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Urology

THE JOURNEY FROM SOIL TO STONE: AN UNUSUAL CASE OF ISOLATION OF PSEUDOMONAS MOSSELII IN RENAL STONE CULTURE

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ABSTRACT Urinary stone cultures have been extensively studied in the past, with regards to their impact on the occurrence of post-operative SIRS/urosepsis, in patients undergoing surgery for upper urinary tract stones. Common bacteria isolated in studies done on urinary stone cultures, are Pseudomonas, Proteus, Escherichia coli and Klebsiella. Pseudomonas mosselii is a soil pathogen that protects plants from fungal and bacterial infections through production of varying metabolites and was first clinically isolated in France, in 2002, and deemed an opportunistic human pathogen [3,4]. In this case report, we highlight the first case in medical literature regarding the occurrence of an unusual organism Pseudomonas mosselii in a renal stone culture, which, to the best of our knowledge, has not been reported in the literature so far.

KEYWORDS : Pseudomonas, Culture, SIRS, Urosepsis

Background: Urinary stones remain a major public health burden. A large number of people are suffering from the problem of urinary stones, all over the globe with an estimated annual incidence of 1%, prevalence of 3–5% and a lifetime risk of 15–25%. About 12% of the Indian population is expected to be affected by urinary stones in their lifetime, out of which approximately 50% may end up with loss of kidney function [1]. Approximately 15% of urinary stones are infective stones. Because urinary stone removal is an elective procedure, patients are ideally required to have a sterile pre-operative urine culture. However, despite this, some patients can be affected by SIRS/urosepsis in the post-operative period; a probable cause of this post-operative event can be due to bacteria harboured by the stone itself. In a study conducted by Songra et al., the organisms isolated from stone cultures from 65 patients undergoing surgery for renal and ureteral calculi, consisted of: Pseudomonas, Klebsiella, Proteus, Escherichia coli, Coagulase negative staphylococcus and Citrobacter [2]. Pseudomonas mosselii can be detected in the rhizospheric soil, deeming it an environmental species [5,6] and causes opportunistic infections in human. In our knowledge, a case of Pseudomonas mosselii has been reported to cause a prosthetic valve endocarditis [7]. Similarly rare Pseudomonad species from unknown natural sources act as opportunistic pathogens which mostly play a role as shuttles for acquired MBL genes.

Case Presentation: A 69-year-old female complaining of right flank pain since the last 3 months, was evaluated using intravenous urography, and found to have a right renal stone, for which she was worked up for elective surgery (percutaneous nephrolithotomy). She did not have any comorbidity nor any history of pyuria, fever (associated with chills) or vomiting. The patient was a known stone former and had previously undergone a right ureteroscopic laser lithotripsy approximately 3 years back. Mini-PNL was done using infra-costal mid-posterior calyceal puncture with a tract size of 17.5 French. A 1.2 x 1 cm stone was present in the renal pelvis. Time required for complete stone clearance, using Holmium:YAG laser (using 550 micron laser fibre, 1 Joule energy, 10 Hertz frequency settings) with the Quanta System (Varese, Samarate, Italy), was 50 minutes. The surgery was performed in the prone position and was uneventful. Postoperative period was also uneventful and the patient was discharged on the 2nd postoperative day. Intra-operative stone samples were washed and sent for stone culture immediately, and detected Pseudomonas mosselii to be the micro-organism contained in the renal stone, upon MALDI-TOF MS analysis.

The protocol followed for stone culture and antimicrobial susceptibility testing, at our institute was as follows:

Few renal stone pieces were picked by sterile loop, rolled on blood agar & CLED agar, and were incubated overnight at 37oC. The remaining pieces with the saline were taken in 10 ml falcon tubes and centrifuged at 3000 rpm for 3 minutes. The sediment and stones were further inoculated directly on blood agar & CLED agar. Also, centrifuged sediment and stones were added to Robertson's Cooked Meat (RCM) Medium and were incubated overnight at 37oC. Next day the RCM was observed for presence of any turbidity, and culture medium for the presence of colonies. In cases of turbidity, the RCM was inoculated on Blood agar and CLED, and was incubated overnight at 37oC. After incubation, all the lactose fermenting and non-lactose fermenting bacteria were identified by MALDI-TOF mass spectrometry (MS).

Antimicrobial susceptibility testing (AST): The AST was performed using the disc diffusion method according to the clinical and laboratory standards institute (CLSI) guidelines (CLSI 2018-M100-S28) by the following antibiotic discs including amikacin (AK), gentamicin (GN), cefotaxime (CTX), ceftazidime (CAZ), ceftriaxone (CRO), imipenem (IMI), meropenem (MRP), cefepime (FEP), ciprofloxacin (CIP), ampicillin (AMP), imipenem and ceftazidime and aztreonam (AZM). Minimum inhibitory concentrations (MICs) of Colistin were determined by broth dilution method. Escherichia coli ATCC 25922 was used as the quality control strain for antimicrobial susceptibility testing. Pseudomonas mosselii was found to be intermediate-sensitive to colistin, in this case, and resistant to all other drugs.

Conclusions: Pseudomonas mosselii is a novel species, which has been characterized in 2002. Despite the wide-ranging prevalence of multiple bacteria in urinary stones, none of the articles in medical literature have reported the presence of Pseudomonas mosselii. In this case, we highlight the rare occurrence of this organism in a renal stone, which is the first reported case in urological literature. The organism was seen to be present in the renal stone of this individual, in spite of the individual not having any comorbidity or immunocompromised state. Although the presence of this opportunistic organism might not have any clinical significance in this particular case, further studies on stone culture are required to elucidate the possible presence of this organism in urinary stone samples (using specialized microbiological detection techniques), since the prevalence/occurrence of this micro-organism in stone samples, might have been underestimated in the past.

List of Abbreviations:

SIRS – Systemic Inflammatory Response Syndrome
YAG – Yttrium Aluminium Garnet
MALDI-TOF - Matrix-assisted laser desorption/ionization-time of flight

CLED - Cystine Lactose Electrolyte Deficient
PNL – Percutaneous nephrolithotomy
MBL - Metallo- Beta- Lactamase
PMF – Peptide Mass Fingerprint

Figure legends:

Fig.1: CLED media (shown in blue) depicting the non-lactose fermenting colonies
Fig. 2: Principle of MALDI-TOF mass spectrometry analysis [8]
Fig. 3: 1000x magnification view in oil immersion field of Pseudomonas species, by light microscopy
Fig. 4: Intravenous urographic film of patient, demonstrating the right renal pelvic calculus with hydronephrosis, in the lower moiety of the duplicated collecting system

Figures:

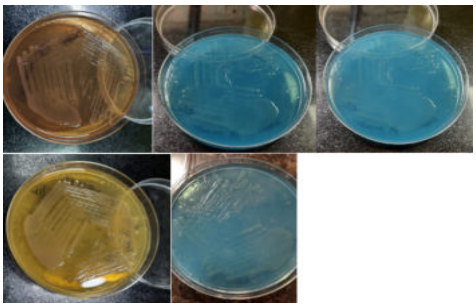

Fig. 1

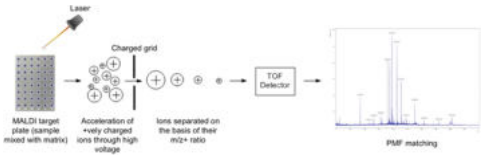

Fig. 2

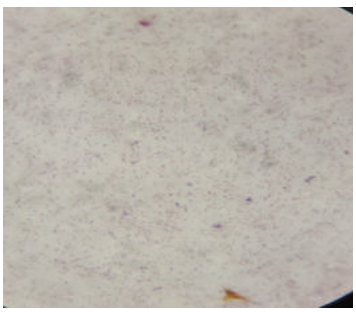

Fig. 3

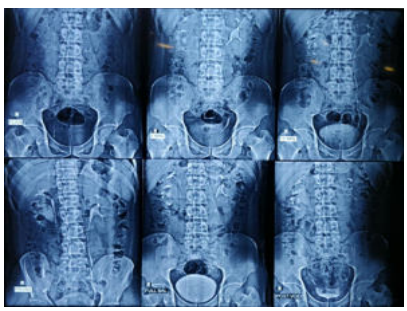

Fig. 4

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