

Conference Paper

Postoperative Urinary Tract Calculi Culture – Is it necessary in Negative Urine Culture Patients?

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ABSTRACT

Postoperative infection in urinary tract calculi (UTC) cases still become an issue. It is accounted for up to one-tenth of patients experiencing urinary tract infections. Standardized preoperative urine culture help identify bacteria and antibiotic needed for UTC patients. Nevertheless, postoperative infection occurs even though no bacteria were found in urine preoperatively. This descriptive study aims to identify bacteria in calculi. Calculi culture and antibiotic sensitivity tests were carried out in patients with negative urine cultures who underwent endourology procedures from February to June 2022. Thirty-five negative urine culture cases consisting of 23 (46%) males and 12 (24%) females were identified. Positive calculi culture was identified in 11 (31.4%) cases with a previously negative urine culture. *Escherichia coli*, and *Klebsiella pneumoniae* were two prominent bacteria found. Among those patients, 5 (45.5%) cases develop SIRS and required antibiotic changes. Our data suggested added benefit of calculi culture in patients with stone disease, especially one enduring endourology procedure. An extensive study with larger sample size is required to decide whether routine calculi culture examination is necessary.

Keywords: Calculi culture, urine culture, microorganism, endourology procedure

Introduction

Urolithiasis is one of the most predominance urologic disease in Asia, ranging from 1-5% (Sorokin et al., 2017). The prevalence of urolithiasis in Indonesia is currently not available (Rasyid et al., 2018). Urinary tract infection (UTI) known to be related to urinary calculi for quite some time (Trinchieri, 2014). Post-operative infection is accounted for up to one-tenth of a patient who experiences UTI. Urinary tract infection due to calculi induces a systemic response, known as a systemic inflammatory response (SIRS), which can occur before, during, and after stone manipulation. This process happened related to bacterial release into the bloodstream (Songra et al., 2015). SIRS can cultivate urosepsis, multiple organ failures, and even catastrophize to death if not managed accordingly. Preoperative urine culture is a routine procedure to identify bacteria and its susceptibility to antibiotics. Proper antibiotic administration is intended to generate a sterile urine state, hopefully, reducing or diminishing postoperative infection (Wollin et al., 2017). In sterile or no bacterial growth, profilaxis antibiotics are usually administered, but post-operative infection is unavoidable in several cases (Martov et al., 2014). Postoperative calculi culture is not routinely performed in stone surgery cases, previous studies revealed the diverse result. Five studies encourage routine calculi culture examination (Songra et al., 2015; Martov et al., 2014; Gupta et al., 2020; Ashra Mahabani & Kumar, 2022), but two studies suggest the opposite (Osman

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et al., 2016; Elshal et al., 2014). Songra et al. (2015), and Gupta et al. (2020) showed the relevancy of calculi culture in urological procedures, but the included cases were all preoperative urine culture status, positive and negative. Positive urine cultures will be managed with relevant antibiotics, none of those studies emphasized the importance of calculi culture in previously negative urine cultures. Geography and ethnicity variance between those studies with our settings was also taken into account. This study was conducted to evaluate the necessity of calculi culture in negative urine culture patients in our clinical setting.

Material and Methods

After obtaining ethical committee approval, appropriate cases were included in the study. Inclusion criteria were all patients having endourological stone removal procedures with a negative preoperative urine culture. Patients with comorbidities of diabetes and immunological disorders were excluded. Patient's demography characteristics, calculi configuration, and pre and post-operative data were gathered. Calculi culture and antibiotic sensitivity tests were obtained from crushed calculi collected intraoperatively. All patients receive profilaxis of cefazolin based on the hospital infection control committee recommendation. Post-operative SIRS parameters and length of stay are also collected. A descriptive approach will be used to analyze the data obtained.

Results and Discussion

Between February to June 2022, a total of 35 patients that met inclusion criteria were included. Demographic, stone, and peri-operative data are demonstrated in table 1.

Table 1. Demographic, stone, and peri-operative patients' parameters (PCNL: percutaneous nephrolithotripsy, URS: ureterorenoscopy)

	48 (20 – 68)
<i>Demographics</i>	
Age (mean; range)	18 (51.4)
Sex (n; %)	17 (48.6)
Male	
Female	
<i>Calculi configurations</i>	
<i>Location</i>	
Kidney (n, %)	
Right	8 (22.9)
Left	12 (34.3)
Ureter (n, %)	
Proximal	2 (5.7%)
Media	3 (8.6%)
Distal	10 (28.6%)
<i>Procedures</i>	
PCNL + ultrasound lithotripsy	20 (57.1%)
URS + laser lithotripsy	15 (42.9%)
<i>Perioperative parameters</i>	
Preoperative WBC (10^3) (mean; range)	8.5 (3.4 – 10.7)
Postoperative SIRS (n, %)	
Positive calculi culture	5 (14.2)
Negative calculi culture	2 (5.7)
Length of stay (mean, days)	3.2

PCNL was the majority procedure performed in this study, accounting for 57% of cases. URS was in 43% of cases. Both procedures were performed by a single operator with a similar ureterorenoscopy and nephroscope size, using an ultrasound lithotripter for calculi fragmentation in PCNL cases and a holmium laser in URS cases. PCNL was performed solely in ultrasound guidance, ureteroscope was introduced to assess the patency of the ureter and dilate pelvicalyces system (PCS). Renal access and tract dilation were established under ultrasound guidance. Dilation using single dilation technique using Webb-dilators, amplatz sheath introduced, and calculi disintegration and removal performed accordingly. We placed 5Fr double-J stent in all patients at the end of the procedure. URS was performed using a 6/7.5Fr ureteroscope, all stones disintegrate using holmium laser and stone fragments were collected for bacterial culture. In all URS patients, we also placed 5Fr double-J stents as drainage and ureter patency control.

We identified 11 cases (31,4%) with previously negative urine cultures that came out with positive calculi cultures. *Escherichia coli* were detected in five calculi cultures, *Klebsiella pneumoniae* were in four, and *Sphingomonas paucimobilis* in two patients. All with significant bacteria growth of 10^5 colony-forming units.

Among those patients, 5 (45.5%) cases develop SIRS and required antibiotic changes. Three patients were converted to meropenem, and two patients were given trimethoprim/sulfamethoxazol. Four positive calculi culture patients did not develop SIRS, and two patients develop SIRS but can be managed only with symptomatic therapies without the need for alternative or additional antibiotics. All patients with SIRS showed improved clinical condition after symptomatic therapies and antibiotic changes in day five postoperative. No patient develops sepsis or septic shock.

The endourological procedure has become a usual surgical intervention in urological daily practices for calculi patients (Quhal & Seitz, 2021). Some procedures don't involve direct injury to the urinary tract, as in ureterorenoscopy. Others, as in PCNL correlated with injury to renal parenchyma. Both procedures can also cause interference in lymphatic and vascular equilibrium, which may enable the transposition of bacteria from the urinary tract into the bloodstream. The release of bacteria and its endotoxin into the blood may cause responses, named Systemic Inflammatory Response Syndrome (SIRS). SIRS is defined by the involvement of any two of these criteria: body temperature over 38 or under 36 degrees Celsius, heart rate greater than 90 bpm, a respiratory rate greater than 20 bpm, leukocyte count greater than 12000 or less than 4000 /microliters or over 10% immature forms or bands (Chakraborty & Burns, 2022). The most common SIRS event is fever, which is transient and frequently diminishes with conservative approaches. SIRS may progress to sepsis or septic shock, but it is less likely to occur. In our study, SIRS were encountered in 7 (20%) patients, some only require conservative management and some required changes in antibiotics, but neither were clinically significant.

Urine culture has enabled us to pinpoint which antibiotic is required. In case of negative urine culture, usage of prophylaxis antibiotic sometimes is not adequate in certain cases. Theoretically, preoperative antibiotics could not penetrate hence eradicating bacteria inside calculi. Removal of calculi through the surgical procedure will remove bacterial reservoirs. Nevertheless, during fragmentation abundant number of bacteria releases into the surgical field and enter the tissue and the bloodstream through a surgical incision or lymphatic backflow. This condition will be followed by the circulation of bacteria that eventually developed clinical manifestations in a patient in form of SIRS. Prophylactic antibiotics given preoperatively could eradicate those bacteria and prevent infection in post-operative patients, but it would be a problem whenever bacteria already develop resistance against prophylactic antibiotics. In this kind of case, the clinician usually changes the antibiotic with a newer generation or performed a blood or urine culture. Blood or urine culture usually takes 4-7 days to present with a result, therefore stretching the patient's length of stay. Available information on bacteria and antibiotic sensitivities from calculi cultures taken intraoperatively will shorten waiting time for appropriate patient therapies. Thus, in our setting, information of bacteria and its antibiotic sensitivities from calculi culture enable clinician to react faster whenever postoperative infection developed.

In recent years, multiple studies arise to assess the value of calculi culture, most studies promote the usage of calculi culture as a routine examination (Songra et al., 2015; Eswara et al., 2013; Gupta et al., 2020; Ashra Mahabadi & Kumar, 2022). We highly considered the clinical importance of calculi culture in patients with negative preoperative urine culture, as the result enabled the clinician to manage patients with precision. Early management of SIRS also leads to better clinical outcomes, and evade patients from devastating conditions.

Conclusion

Our data suggested added benefit of calculi culture in patients with stone disease with a negative preoperative urine culture. An extensive study with a larger sample size is required to decide whether routine calculi culture examination is necessary

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