



Sphingomonas Paucimobilis : A Rare Infectious Agent Found in Cerebrospinal Fluid

Tuncer Göker, M.D.,¹ Rahile Zülal Aşık, M.D.,¹ Muhammet Bahadır Yılmaz, M.D.,¹ İlhami Çelik, M.D.,² Ayhan Tekiner, M.D.¹

Departments of Neurosurgery,¹ Infectious Diseases,² Ministry of Health, Training and Research Hospital, Kayseri, Turkey

Sphingomonas paucimobilis (*S. paucimobilis*) is a gram negative bacillus. It has existed in soil, drinking water and plants. It has been isolated from distilled water tanks, respirators, and hemodialysis devices at the hospital setting. Patients with chronic disorders or immune suppression may be susceptible to infections with it. This microorganism has also been reported to infect healthy persons. Both nosocomial and community-acquired infections have been reported. So far, a variety of infections have been reported, including sepsis, septic pulmonary embolism, septic arthritis, peritonitis, and endophthalmitis. Only 2 cases of meningitis have been reported so far in the literature. So far, no previous reports of culture proliferation have been reported in patients with external ventricular drains, as was the case in our patient. Therefore, our case is the first to have *S. paucimobilis* proliferation in cerebrospinal fluid culture during intensive care unit stay for an external ventricular drain.

Key Words : *Sphingomonas paucimobilis* · External ventricular drain · Bacteria · Infection · Cerebrospinal fluid.

INTRODUCTION

Sphingomonas paucimobilis (*S. paucimobilis*) is a non-fermentative, aerobic, gram negative bacillus first described in 1990^{7,12,13}. It is oxidase and catalase positive. It is a nonspore-forming bacillus characterized by a yellow pigment production and motility with its polar flagellum^{12,13}. It may cause both nosocomial and community-acquired infections, albeit rarely. It has been reported to proliferate in distilled water, hemodialysis fluids, and sterile drug solutions. It can infect particularly persons with chronic diseases or immune suppression^{1,10}. Although meningitis associated with *S. paucimobilis* has been previously reported, no proliferation has been reported in patients with an external ventricular drain^{5,12}. The patient reported herein is the first patient who had *S. pauci-*

mobilis proliferation in cerebrospinal fluid (CSF) culture while being followed at the intensive care unit for an extra ventricular drain (EVD).

CASE REPORT

A previously healthy 48-year-old woman admitted to emergency department with sudden-onset speech disturbance and worsening general status. In neurological examination the patient was unconscious, pupils were normal, light reflex +/-, eyes deviated to left, and there was an abnormal flexor response to painful stimuli. The Glasgow coma scale (GCS) was 5/15. There were no signs of meningeal irritation or stiff neck. There was no fever, either. The laboratory examinations were

• Received : February 13, 2014 • Revised : May 17, 2014 • Accepted : June 7, 2014

• Address for reprints : **Muhammet Bahadır Yılmaz, M.D.**

Department of Neurosurgery, Ministry of Health, Training and Research Hospital, Sanayi Mah. Atatürk Bulvarı Hastane Cad. No :78, 38010 Kayseri, Turkey
Tel : +90-505-319-23-65, Fax : +90-352-320-73-13, E-mail : mbahadiryilmaz@yahoo.com.tr

This is an Open Access article distributed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/4.0>) which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

Table 1. Summary of previous and present reported cases

Patient	Age/sex	History	Clinical presentation	Neurological examination	Radiological examination	Outcome
Hajiroussou et al. (1979) ⁵⁾	39/M	Seizure	Headache, seizure	Sign of meningitis	No information	Discharged
Tai and Velayuthan (2014) ¹²⁾	31/M	Open wound in leg	Appetite and weight loss, bacteremia, meningitis	Sign of meningitis	Contrast revealed meningeal enhancement and cerebral oedema	Exitus
Present case (2014)	48/F	Healthy	Speech disturbance and worsening general status	GCS : 5/15, no signs of meningeal irritation or stiff neck	Basal ganglia and intra-ventricular hemorrhage. No evidence of infection	Exitus from heart failure

normal. A computerized brain tomography revealed a 4×4 cm hemorrhagic lesion in the basal ganglia, which opened into the left lateral ventricle leading to hydrocephalus. An external ventricular drain was placed against intraventricular hemorrhage and hydrocephalus. No permanent ventriculoperitoneal shunt was placed since a bloody CSF drainage with a high protein content was observed. The patient could not tolerate closure of the drainage because of hydrocephalus. Thus, wound and catheter care were repeated and a new external ventricular drainage catheter was placed every ten days. During the same period prophylactic ceftriaxone therapy was also administered. Daily CSF smears and cultures were sent, and gram negative bacilli were seen in CSF gram staining at 23rd day. Laboratory results at that period were as follows : white blood cell and neutrophil rate were normal. CRP : 221 mgr/L, and sedimentation rate : 25 mm/h. The patient did not have fever. She also had no signs of meningeal irritation or stiff neck. No evidence of infection was detected on brain CT with contrast. The infectious diseases department was consulted and meropenem 3×1000 mg (I.V) was begun. On 25th day *S. paucimobilis* proliferated in CSF culture. It was resistant to colistin but sensitive to meropenem and gentamycin in antibiotic sensitivity test. No culture proliferation was observed in CSF, tracheal aspirate, and blood culture sent 1 day after the onset of meropenem therapy. Tests for immune insufficiency were all negative. Immunoglobulin levels were within normal levels. No sign of infection was detected on follow-up brain CTs. The patient died from heart failure on 46th day of admission.

DISCUSSION

S. paucimobilis was first isolated by Holmes et al. and named as *Pseudomonas paucimobilis* in 1977⁶⁾. The microorganism was renamed by Yabuuchi et al.¹³⁾ as *S. paucimobilis* in 1990. Currently, it has more than 30 subspecies¹⁰⁾. It has been shown to exist in soil, drinking water, and plants. At the hospital setting it has been isolated from distilled water tanks, respirators, and hemodialysis devices^{2,4,9)}. Although it is known to have a low virulence, it may cause bacteremia and septicemia¹²⁾. It may cause both nosocomial and community-acquired pneumonia with a mortality potential¹²⁾.

Despite it often leads to infections in persons having certain conditions such as immune suppression, malignancy, and diabetes, it has also been reported to infect previously healthy persons. Balkwill et al.¹⁾ reported that, although there may be certain predisposing conditions, it may not be always possible to determine the source of the infection. Lin et al.⁸⁾ evaluated 16 cases with *S. paucimobilis* bacteremia and found a malignancy rate of 57.1% and a diabetes rate of 40.5%. So far, a variety of infections have been reported with this microorganism, such as sepsis, septic pulmonary embolism, septic arthritis, peritonitis, and endophthalmitis^{3,7,11,12)}.

The bacteria called *Pseudomonas paucimobilis* were later renamed as *S. paucimobilis* in the literature. Therefore, the report of Hajiroussou et al.⁵⁾ dating back to 1979 can be considered as the first report on meningitis caused by *S. paucimobilis* (Table 1). In that report, the patient presented with seizure and headache and was diagnosed with meningitis. *S. paucimobilis* was subsequently isolated from CSF⁵⁾. In that paper a 39-year-

old man with meningitis caused by *Pseudomonas paucimobilis* was presented. The second case of meningitis in the literature was the one reported by Tai and Velayuthan¹²⁾ (Table 1). In that report, the patient was a farmer who received the microorganism through an open wound in his leg. The patient developed bacteremia and meningitis later on. Thus, the authors suggested that the organism might have been soil borne¹²⁾.

It has been reported that *S. paucimobilis* responded well to fluoroquinolones, a combination of beta lactam and beta lactamase, and carbapenem whereas it was resistant to penicillin and first generation cephalosporins^{8,12)}. In our patient meropenem was begun as the initial antimicrobial therapy and continued upon repeated negative CSF, tracheal aspirate, and blood cultures.

Our patient had no predisposing factor to *S. paucimobilis* infection with the exception of having an EVD hydrocephalus secondary to intraventricular hemorrhage. The immunoglobulin levels of our patient were within normal levels and no apparent immune suppression was present. Since we did not previously encounter this agent at our intensive care unit and we applied sterile techniques while sampling CSF, the possibility of contamination was considered unlikely. In agreement with Balkwill et al.¹⁾ who reported that the source of infection often cannot be determined, we could not determine the source of infection in our patient.

CONCLUSION

In conclusion, *S. paucimobilis* is an infectious agent that is prevalent in nature but may also be isolated at the hospital setting. It can lead to nosocomial or community-acquired infections. Although it can be eliminated with prophylactic therapy, sensitivity pattern should be definitely studied to determine the optimal treatment.

References

1. Balkwill DL, Frederikson JK, Romine MF : Sphingomonas and related genera in Dworkin M, Falkow S, Rosenberg E, Schleifer KH, Stackebrand R (eds) : **The Prokaryotes : An Electronic Revolving Resource for the Microbiological Community**, 3rd ed. New York : Springer Verlag, 2006, pp605-629
2. Crane LR, Tagle LC, Palutke WA : Outbreak of pseudomonas paucimobilis in an intensive care facility. **JAMA** **246** : 985-987, 1981
3. Dervisoglu E, Meric M, Kalender B, Sengul E : Sphingomonas paucimobilis peritonitis: a case report and literature review. **Perit Dial Int** **28** : 547-550, 2008
4. Faden H, Britt M, Epstein B : Sinus contamination with Pseudomonas paucimobilis: a pseudoepidemic due to contaminated irrigation fluid. **Infect Control** **2** : 233-235, 1981
5. Hajjirossou V, Holmes B, Bullas J, Pinning CA : Meningitis caused by Pseudomonas paucimobilis. **J Clin Pathol** **32** : 953-955, 1979
6. Holmes B, Owen RJ, Evans A, Malnick H, Willcox WR : Pseudomonas paucimobilis, a new species isolated from Human Clinical Specimens, the hospital environment, and other sources. **Int J Syst Bacteriol** **27** : 133-146, 1977
7. Kuo IC, Lu PL, Lin WR, Lin CY, Chang YW, Chen TC, et al. : Sphingomonas paucimobilis bacteraemia and septic arthritis in a diabetic patient presenting with septic pulmonary emboli. **J Med Microbiol** **58(Pt 9)** : 1259-1263, 2009
8. Lin JN, Lai CH, Chen YH, Lin HL, Huang CK, Chen WF, et al. : Sphingomonas paucimobilis bacteremia in humans: 16 case reports and a literature review. **J Microbiol Immunol Infect** **43** : 35-42, 2010
9. Reina J, Bassa A, Llopart I, Portela D, Borrell N : Infections with Pseudomonas paucimobilis: report of four cases and review. **Rev Infect Dis** **13** : 1072-1076, 1991
10. Ryan MP, Adley CC : Sphingomonas paucimobilis: a persistent Gram-negative nosocomial infectious organism. **J Hosp Infect** **75** : 153-157, 2010
11. Seo SW, Chung IY, Kim E, Park JM : A case of postoperative Sphingomonas paucimobilis endophthalmitis after cataract extraction. **Korean J Ophthalmol** **22** : 63-65, 2008
12. Tai ML, Velayuthan RD : Sphingomonas paucimobilis : an unusual cause of meningitis-case report. **Neurol Med Chir (Tokyo)** **54** : 337-340, 2014
13. Yabuuchi E, Yano I, Oyaizu H, Hashimoto Y, Ezaki T, Yamamoto H : Proposals of Sphingomonas paucimobilis gen. nov. and comb. nov., Sphingomonas parapaucimobilis sp. nov., Sphingomonas yanoikuyae sp. nov., Sphingomonas adhaesiva sp. nov., Sphingomonas capsulata comb. nov., and two genospecies of the genus Sphingomonas. **Microbiol Immunol** **34** : 99-119, 1990