Mid Stream Urine with Renal Pelvic Urine and Stone to Predict Urosepsis following Percutaneous Nephrolithotomy: A Prospective Clinical Study". Journal of Evidence based Medicine and Healthcare; Volume 2, Issue 45, November 05, 2015; Page: 8178-8182, DOI: 10.18410/jebmh/2015/1100

INTRODUCTION: Percutaneous nephrolithotomy (PCNL) is the most frequently performed surgery for renal stone disease at our institution. Nearly 100 PCNL procedures are being performed in a year at our institution. Indications are larger stones (greater than 1.5 cm), failed extracorporeal shock wave lithotripsy, <1.5 cm stones which is in lower calyx with narrow infundibulopelvic angle etc.

Septicemia following PCNL can be catastrophic despite sterile preoperative urine and prophylactic antibiotics.[1] Infected stones, obstructed kidneys, and comorbidity have been held responsible for septicemia.[2] In this study we analyzed various culture specimens, namely mid-stream urine (MSU), renal pelvic urine and crushed stones. The first description of percutaneous stone removal was that of Rupel and Brown (1941) of Indianapolis, who removed a stone through a previously established surgical nephrostomy track. It was not until 1955, however, that Goodwin described the first placement of a percutaneous nephrostomy tube to drain a grossly hydronephrotic kidney (Goodwin et al, 1955). In 1976, Fernstrom and Johannson first reported the establishment of percutaneous access with the specific intention of removing a renal stone.

It has been standard practice in our institution to test urine for infection at least a week prior to PCNL by MSU C&S. Patients with infection were treated with appropriate antibiotics for 7 days and then urine C&S was repeated. Most centres worldwide use antibiotic prophylaxis in accordance with the Infectious Diseases Society of America and European Society of Clinical Microbiology and Infectious Diseases guidelines, but the empirical prescription of preoperative antibiotics for longer is being used for patients with a 'higher risk' of urosepsis. The inability to reduce the infection within stones in a few patients might be attributed to the impenetrability of the stones, presence of endotoxins in the stone matrix, and the possibility that the patients did not comply with the preoperative antibiotic regimen.[3] MSU samples have been shown not to represent the infection present in the upper tracts.[4,5] The stone and pelvic urine C&S were better

Submission 16-10-2015, Peer Review 17-10-2015,
Acceptance 24-10-2015, Published 05-11-2015.
Corresponding Author:
K. Bhargava Vardhana Reddy,
Associate Professor,
H.No:25-587A, Srinivasa Nagar,
Nandyal, Kurnool District-518502, Andhra Pradesh.
E-mail: dr.malleswari@gmail.com
DOI: 10.18410/jebmh/2015/1100

predictors of urosepsis after surgery and large stones are more likely to be harbour infection.[6]

MATERIALS AND METHODS: We performed a prospective clinical study in all our patients undergoing PCNL between June 2013, and May 2015. The exclusion criteria are bilateral obstruction, previous urinary tract manipulation, concomitant ureteral and bladder stones. MSU or a clean, straight catheter specimen of urine was sent for culture and sensitivity testing (C&S) one day prior to surgery.

After antiseptic preparation with chlorhexidine a standard cystoscope with a working channel is introduced into the bladder. The corresponding ureterovesical opening is cannulated with a sterile 0.0035-inch straight guide wire and under image intensification, it is passed into the pelvicaliceal system. A sterile 5 Fr ureteral catheter is then threaded on the guide wire to place within the collecting system. The patient is then turned prone and sterile preparation is performed. Percutaneous access into the ipsilateral pelvicaliceal system is achieved under image intensification using a fine, 14 gauge Kellet needle. Urine from the pelvicaliceal system is first aspirated and sent for C&S. The tract is then dilated using Amplatz dilators until a 24 or 26 Fr Amplatz sheath can be placed. Nephroscopy and pneumatic lithotripsy are performed under low pressure irrigation. Stone fragments are collected and sent for C&S. We followed the Nemoy and Stamey technique in processing of stones for culture. First the stone is washed off to remove surface contaminants and culture bacteria within the stone. Essentially fragments were washed in 5 sequential bottles containing sterile saline and then crushed in the fifth bottle, and subjected to stone C&S.[7]

All patients were left with a nephrostomy tube for 24 hours before it was clamped and removed. Patients were monitored closely in the postoperative period to watch for signs of systemic inflammatory response syndrome (SIRS), defined as the development of 2 of 4 criteria, namely body temperature less than 36^0C or greater than 38^0C, heart rate greater than 100 beats per minute, respiratory rate greater than 20 breaths per minute and white cell count greater than 11000/l or less than 4000/l. The development of hypotension below a systolic blood pressure of 90 mm Hg or 40 below baseline for the patient in the presence of SIRS was considered septic shock. Urosepsis in this study was defined as SIRS or shock. The data collected were divided into 3 main groups, that is MSU C&S, pelvic urine C&S (urine proximal to the obstructing stone) and stone C&S.

We performed statistical analysis of the data obtained using SPSS software to determine associations among the various groups and subgroup.

RESULTS: A total of 83 patients were included in the study, of this MSU C&S was positive in 9/83(10.8%) patients, Pelvic C&S positive in 10/83(13.7%) patients and Stone C&S positive in 25/83 (30.1%) patients.

All 3 cultures were positive in 2 cases. Stone C & S was positive in 25(30.1%) cases, but only 4(16%) cases of these positive stone cultures were concordant with the MSU. (Stone C & S was positive in 21 cases in which pre op MSU C & S was negative). Twenty (24.1%) patients had SIRS and 3 pts experienced septic shock out of 83 patients. Out of 25 cases of stone culture positive patients 17 patients developed SIRS, but only 2 patients developed SIRS in MSU C & S positive patients. (Fig. 2) Stone C&S predicted SIRS better than MSU C&S (P=0.0252). But there is no significant difference between Pelvic urine C&S and MSU C&S to predict SIRS.

DISCUSSION: It has been standard practice in our department to test urine for infection prior to PCNL by MSU C&S. Patients with infection was treated with appropriate antibiotics for 7 days. Despite this careful preoperative preparation, experience has shown that septicemia and septicemic shock still develop in patients in direct proportion to the duration of procedure, bacterial load in the urine, severity of obstruction by the stone and presence of infection in the stone[8] In a series of 9 patients reviewed by O'Keeffe et a[1] mortality from septicemia after ureteroscopy was as high as 66%. Stamey et al revealed that ureteral catheterization and collection of urine from within the ureter can identify infection in the upper urinary tract that can be missed on routine bladder urinalysis.[9] Urosepsis and shock have been found to occur in direct proportion to the severity of obstruction and infection in the stone. McCartney and Bratellio et al. confirmed a poor correlation between infection in the stone and in bladder urine specimen's.[10] Rao et al described preoperative and postoperative changes in endotoxin and tumor necrosis factor (TNF). Blood C&S in this series did not prove to be an accurate test even in the face of septic shock.[11]

Larger stones are more likely to be triple phosphate stones and they have been found to harbor infection. We believe that samples collected from the upper tract will be the best guide to therapeutic antibiotic use when systemic infection arises. The preoperative prediction of urosepsis is the ideal and some groups at high risk can be identified, such as patients with staghorn calculi, abnormal anatomy and diabetes, and immuno compromised patients.

CONCLUSIONS: The results of our study suggest that positive stone C&S is the better predictor of potential urosepsis than MSU. Stone culture is available only after surgery but appears to be the best guide for antibiotic therapy in case of sepsis. So the routine collection of stone for C&S will be beneficial.

BIBLIOGRAPHY:

1. O'Keeffe, N. K., Mortimer, A. J., Sambrook, P. A. and Rao, P. N.: Severe sepsis following percutaneous or endoscopic procedures for urinary tract stones. Br J Urol, 72: 277, 1993.

2. Mariappan et al, Stone and pelvic urine culture and sensitivity are better than bladder urine as predictors of urosepsis following percutaneous nephrolithotomy: a prospective clinical study. 2005,J Urol Vol. 173, 1610–1614.
3. Paramananthan Mariappan, Gordon Smith, Sami A. Moussa and David A. Tolley Western General Hospital, Urology, Edinburgh, UK Accepted for publication 12 June 2006.
4. Bratell S, Brorson JE, Grenabo L, Hedelin H, Pettersson S. The bacteriology of operated renal stones.EurUrol1990; 17: 58–61.
5. Fowler JE Jr. Bacteriology of branched renal calculi and accompanying urinary tract infection. J Urol 1984; 131 213–5.
6. Shigeta M, Hayashi M, Igawa M.Aclinical study of upper urinary tract calculi treated with extracorporeal shock wave lithotripsy: association with bacteriuria before treatment. Urol Int1995; 54. 214–6.
7. Nemoy NJ, and Stamey TA: Surgical, bacteriological, and biochemical management of "infection stones" JAMA 215: 1470 (1971).
8. Stackl, W. and Marberger, M.: Late sequelae of the management of ureteral calculi with the ureterorenoscope. J Urol, 136: 386 1986.
9. Stamey, T. A., Govan, D. E. and Palmer, J. M.: The localization and treatment of urinary tract infections: the role of bactericidal urine levels as opposed to serum levels. Medicine, 44: 1, 1965.
10. McCartney AC, Clark J, Lewi HJ. Bacteriological study of renal calculi. Eur J Clin Microbiol, 1985 Dec; 4(6): 553-5.
11. Rao, P. N., Dube, D. A et al. Prediction of septicemia following endourological manipulation for stones in the upper urinary tract. J Urol. 1991 Oct; 146(4): 955-60.

Sensitivity & Specificity to detect SIRS

	Sensitivity (%)	Specificity (%)
MSU	8	88.3
PCN	31.5	92.3
STONE	73.9	86.6

Table 1

Antibiotic sensitivity patterns between MSU positive & Stone positive patients (Total no of Pts: 4)

Pt	MSU	STONE
1.	AMK,GM, COT, CEPHALOSPORINS,IMP,MP	AMK,IMP,MP
2.	AUG,CIPRO,OFLOX,AMK,IMP,MP	PIP+TOZ, IMP,MP
3.	AMK,IMP,MP, PIP+TOZ	IMP,MP
4.	AMK,CEPHALOSPORINS	AMK,CEPHALOSPORINS, PIP+TOZ,IMP

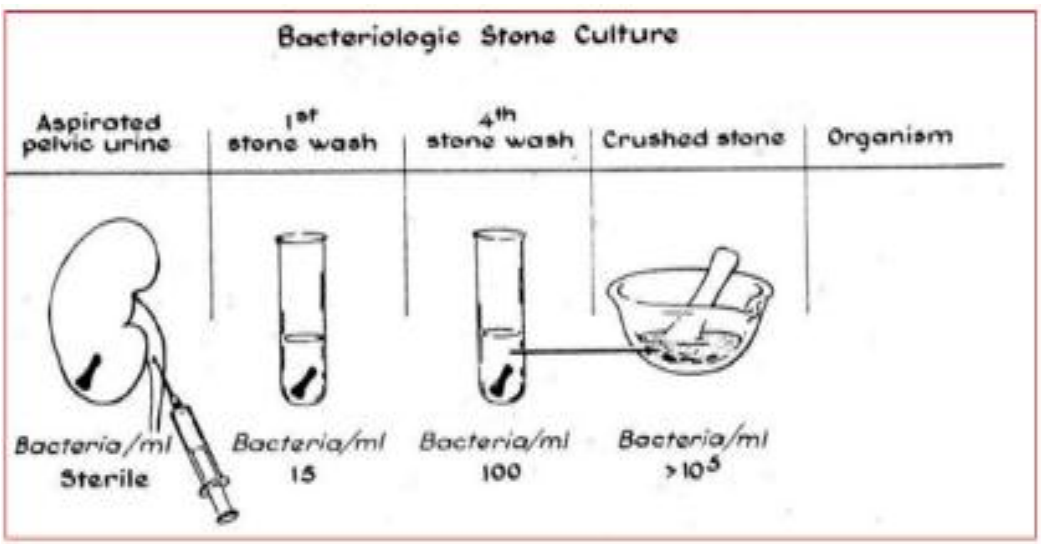
Table: 2

	Stone positive (%)	Simultaneous MSU positive (%)
Fowler et al, J Urol, 131: 213, 1984	77.3	12.5
Bartel Eur Urol, 17: 58, 1990	50-70	15
Rao et al	47.8	20
Our study	30.1	16

Table: 3

Studies	Septic Shock in Pts
Levy, M. Crit Care Med, **31:** 1250, 2003	1% to 2%.
Our study	3.6 %

Table: 4 Setpic Shock



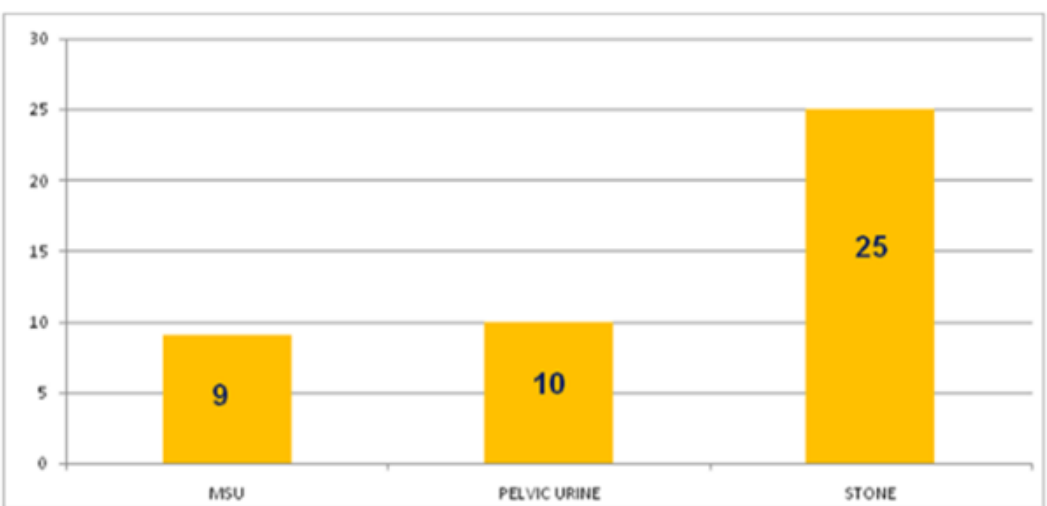


Fig. 1

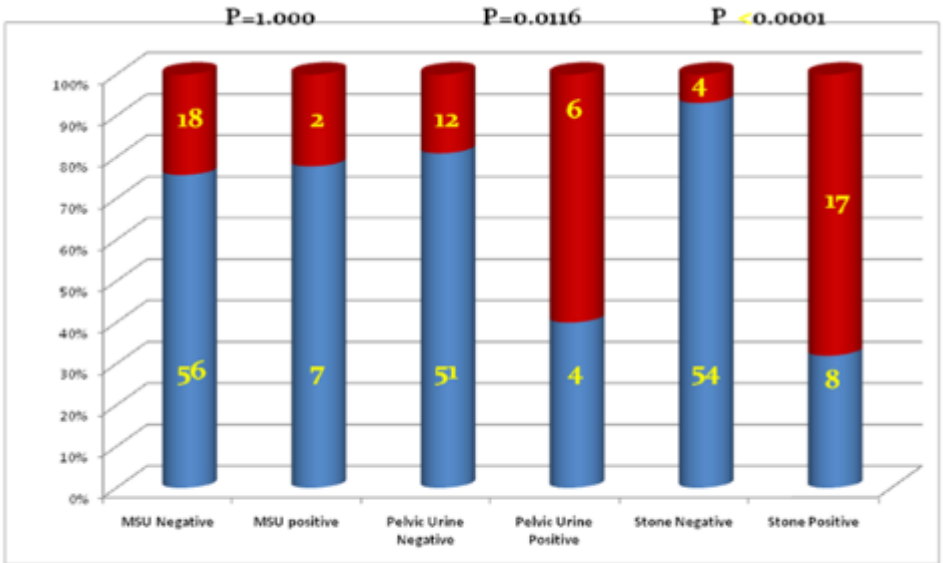


Fig. 2

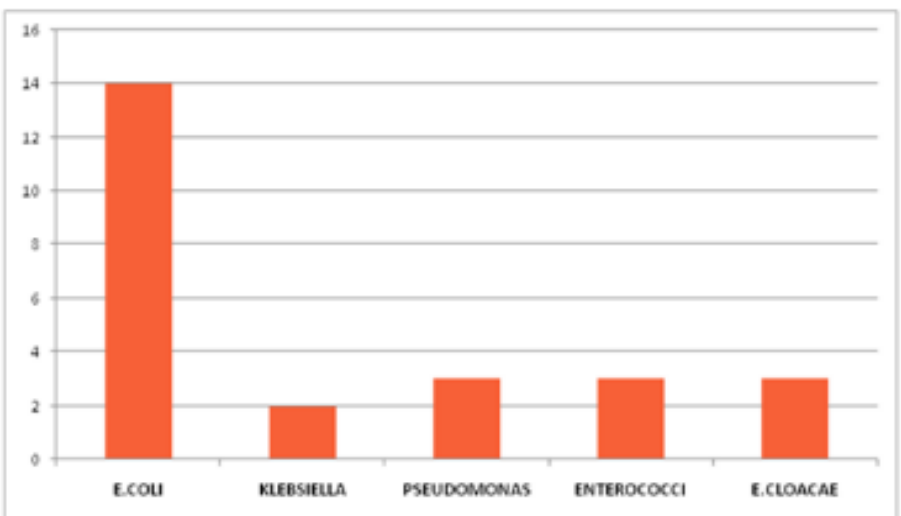


Fig. 3 (Total No Cases: 25)