

Nosocomial Infections and Cases of *Sphingomonas Paucimobilis*

Nosokomiyal Enfeksiyonlar ve *Sphingomonas Paucimobilis*: Olguların Sunumu

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Abstract

Sphingomonas paucimobilis (*S. paucimobilis*), especially in patients with immune suppressive and very rare in healthy people, attracted attention recently, causing nosocomial infections, is a gram-negative, aerobic bacillus. This bacterial nosocomial infection in our hospital as a first six-month period, six times was isolated from five patients. These five patients were acute peritonitis, vaginal cuff, surgical field, soft tissue and bloodstream infection. The identification of microbiological methods known to *S. paucimobilis* was examined by the antibiotic sensitivity disk diffusion test. Antibiotic sensitivity of the isolated bacteria were the same. From the environment and environment cultures *S. paucimobilis* was isolated once from the use water as a hospital infection effect. It was realized that the chlorination of hospital waters was inadequate during that period. Our hospital was thought to have a small epidemic. In conclusion, *S. paucimobilis* has recently been investigated in the context of literature with the belief that a new nosocomial infection will be affected.

Öz

Sphingomonas paucimobilis (*S. paucimobilis*) özellikle immünsüpresif hastalarda ve sağlıklı insanlarda oldukça nadir görülen, son zamanlarda dikkati çeken, nozokomiyal enfeksiyonlara neden olan, gram-negatif, aerobik bir basildir. Bu bakteri hastanemizde ilk altı aylık bir süreç içerisinde nozokomiyal enfeksiyon etkeni olarak, beş hastadan altı kez izole edildi. Toplam beş hasta; akut peritonit, vaginal cuff, cerrahi alan, yumuşak doku ve kan yolu enfeksiyonu idi. *S. paucimobilis*'in identifikasyonu bilinen mikrobiyolojik yöntemlerle, antibiyotik duyarlılığı ise disk difüzyon testi ile incelendi. İzole edilen bakterilerin antibiyotik duyarlılığı aynı idi. Yapılan çevre ve ortam kültürlerinden *S. paucimobilis* hastane enfeksiyon etkeni olarak bir kez kullanım suyundan izole edildi. O süreç içerisinde hastane sularının klorlamasının yetersiz olduğu fark edildi. Hastanemizde küçük bir epidemi olduğu düşünüldü. Sonuçta *S. paucimobilis* son zamanlarda yeni bir nozokomiyal enfeksiyon etkeni olacağı düşünülerek literatür eşliğinde olgularla irdelendi.

Introduction

Sphingomonas paucimobilis (*S. paucimobilis*), a non-fermentative gram-negative bacillus, has recently begun to be reported as a causative pathogen in rare cases of nosocomial infections (1-4). This bacterium has been shown to be an opportunistic pathogen in environmental samples just like other opportunistic non-fermentative bacteria, especially in immunosuppressive, diabetic and cirrhotic cases (5-14). This micro-organism is a bacterium with poor pathogenicity (12-18), which has the property of being found in low carbon environment (oligotrophic), water, nature and soil. Especially in hospitalized patients, *S. paucimobilis* has been reported as a catheter-associated bacteremia, sepsis, meningitis, peritonitis, genito-urinary, skin and wound infections (6-10). This bacterium has been reported to be community and hospital infections in Turkey and other countries, which are sometimes transmitted by water and food (9,16-22).

In this presentation, five nosocomial infections due to *S. paucimobilis* seen in the hospital within a period of six months were discussed in the context of the literature.

Case Report

In a university hospital in 2008, *S. paucimobilis* was isolated by conventional methods from six clinical specimens of five patients over a period of six

months. In the hospital microbiology laboratory, the demographic and clinical information of the patients in whom the agent was isolated and the culture samples were belonged to infectious diseases were evaluated by the consul general practitioner.

Identification of the patients: The clinical data were collected from all data records by interviewing the patients with *S. paucimobilis*, the laboratory supervisor, the consultant physician and the clinician in cooperation. Diagnosis, treatment and follow-up of patients were made according to centers for disease control criteria for nosocomial infection (1,2). Environment and patient-use materials were cultured for possible contamination.

Antibiotic sensitivity: The antibiotic sensitivity test of seven *S. paucimobilis* isolates isolated from a total of five patients and one drinking water was carried out by Mueller Hinton agar with disc diffusion method.

Within a total period of 6 months, *S. paucimobilis* was isolated six times from five patients identified as nosocomial infection due to *S. paucimobilis* and once from the use water. The demographic data of the cases are shown in Table 1. Antibiotograms of all isolates were prepared by disk diffusion method; cefazolin, cefepime, cefotaxime and ciprofloxacin are resistant; ampicillin x sulbactam, gentamycin, imipenem, piperacillin x tazobactam, co-trimoxazole, cefaperazone x sulbactam and levofloxacin were found to be sensitive. Antibiotic sensitivity tests of strains that could not be genotypically screened

Table 1. Isolated nosocomial *Sphingomonas paucimobilis* infections and demographic data of patients

Age/genus	Where isolated	Clinical findings	Comorbid sick	Therapy	Results
54/male	Blood culture and peritoneal fluid	Fever/vomiting/nausea/abdominal pain	Chronic renal failure (Ambulatory peritoneal dialysis since 5 years)	Ampicilline plus sulbactam	Recovery
55/women	Vaginal cuff	Abdominal pain and vaginal discharge	Endocervical cancer and chemotherapy	Imipenem plus gentamysine	Recovery
67/male	Wound culture from surgical incision	Postoperative surgical incision infection	Cholangio carcinoma	Sefaperazon plus sulbactam	Recovery
63/women	Wound culture from decubitus	Nosocomial soft tissue infection	Multiple myelomatosis	Levofloksasin	Recovery
56/male	Blood culture	Blood stream infection	Hodgking lymphoma and chemotherapy	Piperacillin plus tazobactam	Death

as a molecular were the same. Insulation from any place other than the use water could not be made in the environment survey. When we retrospectively analyzed the 5 cases of our study, we found that all of the cases of ciprofloxacin and the underlying malignancy of the second immunodeficiency epidemic were detected.

Examination of the cases and the underlying risk factors: The first case was a 54-year-old male patient had been on regular peritoneal dialysis to treat chronic renal failure for 3 years. The patient was admitted to the emergency department with fever, nausea and vomiting, and hospitalised for acute pyelonephritis pre-diagnosis and taken for empirical treatment with ciprofloxacin. *E. coli* was produced in the urine culture of the patient and the urine culture was negative on the 5th day of treatment. On the 8th day of hospitalization, fever, abdominal pain and turbidity were seen in the peritoneal dialysis fluid when the patient's treatment was monitored to be completed at the 10th day. *S. paucimobilis* was isolated in the blood and peritoneal fluid cultures. The patient was treated with ampicillin x sulbactam.

Second case; A 55-year-old female patient with endocervical cancer diagnosis and postoperative chemotherapy treatment. The patient had been in hospital for a month. *S. paucimobilis* was isolated from the vaginal cuff culture when the patient complained of fever, abdominal pain and purulent vaginal discharge. The underlying risk factors were diabetes, malignancy and long-term antibiotic use (ciprofloxacin and cefazolin). The patient was treated with a combination of imipenem and gentamycin.

Third case; A 67-year-old male patient who was operated on for cholangiocarcinoma. On the 34th day of the hospitalization, *S. paucimobilis* was isolated from the purine stream developed at the site of abdominal incision, in culture. There was an underlying malignancy story. Previously, the treatment of ciprofloxacin and ceftriaxone was replaced with cefoperazone x sulbactam. After ten days of treatment the patient was discharged with the recovery of the incision site.

Fourth case; A 63-year-old female patient who had been diagnosed with multiple myeloma since long-term follow-up. The patient was on the 45th day of his admission. *S. paucimobilis* was isolated from cultures of the patient's dorsal rupture of decubitus ulcers

in the back and hips. The patient was treated with levofloxacin and wound care. No regrowth was found in the control cultures of the wounded patients.

In the third and fourth cases, information was obtained that they used ciprofloxacin in advance of the urinary system infection.

Fifth case; A 56-year-old male patient with a Hodking Lymphoma that has been seen since long time. The case was followed up for 12 days in the hospital with the cause of febrile neutropenia after 4th cure chemotherapy and taken for carbapenem and ciprofloxacin treatment. *S. paucimobilis* was isolated in a blood culture taken at the height of the fever (38.9 °C) when the patient's discharge was considered. Although the patient was treated with piperacillin x tazobactam, she died of severe respiratory failure on 20th day of admission. All cases have been taken with the informed consent form.

Discussion

S. paucimobilis previously known as *Pseudomonas paucimobilis* non-fermentatif gram-negative bacilli, which is a slow moving eyelashes one polar (3,4,19). Bacteria are found in nature, in soil, in water, in the environment outside, and rarely cause nosocomial infections (5,9,12,15-17). In nosocomial infections, where endogenous florans predominate, *S. paucimobilis* is often contaminated by the contamination of sterile solutions (5,6,9). Pathogenicity of the bacteria, although weak, especially when it is stated that patients be treated with immunosuppressive and hematological history is with a 5.5% mortality (12,17). Glupczynski et al. (19) first reported peritonitis in the literature and then Hsueh et al. (17) have isolated a total of eleven *S. paucimobilis* from six patients, influencing nosocomial infection in the large study they performed in 1995-96. In the literature, it has been reported that *S. paucimobilis* is associated with ventilator-associated pneumonia, intravascular catheter infection, wound infection, urinary tract infection, biliary tract infection, and all patients have been treated (14,17,18). In some publications, it has been reported that the patient's blood culture is long-standing and the removal of the catheter allows eradication of the bacterium (3,4,6,8,13).

Our first case was a case with peritoneal dialysis and acute peritonitis was shown in the hospital while

it was seen as urinary system infection. We thought that the patient would have infected *S. paucimobilis* during peritoneal dialysis. Since the peritoneal exchange fluids used are sterile and ready, the agent may be contaminated from the outside. In the case of peritoneal dialysis performed in the hospital, *S. paucimobilis* was detected as an effective pathogen in the developing nosocomial peritonitis and treated with appropriate antibiotic. In this case, it was thought that it could be transmitted from outside environment through the hands and environment culture, but the source was not found. The isolation of the same bacterium from other patients over the next six months of this episode has caught our attention to a possible nosocomial epidemic. Isolation from a waiting cell with utility water in the constructed environment is done.

In our country and abroad, occasionally isolation of peritoneal fluids is occurred (6,8,17,18). Dervisoglu et al. (6) have isolated *S. paucimobilis* in the peritoneal fluid of a patient undergoing chronic ambulatory peritoneal dialysis and have shown that this bacteria remains in the patient's peritoneal fluid for 17 days despite appropriate antibiotic therapy. Some authors have reported that bacterial peritoneal fluid isolation is terminated after changing the patient's catheter in their presentations (3,6). When case-based analysis was performed, *S. paucimobilis* was isolated from both blood and peritoneal fluid (8,17-19). Maragakis et al. (5) detected *S. paucimobilis* bacteremia in a total of six patients and thought that they were contaminated with intravenous fentanyl, but could not isolate bacteria from closed solutions. Likewise, *S. paucimobilis* infections, which are transmitted by water in coronary intensive care patients and hematologic-oncologic outbreaks, have been reported in studies reported by our country (9,10,13). Willke et al. (9) showed *S. paucimobilis* distilled water used in the oxygen flowmeter, to the coronary intensive care patients by molecular examination method. We thought that we could be contaminated by water that was used from outside. But we have not done molecular studies. All isolated strains showed the same sensitivity of antibiotics.

S. paucimobilis was isolated from the vaginal cuff culture taken during hospitalization in the second case presented. This phenomenon has not been reported in English sources yet. Having the underlying malignancy of the patient, performing interventional

procedures, and antibiotic use predispose to nosocomial infection. Likewise, the third, fourth and fifth cases are immunosuppressive patients and have multiple risk factors for *S. paucimobilis* infection. The third and fourth cases were thought to be contagious during the dressing and wound care of the bacterium, and during the intravenous application of the fifth case. In the studies conducted, in the development of *S. paucimobilis* infections, as preparatory factors; alcohol use, diabetes and ciprofloxacin have been reported as risk factors (3,11,12,17). Toh et al. (12) reported a total of 55 nosocomial *S. paucimobilis* infections in a four-year study and reported diabetes and alcoholism as underlying factors. The authors reported that 63 of *S. paucimobilis* isolates from 61 patients in this study, half of them reported that they were community-acquired infections and the other half of them commonly had lower respiratory tract infections in hospital-acquired infections (12).

While the second, third and fourth cases were cured with treatment, our fifth case died despite appropriate treatment. Despite the presence of a weak pathogen, the *S. paucimobilis* causative pathogen can be seen as having high morbidity and mortality in immunosuppressive cases. In many studies, when *S. paucimobilis* was not treated as a pathogen, it was associated with high mortality in immunosuppressive patients, with 40-58% of ciprofloxacin resistance (4,7,11,15). In retrospective studies conducted in our country, Turhanoglu and Bilman (20) have isolated this bacterium in 83 materials, including the most sputum, in a ten-year review according to laboratory data. Bayram et al. (21) defined 11 of the 24 cases as nosocomial infection. *S. paucimobilis* infections with poor pathogenicity but on different clinical tables are more mortal, especially in immunosuppressive patients (3,5,12,17,19).

Five cases presented are immunosuppressive patients. The use of broad spectrum antibiotics in the literature of these patients is also a risk factor. In the examination of the cases, there are preparatory factors for the development of *S. paucimobilis* infections, such as ciprofloxacin using history and being immunosuppressive patients. For the first case, it was understood that the risk factors identified in their follow-up were inadequate chlorination and pending distilled waters. When this rare bacterium was isolated from other patients, environmental cultures were taken as a possible risk factor for

Table 2. Nosocomial *Sphingomonas paucimobilis* cases followed up to date (total 45 cases)

Autors name	Country	Underlying causes	Number	Clinic findings	Where isolyted	Result	Sources
Yozgat Y.	Turkiye	Rheumatic fever	1	Septic shock	Blood	Recovery	Indian J Med Microbiol. 2014
Gil Diaz A.	Canary islands	Diabetes mellitus	1	Hepatitis	Blood	Recovery	Ir J Med Sci. 2014
Pascale R.	Italy	Chronic osteomyelitis	1	Surgical incision infection	Purulent material	Recovery	
Bayram N.	Turkiye	4 febril neutropenie, one burn, one imperfore anus,	11	Bacteriemia, catheter infections	Blood	Recovery	
Lanoix JP.	France	Lynphoma	1	Bacteriemia, catheter infections	Blood	Recovery	Med Mal Infect. 2012
Thompson SM.	England	Surgical procedure	1	Surgical incision infection	Patien used material	Recovery	Ann R Coll Surg Engl. 2011
Kriet MM.	France	Postpartum panophtalmitis	1	Ophthalmitis	Purulent tears	Recovery	Bull Soc Belge Ophthalmol. 2011
Özdemir M.	Turkiye	Down syndrome	1	Pnemoniae	Blood	Recovery	Int J Med Sci. 2011
Mutlu M.	Turkiye	Neonatal	11	Bacteriemia, catheter infection	Hospital using water	Recovery	Indian Pediatr. 2011
Meric M.	Turkiye	Cardiac operation	2	Pneumoniae	Hospital using water	Recovery	J Infect. 2009
Bulut C.	Turkiye	Ventriculoperitoneal şunt	1	Bacteriemia, catheter infection	Blood	Recovery	Mikrobiyol Bul. 2008
Kilic A.	Turkiye	Lynphoma, leucemia, neuroblastoma	4	Bacteriemia	Blood and hospital using water	Recovery	Jpn J Infect Dis. 2007
Lee JU.	Kore	Peritoneal dialysis	1	Bacteriemia, catheter infection	Blood	Recovery	Kidney Research and Clinical Practice. 2012
Perola O.	Finland	Leukemia	1	Bacteriemia	Blood and hospital using water	Recovery	J Hosp Infect. 2002
Hsueh PR.	Taiwan	Cholangio carcimamatosi, breast cancer, wound, cranial taruma, adenocarcinomatosis	6	Cholangitis, urinary tract infection, wound infection, pneumoniae	Blood, bile, wound, urine	Recovery	Clin Infect Dis. 1998
Krishna S.	India	Renal transplant	1	Urinary tract infection	Urine	Recovery	Int. J. Med. Public Health. 2011

contamination and the same bacteria were isolated from a pending water bomb only. As an infection control team, it was noticed that the hospital waters had not been adequately chlorinated at that time and the necessary precautions were taken, thus preventing a possible major epidemic. In these cases

it is thought that the possible infectious use water can be passed through the hospital staff or through the use water. In the second six months of follow-up we did not identify *S. paucimobilis* and other infection. Seeing gram-negative cocobacil and yellow-colored colonies in routine culture has helped us to

define *S. paucimobilis*. Four of the presented cases were completely healed after appropriate antibiotic treatment. Despite the appropriate antibiotic treatment, the fifth case was lost with developing respiratory failure and septic shock. In our hospital, *S. paucimobilis* was isolated six times in total. The fact that our cases are seen in a period of six months and there is no subsequent isolation confirms that this bacterium may rarely affect hospital infection. The antibiotic susceptibility of the cases varies according to region and country and in "Table 2" we tried to compile similar nosocomial *S. paucimobilis* infections as reported in our country and abroad.

As a result, *S. paucimobilis*, a rare pathogen, can be recognized by a particularly careful laboratory examination and treated with antibiotics that are sensitive.

A total of 45 *S. paucimobilis* related nosocomial infections are reported in the Turkish and English literature review and in PubMed screening until 2015. Especially in opportunistic infections that develop in immunosuppressive patients, environmental contamination should be considered. In this presentation, it has been revealed that it is necessary to be aware of the isolation of *S. paucimobilis* in the microbiology laboratory. Because the nosocomial epidemics that will be seen with the negative environmental conditions in the hospital, we need to be careful in *S. paucimobilis* isolations that we believe will become an important nosocomial pathogen in the future.

Ethics

Informed Consent: All cases have been taken with the informed consent form.

Peer-review: Internally peer-reviewed.

Authorship Contributions

Surgical and Medical Practices: F.S., Concept: F.S., E.B., Design: F.S., E.B., Data Collection or Processing: F.S., O.K., E.B., Literature Search: A.O., O.K., Writing: F.S., P.B.

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