

Sphingomonas paucimobilis from Blood Stream Infection to Spondylodiscitis

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Abstract

Sphingomonas paucimobilis, is a yellow-pigmented, aerobic, non-fermentative, gram negative motile bacillus. *S. paucimobilis* which is widely found in nature and hospital environments rarely cause serious or life threatening infections. It's rarely isolated from clinical specimens but it is associated with a great variety of infections in both healthy and immunocompromised people. In this report we present two cases with infection due to *S. paucimobilis*. One of them was systemic blood stream infection and one focal infection. One was immunocompetent and the other with diabetes mellitus for more than ten years. Both of them were community acquired infection due to *S. paucimobilis*. These cases are reported to emphasize that *S. paucimobilis* should be kept in mind as a community acquired infection. We present the first cases of *Sphingomonas paucimobilis* in Albania one of which is a spondylodiscitis in immunocompetent patient and include updated literature concerning infections by this microorganism.

Keywords: *Sphingomonas paucimobilis*; Sepsis; Spondylodiscitis; Infection

Introduction

Sphingomonas paucimobilis is a gram-negative, slightly motile with polar flagellum and non-spore-forming, non-fermentative; oxidase positive and forms yellow-pigmented S colony in blood agar, opportunistic pathogen that rarely causes infections in humans [1,2]. The microorganism is widely found in natural environment, especially in water and soil [1-11]. *Sphingomonas paucimobilis* has been associated with variety of infections ranging from milder illness to serious ones. It has been reported to cause outbreaks of bacteremia among immunocompromised patients especially in hematology and oncology [5-8]. On the other hand it can cause infection in nonimmunocompromised patients. Among *S. paucimobilis* nosocomial infections, osteomyelitis is particularly rare: only 2-3 cases of osteomyelitis are recorded in the literature, both in immunosuppressed patients [10-11]. Till now the cases reported of sphingomonas has a very low mortality rate and a good prognosis unlike other gram negative bacteria. We report two cases of community acquired primary bacteremia by *Sphingomonas paucimobilis*. One of them is a septic shock in an immunocompromised patients and the other is a spondylodiscitis in an immunocompetent. Both of them aren't hospital infections.

Case 1

A 54-year-old female patient operated 4 years before with aortic valve stenosis, actually with mechanic valve, presented in emergency service with intermittent fever for 3 days, chills, altered mental status, and malaise. She had been suffering from diabetes mellitus for more

than 10 years, medicated with oral drugs. During regular visits to the local clinic, the post-prandial finger sugar level always exceeded 200 mg/dl. On admission the patient was: febrile with fever 39.3°C, disorientated, with tachycardia, tachypnea, hypotension and oliguria. Upon admission, blood investigations were as follows: white blood cells (WBC) $21.4 \times 10^6/\text{mm}^3$ (range $4-10 \times 10^6$), hemoglobin level was 12.3 g/dl, elevated of hepatic transaminases ALT was 122 UI/dl (range 0-45) and AST 165 UI/dl (range 0-35), total bilirubina was 4.74 mg/dl (normal <1.2), erythrocyte sedimentation rate (ESR) was 52 mm/h (range 12-18), fibrinogen 535 mg/dl (range 200-400), C-reactive protein (CRP) was 23.7 mg/l (range <0.5), procalcitonine (PCT) 39.8 ng/ml (range 0-2) and HbA1C 10.2%. Based on clinical and laboratory data patient was considered as sepsis with unknown pathogen for the moment. In transthoracic and transesophageal echocardiography we excluded vegetations in aortic valve and in others native valve. In total body magnetic resonance imaging (MRI) were seen ischemic lesions in left brain hemispha, in spleen and in the right kidney. After few hours the patient complicated with acute infarction of inferior myocardial wall and right anterior ventricular wall, fatal arrhythmia, and cardiac arrest. During coronarography we have seen thrombotic lesions in proximal right coronary artery level. We had start treatment with ceftriaxone, metronidazole and moxifloxacin plus supportive therapy. Two sets of hemocultures were taken which both identified *S. paucimobilis* by using Vitek 2 bioMerieux system. Standardized disc diffusion of the organism by the CLSI method showed susceptibility to ceftazidime, ceftriaxone, cefoperazone, cefepime, cefotaxime, ciprofloxacin, moxifloxacin, imipenem, piperacillin-tazobactam, aztreonam, gentamicin, amikacin and trimethoprim/sulfamethoxazole. Based on antibiogramme result we treated with intravenous imipenem 4 g/day plus levofloxacin. She responded well to the treatment and discharged on the sixteenth day.

Case 2

A 56-year-old previously healthy man with no previous medical illness presented to emergency department at a tertiary hospital in Albania in June 2014 with complaints of severe lumbar pain, significant difficulty in movement, inability in anterior and lateral flexion of vertebral column, numbness of the legs and fever for more than three months. Upon admission, blood investigations were as follows: WBC $7.6 \times 10^6/\text{mm}^3$, hemoglobin level 10.2 g/dl and inflammatory tests as below: CRP 73.1 mg/dl, fibrinogen 627 mg/dl, ESR 55 mm/h. On CT scan we evidenced: Bone erosion of the intervertebral disc with the generalized and prolaboration of lateral sinister disc and foramina in L2-L3. Observed soft tissue edema and iliopsoas muscle at this level without regard for discal hernia. Conclusion L2-L3 spondylodiscitis. On MRI of lumbar colone we observed: Inflammatory lesion with global discal bulging in L2-L3. Heterogeneous infansemment of lesion after iv contrast media administration with bone edema of respective vertebral body's.

Intervertebral disc lesion in L2-L3 vertebral bodies with inflammation in L2 and L3 and paravertebral soft tissue. Spinal canal and medullar cones in normal position. These images was in favor of the L2-L3 spondylodiscitis. The patient resulted negative for brucellosis, tuberculosis and hemocultures to. In aspiration cultures from vertebral column was isolated: *Sphingomonas paucimobilis* (with susceptibility to gentamicin, amikacin, ciprofloxacin, moxifloxacin, imipenem, trimethoprim/sulphamethoxazoli, ceftazidime and cefepime). After receiving the antibiogram was initiated therapy with imipenem plus ciprofloxacin for 21 days. After therapy was evidenced clinical improvement of the patient in sense of: significantly reduction of pain, improved mobility, reduction of inflammatory parameters and slightly improved imaging framework. He became outpatient and continued orally therapy for another 4 weeks with ciprofloxacin and trimethoprim/sulphamethoxazole. We followed him for more than 4 months and he was recovered (Figure 1).



Figure 1: a,b,c. Inflammatory lesion with global discal bulging in L2-L3. Heterogeneous infansemment of lesion after iv contrast media administration with bone edema of respective vertebral body's.

Discussion

S. paucimobilis was first reported to cause human infection in 1977, some others reported first cases in 1979 that masqueraded for years as *Pseudomonas paucimobilis* [1-7]. It was renamed *Sphingomonas paucimobilis* in 1990 based on phylogenetic data. One of the best known species of the genus is *S. paucimobilis*, thus named because it has a single polar flagellum with slow motility [12]. The bacteria is widely found in natural environment, especially in water and soil, but it have been isolated from hospital water supplies, respirators, stocked distilled water, blood, wounds, hospital dialysis equipment, patients with meningitis, septicemia, bacteremia, peritonitis, wound infections, soil, river water, deep subsurface sediments, corroding copper pipes, drinking water, rhizosphere and surfaces of plants [5-7,11]. Because of its ability to survive in low nutrient conditions, oligotrophic niches, reverse osmosis systems, dialysate and ventilators have been implicated as sources of infection. Another undesirable property of this pathogen is that it is capable of forming a biofilm that can cause metal corrosion of plumbing systems and biofouling of drinking water and industrial water distribution systems [12]. Localized corrosion of copper cold-water pipes results in surface erosions, covered tubercles, and through-wall pinhole pits on the pipe inner surface [11,13]. Maybe this ability of it can explain the osteoarticular damage's like in our second case. Human infections caused by *S. paucimobilis* are rare [5,9,14]. Since 1977 it has been

reported to cause variety of diseases from various parts of the world. This organism is responsible for two types of infection in humans: sporadic or community-acquired infections, probably of endogenous or environmental origin (bacteremia, urinary tract infection, wound infection even meningitis); and nosocomial infections associated with the contamination of sterile fluids employed in hospitals [15]. On the other side it can cause infections in immunocompromised hosts as well as in healthy individuals. Both of our cases presented here, are of community acquired primary bacteremia, as the symptoms appeared before admission to the hospital. One of them (case 1) is a diabetic patient for more than 10 years. She was obese, HbA1C was so high and she treated with oral drugs. Case 2 was an immunocompetent patient, without malignity or chronic diseases. *S. paucimobilis* is an opportunistic pathogen and identification of the organism from clinical specimen is rare. It has been isolated from blood in most of cases presented in literature, sputum, urine, wound, bile, and cerebrospinal fluid. In our cases we identified as *S. paucimobilis* by using Vitek 2 (bioMerieux, France) system. *S. paucimobilis* bacteremia had been reported mainly in patients with indwelling devices or in immunocompromised host, especially those with neutropenia, but our two cases haven't neutropenia [6,13]. Infection from *S. paucimobilis* can presented as primary bacteremia, intravascular catheter infections, peritoneal dialysis-associated peritonitis, ventilator-associated pneumonia, biliary tract infection, urinary tract infection, cutaneous

infection, meningitis, myositis, osteomyelitis, septic arthritis, endophthalmitis, cervical adenitis, bromhidrosis, diarrheal disease and septic shock [6,7,13,16]. Primary bacteremia, like in our case 1, was defined as *S. paucimobilis* bacteremia with signs of sepsis but without an identifiable focus of infection. In our report we have two different cases. One systemic infection and one focal infection. The systemic infection in immunocompromised diabetic patient and the focal infection in immunocompetent patient. And the most important question is; how this pathogen reached to cause a spondylodiscitis? The last is an inflammation of the intervertebral disc and neighboring vertebrae included and vertebral body. Pathogens can infect the spine via three routes: by haematogenous spread, by direct external inoculation, or by spread from contiguous tissues. The haematogenous arterial route is predominant, allowing seeding of infection from distant sites onto the vertebral column. Several blood tests resulted negative in our second case. Multiple studies report predisposing factors like diabetes. Diabetes mellitus is the most commonly identified risk factor, but others include advanced age, malignancy, immunosuppression, injecting drug use, renal failure, rheumatologic disease, liver cirrhosis and previous spinal surgery [6]. In our second cases none of them didn't resulted. The patient didn't do any instrumental examination on vertebral column. He didn't suffer from any diseases before admission on hospital. Belong to the antibiotic therapy, the organism has been reported to be resistant to penicillin and first-generation cephalosporin's because of the production of chromosomally encoded beta-lactamase production and susceptible to tetracycline, chloramphenicol, aminoglycosides, carbapenems, fluoroquinolone and trimethoprim/sulphamethaxazole [6,17,18]. Aminoglycoside plus a third-generation cephalosporin have been recommended as suitable antibiotics for treatment of *S. paucimobilis* infections in previous study [6]. Carbapenem may be another good treatment choice because of its high susceptibility rate. In our study, it was found to be susceptible to ceftazidime, ceftriaxone, cefoperazone, cefepime, cefotaxime, ciprofloxacin, imipenem, piperacillin-tazobactam, aztreonam, amikasin and gentamicin and trimethoprim/sulfamethoxazole. In both of our cases we have used a combination of imipenem plus fluoroquinolones.

Conclusion

S. paucimobilis is widely distributed in nature and has been isolated from water distribution systems. Although *S. paucimobilis* is a rare hospital infection, it should be kept in mind as a cause, by virtue of the fact that it is a part of the flora in natural environment, especially in patients with immunosuppressive diseases and patients who have other underlying diseases. Thus, even if it is a microorganism of low clinical virulence, its importance cannot be neglected. More importantly this organism has been reported to cause septic shock in immunocompromised patient, and has been increasingly detected recently. The last but no more less important we don't forget it in immunocompetent patient.

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