



E-ISSN: 2616-3470
P-ISSN: 2616-3462
© Surgery Science
www.surgeryscience.com
2020; 4(3): 36-39
Received: 12-08-2020
Accepted: 17-09-2020

Dr. Nandakishore B
Assistant Professor, Department of
Urology, Father Muller Medical
College, Mangalore, Karnataka,
India

A study of intra-operative urine and stone culture in PCNL (Percutaneous nephrolithotomy operations)

Dr. Nandakishore B

DOI: <https://doi.org/10.33545/surgery.2020.v4.i4a.836>

Abstract

Introduction: Calculus renal disease is one of the commonest problems encountered in general urology practice and PCNL is the main stay of treatment for these patients with sizable renal calculi. Infective complications of PCNL are though not common can result in significant morbidity and even mortality. Postoperative urinary tract infections (UTIs), Secondary haemorrhage of infective origin, and, Surgical site infections (SSIs), are known infection related complications of Percutaneous Nephrolithotomy (PCNL), leading to significant morbidity. Sepsis, bacteruria, septicemic shock are also known and reported in many studies. The effectiveness of perisurgical antimicrobial prophylaxis in reducing postoperative infective complications are well known. This study puts in an effort to find and understand the intra-operative urine and stone culture to give better prophylactic antibiotics.

Aims and Objectives: To find and understand the intra-operative urine and stone culture.

Methodology: It is a prospective study conducted between February 2019 – July 2020 in the Department of urology Father Muller Medical College, Mangalore. All patients presented to our centre and underwent Percutaneous Nephrolithotomy. The Sample size was 191 patients and Study group consisted of Patients clinically and radiologically diagnosed with renal stone.

Results: Pre-operative urine culture was negative in all patients. 140 patients were negative for intra-operative stone and urine culture. 65 cases were reported positive for culture.

Conclusions: According to our study intra-operative urine and stone culture is a valuable tool for early detection and with prompt early treatment of the infective complication will reduce postoperative morbidity.

Keywords: Intra-operative, urine, stone culture in PCNL

Introduction

Renal stones are quite commonly encountered in this part of the world and are also associated with complications^[1]. The tremendous loss of work hours by this disease is seriously impairing the work hours as working young population is often hit with this disease^[2]. The demography is never recorded in India but the demography of the western world is available^[3, 4]. It is understood that the stones that are encountered are the tombstones of the bacterias in majority of times. Million Dollar question is whether the infection preceeds the stone formation or is a consequence of the same. A number of reasons contribute for the stone formation as previously recorded by different authors^[5, 6]. Approximately 10% of people will have a urinary stone during their lifetime^[7]. The United States health care burden from renal calculi disease is immense with 185,000 hospitalizations, 2 million outpatient visits and 2.1 billion dollars expended annually for management^[8, 9, 10]. 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^[11]. However, considerable overlap in urine chemistries exists between individuals with and without renal calculi disease^[12, 13, 14]. Furthermore, supersaturation with calcium oxalate (CaOx) or calcium phosphate (CaPhos) is not different in recurrent renal calculi disease patients compared to controls^[15]. Thus, although supersaturated urine is a risk factor, alone it is insufficient for stone formation. 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^[15]. Despite these treatment strategies, renal calculi disease prevalence in US adults and children has recently increased by 40% and 23%, respectively.

Corresponding Author:
Dr. Nandakishore B
Assistant Professor, Department of
Urology, Father Muller Medical
College, Mangalore, Karnataka,
India

Identification of other factors that contribute to CaOx and/or CaPhos stone formation (lithogenesis) is a critical need. The bacterial contribution to renal calculi disease formation has long been recognized. Magnesium ammonium-phosphate (struvite) stones (a conglomeration of bacteria, crystals and protein matrix) form due to urinary tract infection (UTI) with urease-producing bacteria. Stag horn calculi are known to have bacterial growth within. The infections may or may not be detected in pre-operative cultures and the stone actually masks the infection. Post-PCNL infection is known to be much higher in patients with absolute urine pre-operative negativity. So this study puts in a sincere effort to understand and study the infection in the renal stones and the urine which are extracted during surgery. This study is intended to formulate an antibiotic prophylaxis for PCNL.

Aims and Objectives

To find and understand the intra-operative urine and stone culture

Materials and Methods

Study design: A Prospective Study.

Study period: February 2019 – July 2020.

Study setting: Department of urology Father Muller Medical College, Mangalore.

Study population: All patients presented to our centre and underwent Percutaneous Nephrolithotomy

Sample size: 191 cases

Study group: Patients clinically and radiologically diagnosed with renal stone

Inclusion criteria

1. All patient admitted
2. Patients giving consent for the study.

Exclusion criteria

1. Pre operative urine culture shows growth
2. Staged PCNL
3. Patient with serum creatinine more than 2.0 mg %
4. Patient already on antibiotic treatment

Method

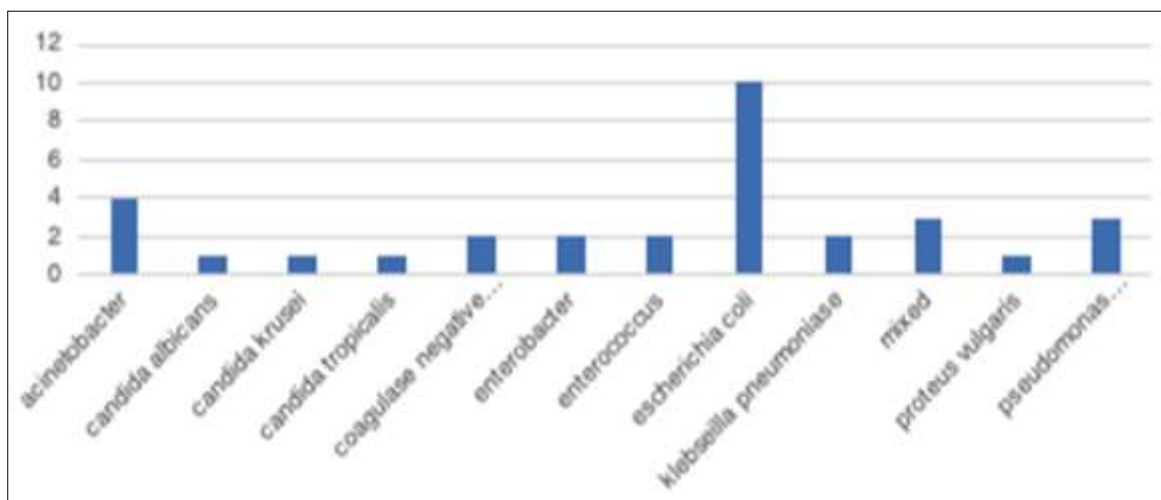
Informed consent is taken. Patient information-Detailed patient information and history are obtained. Routine Pre-operative urine culture and sensitivity is done as a workup for calculus on OPD basis. First dose of antibiotic given at the time of induction of anaesthesia [Ceftriaxone (3rd generation cephalosporins) 1 gm i.v ATD]. Intra-operative Renal urine samples will be obtained by ureteric catheterisation. Fragments of Stone obtained during PCNL are send for culture and sensitivity. Double J (DJ) stent deployed kidney to bladder, nephrostomy tube used according to surgical discrete. Foleys per urethral catheter is placed at the end of procedure. Additional doses of antibiotic are given 12 hrly intervals, till intraoperative culture results were obtained (3 doses). If Culture -ve antibiotics are stopped and If Culture +ve antibiotics are continued for 5 days. Patients were discharged at 5th day and followed up for 4 weeks till stent removal.

Results

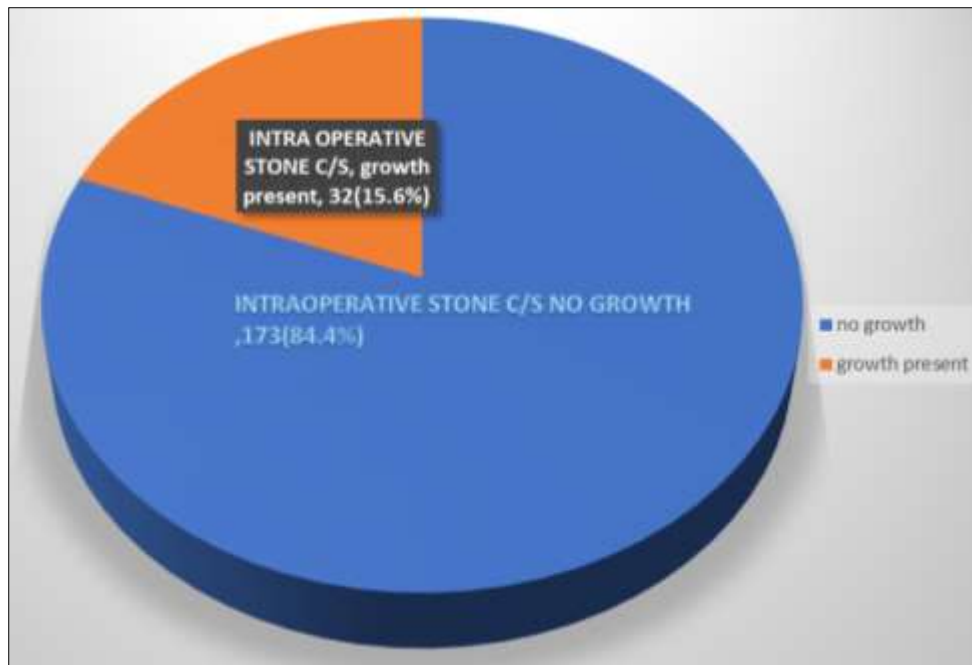
- No pre-operative positive culture was found when urine was examined.

Table 1: Intra operative renal urine culture

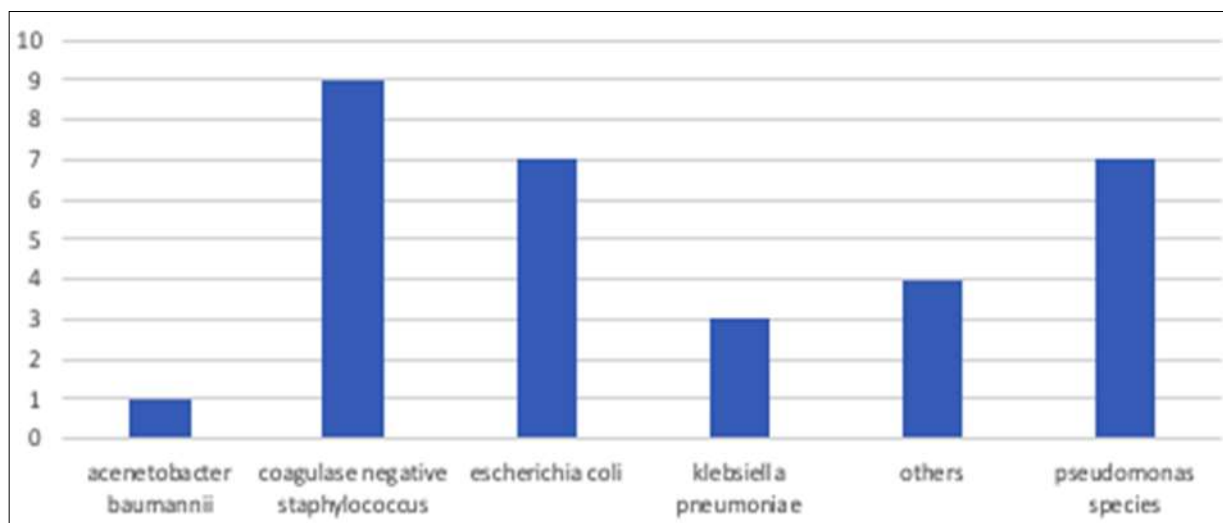
Intra Operative Renal Urine Culture	
growth present	41
No growth	150
Total	191



Graph 1: Intra Operative Renal Urine C/S Organism Type



Graph 2: Intra Operative stone C/S



Graph 3: Intra Operative Renal Stone C/S Organism Type

Discussion

After the operation (PCNL) many complications are encountered although known to be elective surgery which is done in patients with negative urine culture. Some commonly encountered complications are Postoperative urinary tract infections (UTIs), Secondary haemorrhage of infective origin and Surgical site infections (SSIs leading to significant morbidity. Sepsis, bacteruria, septicemic shock are also known. Urine is collected intra-operatively in a sterile container and it is plated in Macconkey Agar and checked for growth. If present then the colony is tested for sensitivity. The urine sample collected in the sterile wide mouth container should be transported to the laboratory immediately. In case of any delay in transit it can be stored in the refrigerator. The urine sample is centrifuged and wet mount is performed. The microscopy is done to check for the pus cells and the bacteria. Followed by microscopy the sample is inoculated into blood agar and MacConkey agar. The inoculation of urine sample is done as per the Kass semi quantitative technique. The growth obtained on the blood agar and MacConkey agar is quantified. The colony count of $>10^5$

Colony Forming Units (CFU) /ml of urine sample is considered significant. Gram stain is performed on the growth obtained in the media. It is then proceeded for biochemical reactions and antibiotic susceptibility testing using the routine antibiotic discs as per the standard CLSI guidelines. Patients with renal calculus undergoing PCNL, stones are collected in BHI (Brain Heart Infusion broth) and sent to Micro-biology Department. Colour changes are recorded after 24 hours and if turned positive it is plated in Muller Hinton Agar Plate. Sensitivity is observed after the procedure.

Alternative method of stone culture; The renal calculi were initially rinsed in the sterile normal saline. Then the calculi were crushed with a sterile saw. The stones were then inoculated into 1 ml of brain heart infusion broth. The broth was incubated at 37 °C for about 18 to 24 hours. The broth was sub cultured onto blood agar and MacConkey agar plate. The isolated organisms were identified by standard techniques. The infections may or may not be detected in pre-operative cultures and the stone actually masks the infection. Post-PCNL infection is known to be much higher in patients with absolute urine pre-operative

negativity. The guidelines recommends for P.C.N.L are 24 hours of antibiotic prophylaxis with either Cephalosporin or Aminoglycoside or Clindamycin or Ampicillin-Sulbactam or Fluoroquinolones. The injudicious use of antibiotics may result in the emergence of Extended Spectrum Beta Lactamases (ESBL) resistant strains. Also other antibiotics are known to be nephrotoxic even though proved to be extensively effective. Among these the 3rd generation cephalosporins are the least nephrotoxic and thus used extensively.

Conclusion

According to our study intra-operative urine and stone culture is a valuable tool for early detection and with prompt early treatment of the infective complication will reduce postoperative morbidity.

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