

Case Report

AN EMERGING THREAT: A RARE NON-FERMENTER IN AN IMMUNOCOMPROMISED PATIENT- SPHINGOMONAS PAUCIMOBILIS FROM A TERTIARY CARE CENTRE

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ABSTRACT

Sphingomonas paucimobilis a rare clinical isolate found in both environmental and hospital settings. This emerging pathogen has been reported to cause a variety of diseases since 1979. It is implicated in both community and hospital acquired infections, especially in patients with immunosuppression. We report a rare case of primary bacteremia by *Sphingomonas paucimobilis* in a 58 years old male patient who was a known case of hypertension and diabetes since 17 years with Chronic Kidney Disease (stage 5) and Coronary Artery Disease. Blood culture yielded *S. paucimobilis* which was found to be sensitive to cotrimoxazole, cefotaxime, piperacillin-tazobactam and polymyxin B and resistant to ampicillin, aminoglycosides, 3rd generation cephalosporins (except cefotaxime), fluoroquinolones, carbapenems and colistin. However, despite proper treatment and supportive measures, the patient developed complications and finally succumbed to refractory sepsis and cardiac arrest. This is the first reported case of *S. paucimobilis* bacteraemia/sepsis from the Punjab state of North India and we therefore suggest early identification of the appropriate adjustments of the treatment plan to avoid shock and possible mortality by this challenging pathogen.

Keywords: *Sphingomonas Paucimobilis, Gram Negative non Fermentative bacilli, Bacteraemia, Immunocompromised Patients, Multiple Drug Resistance, Infection Control*

INTRODUCTION

Infections in the immunocompromised host continue to be a special area of interest with the isolation of uncommon etiological agents. *Sphingomonas* is an aerobic, weakly oxidase-positive, catalase-positive, motile, glucose non-fermenter gram negative rod (Nandy et al., 2013). It has a diverse nutritional substrate spectrum and can be isolated from both environmental and hospital settings such as distilled water, nebulizers and various other medical equipments used in patient care (Ryan et al., 2010). This low virulence organism is a rare opportunistic human pathogen and has been reported to cause a variety of diseases since 1979, especially in immunocompromised hosts. It has been associated with both community acquired and nosocomial diseases including bacteremia, catheter related sepsis, diarrhoeal diseases, peritonitis, meningitis, cutaneous infections, endophthalmitis, visceral infections, urinary tract infections etc. (Nandy et al., 2013).

Injudicious and empirical use of antibiotics has enabled these non-fermenting gram-negative pathogens. It is thus important to clinically correlate and correctly identify them, especially considering their intrinsic multidrug resistance (Chawla et al., 2013). Quinolones or aminoglycosides (either alone or in combination with a β -lactam agent) are the antibiotics of choice in the treatment of infections caused by *Sphingomonas*. Reports exist of β -lactamase production too. Thus treatment should safely be guided by the antibiotic susceptibility studies of the respective isolates only (Krishna et al., 2011).

In this report, we present a case of primary bacteremia by *Sphingomonas paucimobilis* in a 58 years old male who was a known case of hypertension and diabetes since 17 years with Chronic Kidney Disease stage 5 [on Continuous Ambulatory Peritoneal Dialysis (CADP)] with Coronary Artery Disease (CAD).

CASES

A 58 year old male k/c/o hypertension and diabetes since 17 years with chronic kidney diseases on CADP with CAD-unstable angina and anemia was admitted in Christian Medical College & Hospital, Ludhiana

Case Report

with generalized weakness, breathing difficulty and swelling of bilateral feet. He was on treatment for the above mentioned conditions and developed the presenting symptoms which were insidious in onset and progressive in nature. His blood samples were collected under proper aseptic precautions and sent for culture by BD BACTEC 9120 along with complete blood counts and biochemical tests.

The CBC revealed a total leukocyte count of 13,800, Hb-12.2gm% and platelet count of 1,03,000/cumm. Biochemical analysis revealed urea-119mg%, creatinine 12.2mg% and serum electrolyte levels within normal limits.

Multiple blood samples were sent for culture after admission, which were all negative. The sample which was sent on the 15th day of admission indicated a positive growth within 24 hours of collection. Gram staining showed gram negative bacilli, which were non-motile as seen by hanging drop preparation and on semi-solid agar at 37°C. Sub-culture was done on Blood agar and MacConkey agar. On Blood agar-small, circular, smooth, convex, rose with entire edge, deep yellow and non-haemolytic colonies were observed after incubation for 24 hours at 37°C [Figure 1]. Yellow pigmented production was also obtained on Nutrient Agar [Figure 2]. No growth was observed on MacConkey agar. Biochemically, the organism was positive for catalase, oxidase, esculin hydrolysis, arginine dihydrolase and oxidized OF maltose, sucrose and xylose. It was negative for indole, nitrate reduction, urease production, citrate utilization, lysine and ornithine decarboxylase and gelatin liquefaction and sugar fermentation. The reaction on TSI agar slant was alkaline /alkaline with no gas/no H₂S production. The differentiating features of two pathogenic species of *Sphingomonas* (i.e. *S. paucimobilis* & *S. parapaucimobilis*) and *Pseudomonas* has been given in [Table 1].



Figure 1: Colonies of *Sphingomonas paucimobilis* on Blood Agar



Figure 2: Yellow pigmented colonies of *Sphingomonas paucimobilis* on Nutrient Agar

Case Report

Table 1: Differentiating features of *Sphingomonas* and *Pseudomonas* sp.

Characteristics	<i>S.paucimobilis</i>	<i>S.parapaucimobilis</i>	<i>Pseudomonas</i> sp.
Growth in MacConkey agar	-	-	+
Gram stain	GNB	GNB	GNB
Catalase test	+	+	+
Oxidase test*	+	+	+
Indole	-	-	-
Citrate	-	+	+
Esculin	+	+	+/--
H ₂ S in Lead acetate	-	+	-
Polymixin B	S	V	S
Vancomycin	S	S	R
Pigment production	Deep yellow	Deep yellow	Green/blue/yellow /red etc.
Motility**	Motile	Motile	Motile

*In 10% *Sphingomonas* sp.oxidase is negative.

**Motility occurs at 18°C to 22°C.Cannot be detected at 37°C.Moreover in broth culture only a few bacterium are actively motile which makes it difficult to demonstrate motility.

Antibiotic susceptibility was performed in accordance to standard CLSI guidelines by Kirby Bauer's Disc Diffusion method (Clinical Laboratory Standard Institute, 2013). The organism was found to be susceptible to cotrimoxazole, cefotaxime, piperacillin-tazobactam combination and polymyxin B. Resistance was observed to ampicillin, aminoglycosides, 3rd generation Cephalosporins (except cefotaxime), fluoroquinolones, carbapenems and colistin.

The patient was given haemodialysis, ionotropic support, heparin and ventilator support with imipenem and colistin for antibiotic and amphotericin-B for antifungal coverage. However, despite proper treatment and supportive measures, the patient developed complications like type-II respiratory failure, surgical and sub-cutaneous emphysema, haematoma and aneurysm of AV fistula, right lower zone VAP, leucopenia and finally succumbed to refractory sepsis and cardiac arrest after 18 days of hospitalization.

DISCUSSION

Sphingomonas paucimobilis belongs to genus *Sphingomonas* and family Sphingomonadaceae. Homes *et al.*, (1977) named it as *Pseudomonas paucimobilis* to differentiate from *Xanthomonas* on basis of various phenotypic characters. Yabuchi *et al.*, (1990) later reclassified it in 1990 as *Sphingomonas paucimobilis*. Organisms in this genus are gram negative, non-spore forming rods and show sluggish motility (single polar flagellum), hence named *paucimobilis*. They produce yellow or off-white-pigmented colonies on blood agar and are obligate aerobes and produce catalase (Koneman's Color Atlas and Textbook of Diagnostic Microbiology, 2006).

S.paucimobilis and *S.parapaucimobilis* are the only known clinically important species (Koneman's Color Atlas and Textbook of Diagnostic Microbiology, 2006). *Sphingomonas paucimobilis* has been associated with a variety of infections ranging from milder illness to serious ones. Till now the cases reported of *Sphingomonas* have a very low mortality rate and a good prognosis unlike other gram negative bacteria. This can be attributed to the fact that the organism lacks lipo-polysaccharide layer and instead has sphingolipids in the cell wall (Nandy *et al.*, 2013).

The first case of *Sphingomonas paucimobilis* was reported in 1979 in a patient with infectious leg ulcer (Lin *et al.*, 2010). Since 1979 *Sphingomonas paucimobilis* has been reported to cause variety of diseases such as bacteremia, catheter-related sepsis, meningitis, peritonitis, cutaneous infections, visceral abscesses, urinary tract infections, adenitis, and endophthalmitis. It has also been recovered from nebulizers, respirators, dialysis machines, IV fluids and other medical equipments and has been

Case Report

documented to cause infection in the immunocompromised host from various parts of the world including India (Krishna *et al.*, 2011). In India, cases reported so far include one case of UTI by *S. paucimobilis* in a renal transplant patient (Krishna *et al.*, 2011) and Nandy *et al.*, (2013) reported two cases; one patient of Ca gall bladder with metastasis undergoing chemotherapy and another case of 2 year old healthy child admitted with fever.

According to Cheong *et al.*, (2008) second most common type of infection caused by *Sphingomonas paucimobilis* is primary bacteremia. Other reported cases worldwide include community acquired primary bacteremia in children (Bayram *et al.*, 2013), CAPD associated peritonitis in a child (Pascale *et al.*, 2013), osteomyelitis and septic arthritis in immunocompetent patients (Souto *et al.*, 2012), nosocomial bacteremia in malignancy (Lin *et al.*, 2010), diabetic (Kuo *et al.*, 2009) and other immunocompromised patients (Koneman's Color Atlas and Textbook of Diagnostic Microbiology, 2006).

The organism has a variable antibiotic susceptibility pattern. It is reported to be resistant to penicillins and 1st generation cephalosporins, show variable susceptibility towards 3rd generation cephalosporins and fluoroquinolones and sensitivity towards tetracycline, chloramphenicol, aminoglycosides, carbapenems and trimethoprim-sulphamethaxazole (Krishna *et al.*, 2011). Study by Bayram *et al.*, (2013) from Turkey reported 3rd generation cephalosporins or aminoglycosides as the choice of treatment for *S. paucimobilis* infections but reported carbapenems as the most effective therapeutic agents in their study. Whereas Krishna *et al.*, (2011) from India reported quinolones or aminoglycosides (either alone or in combination with a β -lactam agents) as the treatment of choice. In our study the organism was found to be susceptible to cotrimoxazole, cefotaxime, piperacillin-tazobactam and polymyxin B. Resistance was observed to most of the drugs of choice like aminoglycosides, 3rd generation cephalosporins (except cefotaxime), fluoroquinolones and carbapenems. These differing results reinforce the need to treat these infections with individualized antibiotic therapy, guided by the in-vitro susceptibility of each clinical isolate.

Conclusion

Sphingomonas paucimobilis is a rare emerging pathogen and not just a contaminant of environmental and hospital setup. This is the first report of isolation of this organism from the Punjab state of North India in an immune compromised patient with septic shock. Hence this pathogen which showed low virulence in the past should be dealt more cautiously now. Moreover, its mode of spread and source of infection in the community should be studied extensively.

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Case Report

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