Isolation of *Providencia stuartii* from Clinical Samples : An Emerging Drug Resistant Pathogen

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ABSTRACT

Providencia is a gram negative bacilli belonging to the enterobacteriaceae family and found in soil, water and sewage. *Providencia stuartii* is an opportunistic pathogen in humans and is an uncommon cause of human infection. We isolated *Providencia stuartii* in wound swab and from blood culture. Swab was taken from leg wound in a patient with road traffic accident with degloving of skin. Identification of the organism isolated on blood agar was done by vitek 2 automation method (biometrieux) as *Providencia stuartii* in both the cases. JMS 2017; 20(1):38-40

INTRODUCTION

Providencia is a genus within the *Enterobacteriaceae* family. There are currently 8 recognized species within the genus: *P. alcalifaciens*, *P. burhodogranaeriae*, *P. heimbachae*, *P. rettgeri*, *P. rustigianii*, *P. sneebia*, *P. stuartii*, and *P. vermicola*.^(1,2,3,4) *Providencia* is a Gram-negative, motile bacterium. Some strains (*P. stuartii*) are opportunistic pathogens in humans and can cause urinary tract infections, particularly in patients with long-term indwelling urinary catheters or extensive burns.⁵ *Providencia* species are ubiquitous and can be isolated from urine, the throat, perineum, axilla, stool, blood, and wounds in humans.² *P. stuartii* bloodstream infection is associated clinically with fever, tachycardia, and hypotension.⁶ However, *Providencia* bacteremia is uncommon and few studies on the subject have been published^(7,8,9). The prevalence of *Providencia* bacteremia is low, proper empirical antibiotic therapy is important because *Providencia* species are often resistant to multiple

antibiotics.⁹

Providencia stuartii forms pale colonies on MacConkey agar. It is PPA and methyl red positive. Citrate is utilized and urea is hydrolyzed to ammonia. It is voges proskauer and H₂S negative. They can often be recognized by their 'fruity' smell.

CASE REPORT 1

A 35 year old man non-diabetic, normotensive was admitted in plastic surgery ward with Road traffic accident (RTA) with degloving injury bilateral feet with raw area with dislocation of left ankle. General physical examination was normal. Patient had, Hb-10.8g/dl, TLC-10000 cells/microlitre, DLC- Neutrophil- 83%, lymphocytes-11%, monocyte-06%), PLT-213000 cells/ microlitre, KFT- (Urea-51, creatinine-0.70), LFT (bilirubin-1.06, ALT-21, ALP-63, Albumin-2.8).

Patient was planned for curettage with STSG (split thickness skin graft) under general anesthesia. Intra operative finding (IOF) showed, a raw area about 8-12cm on right foot, raw area on anterolateral aspect of left leg measuring 6 x 14 cm. External fixator was placed in situ. Left leg showed exposed fibula (0.5-1.0 cm). Debridement of gangrenous skin left leg and bilateral foot was done. Post

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operatively patient was treated with IV fluids , Metronidazole, Amikacin and Amoxicillin Clavulanic acid.

A wound swab was send to the department of microbiology for gram staining and culture before the start of antibiotic ,which showed bacterial growth of providencia stuartii. Identification was done manually and confirmed by vitek 2 automation. The drug sensitivity pattern showed sensitive to imipenem and resistant to norfloxacin, ertapenem, cefepime, tetracycline, nitrofurantoin, levofloxacin, cefoperazone/sulbactam. Patient is undergoing treatment in plastic surgery ward and is symptomatically better.

Case 2

A 50 year old normotensive, non-diabetic man with symptoms of fever with chills, high coloured urine with increased frequency of micturition for 3 days came to the out patient department .On examination, there was no significant finding. The patient was seen in general medicine OPD and was advised for routine urine examination and urine culture and sensitivity. On routine urine examination 30-40 pus cells/HPF were seen. Urine culture revealed bacterial growth of *Providencia*. Identification was done by vitek 2 automated method. It was sensitive to imipenem, piperacillin/tazobactam, gentamicin and amikacin and resistant to norfloxacin, ertapenem, cefepime, tetracycline, nitrofurantoin, levofloxacin and cefoperazone/sulbactam.

Patient was treated with amikacin and advised to take plenty of fluids. He was asked to come to the OPD after I week for follow up. The patient had none of the symptoms which were reported earlier and a repeat urine culture was advised which showed no bacterial growth.

DISCUSSION :

Providencia is a gram negative bacterium commonly found in soil, water, and sewage. It is an opportunistic pathogen seen in patients with severe burns or long term indwelling urinary catheters. Elderly individuals are at greater risk for *P.stuartii* infections. In,humans it can be isolated from urine (most common), stool, blood as well as sputum, skin and wound cultures. *P. stuartii* septicaemia is primarily of urinary origin. It is generally multiple antibiotic resistant and treatment should be instituted on the basis of anti-microbial sensitivities, site of infection, cost and comorbid conditions.

Providencia urinary tract infections manifest as typical

features on physical examination, including fever, dry mucous membranes, suprapubic tenderness, and flank pain in pyelonephritis . Complete blood count is used to monitor for leukocytosis or a left shift, which indicates infection. A chemistry panel is used to monitor renal function and complications or toxicities associated with antibiotics.

Providencia species are isolated from urine and blood using standard laboratory media. Most commercially available identification system used in clinical laboratory appears as lactose negative colonies on MacConkey agar . On blood agar colonies are up to 4mm in diameter opaque white glossy and convex (Fig 1).

Figure 1: *Providencia stuartii* on blood agar.

All races appear to be equally susceptible to *Providencia* infection. The genus *Providencia* includes urease-producing gram-negative bacilli that are responsible for a wide range of human infections. *Providencia* infections are uncommon and are usually nosocomial. They represent an emerging problem because of the increasing prevalence of antibiotic resistance secondary to extended-spectrum beta-lactamase (ESBL).

Generally, *Providencia* species are almost always resistant to tetracyclines, older penicillins, and cephalosporins, with susceptibility to late-generation cephalosporins, aztreonam, imipenem, and meropenem. *Providencia* species have variable susceptibilities to fluoroquinolones, aminoglycosides, and trimethoprim-sulfamethoxazole (TMP-SMX) . *P. stuartii* is typically the most resistant of all *Providencia* species.

Carbapenems are the best choice for empirical therapy in life-threatening infections or nosocomial outbreaks suspected to be caused by *P. stuartii* until speciation is confirmed. Amikacin and beta-lactam/beta-lactamase

inhibitors such as piperacillin/tazobactam are good first-line agents in nonlife-threatening infections.⁹

In conclusion providential species should be reviewed as an important cause of opportunistic infection in chronic medical illness and patients with in dwelling catheters. Medical care of *Providencia* infection includes initiation of an antimicrobial agent to eradicate infection. Selection of an empirical agent (while awaiting microbiological identification of the organism and susceptibility testing) should be based on known resistance patterns in the patient's locality (eg, community, hospital, long-term care facility). Amikacin and beta-lactam/beta-lactamase inhibitors such as piperacillin/tazobactam are good first-line agents in nonlife-threatening infections.

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