

How Did that Happen? Case Report of a Rarely Heard Bacteria *Staphylococcus Pettenkoferi* and Meningoencephalitis and Brain Abscess

Emine Kübra Dindar Demiray¹, Gökmen Reyhanlı^{2*}, and Ozan Aydoğdu³

¹Bitlis Public Hospital, Department of Infectious Diseases and Clinical Microbiology, Bitlis, Turkey

²Bitlis Tatvan Public Hospital, Department of Brain and Neurosurgery, Bitlis, Turkey

³Erciş State Hospital, Department of Brain and Neurosurgery, Van, Turkey

Received: 13 August 2023

Accepted: 15 February 2024

*Corresponding author: e.kubradindar@hotmail.com

DOI 10.5001/omj.2026.22

Abstract

Meningitis is inflammation of the pia and arachnoid membrane surrounding the brain and spinal cord. Brain abscesses are suppurative infections that develop in the parenchyma tissue of the brain. Both these diseases can be of external origin such as trauma and surgical intervention, or it can be of internal origin as a complication due to congenital heart disease, endocarditis, intrathoracic and abdominal infections based circulatory infections, otitis media, tonsillitis, sinusitis and dental caries. In this case report, 33 year old Turkish male patient who had no diagnosis of any disease before was admitted to Hospital with sudden chills, nausea and vomiting. Diffuse brain edema was detected in the (Computed tomography) CT scan. Decompressive surgery was performed on the patient by the neurosurgeons as an emergency. *Staphylococcus pettenkoferi* was isolated from the patient as a result of peripheral blood culture and brain tissue culture performed with the preliminary diagnosis of meningitis. It was learned that the patient had a low socioeconomic level and was addicted to alcohol. In the presence of predisposing factors, it should be kept in mind that many microorganisms found as normal flora elements in the body can cause serious infections.

Keywords: *Staphylococcus Pettenkoferi*, Meningitis, Brain Abscess

Introduction

The genus *Staphylococcus* consists of more than 40 species and subspecies that are ubiquitous in nature and can colonize or infect a wide variety of animals. In addition to coagulase positive *Staphylococcus aureus* *subsp. aureus*, coagulase negative *staphylococci* (CoNS) are among the most frequently isolated bacterial species clinically. CoNS can settle in foreign bodies such as intravenous catheters, prosthetic heart valves and joint prostheses as nosocomial pathogens and cause infection in patients.¹ In addition, they infect premature babies, patients with malignant diseases, patients receiving chemotherapy and patients with organ transplants.^{2,3} Two strains of CoNS of human origin have been isolated and identified as "*Staphylococcus pettenkoferi*"^{4,5}, but this name has not yet become popular in literature. Worldwide, CoNS is among the most common organisms causing nosocomial bacteremia.⁶ *S. pettenkoferi* accepted as a new member of CoNS.

Case Report

A 33-year-old Turkish male patient was admitted to the emergency service with a poor general condition. The patient complained of chills, nausea and vomiting from the morning. Afterwards, he developed unconsciousness, involuntary swaying movements in his arms and legs. In his clinical examination Glasgow Coma Scale: 11, Oxygen Saturation: 96%, Heart Rate 100/minute, Respiratory Rate 32/minute, Blood Pressure 150/90 mmHg. In Neurosurgery consultation, he is unconscious, pupils are dilated, indirect light reflex (ILR) is absent in both eyes, Painful stimulus is more localized to the left upper extremity. There is movement in the right upper extremity. Deep Tendon Reflexes (DTR) +/- . Nuchal rigidity was not detected. In laboratory tests; white blood cell (Wbc) was 23 cells/mm³ (4,50-11,00), C-reactive protein (CRP) was 102 mg/L (5-10), Procalcitonin: 20 ng/mL (0-5) and the erythrocyte sedimentation rate (ESR) was 96 mm/h (0 – 20). There were no pathological findings in other biochemical tests. Anti-HCV, Anti-HIV tests of the patient were negative. Fever: 37.4 celcius (C).

In the physical examination, there was no rash on inspection. Blood culture of the patient was taken. Emergency brain (Computed tomography) CT and brain diffusion (Magnetic resonance imaging) MRI was taken. Bleeding was not observed in the report, diffuse cerebral edema was observed. Cerebral edema which was evident in the apparent diffusion coefficient (ADC) sequence in MRI due to the absence of bleeding and no covering lesions, neurosurgery recommended consultation with infectious diseases with a preliminary diagnosis of (Central Nervous System) CNS infection. Due to a suspicious history of seizures, the patient was recommended 1500 mg levetiracetam intravenous (iv) first then as a maintain dosage 2x500 mg levetiracetam infusion (inf.) with the recommendation of Infectious Diseases consultation, broad-spectrum Meropenem 3x2 gr flk, Vancomycin 2x1 gr flk and Acyclovir 3x800 mg flk was empirically started.

On the 2nd day, the patient underwent contrast-enhanced cranial MRI. Widespread cerebral edema and tonsillar herniation were observed on MRI. The patient was intubated. Emergency decompressive surgery was performed by neurosurgery. After bilateral decompressive hemicraniectomy, bilateral star-shaped opening of the dura, the necrotic and pus-filled cerebrum was washed [Figure 1]. It was observed that the necrotic pus tissue organized and showed abscess formation. Brain tissue culture was taken. The bones were embedded anteriorly, each on its own side. Anti-edema treatment at the maximum level was initiated for the patient. Sitradine support was started due to the low blood pressure of the patient during the follow-ups. Antibiotherapy doses were regulated in the follow-ups due to disorder of liver function tests and kidney function tests. Nephrology and Gastroenterology were consulted. In the follow-ups, in the control MRI, 'In the sections passing through the supratentorial level; Cortical widespread signal increase and diffusion restriction are observed in these areas. The sulci are noticeably erased. The findings were reported as 'primarily suggestive of meningoencephalitis. Due to high urea creatinine and electrolyte imbalance in his current biochemistry, he was taken to dialysis. The patient is on daily dialysis. There was growth in the patient's brain tissue and peripheral blood culture. Catalase positive growth, *Staphylococcal* spp. was confirmed by gram staining. Polymerase Chain Reaction (PCR) was performed to detect the presence of methicillin resistance and to distinguish the strain from *S. aureus*. Therefore, neither nuc nor mecA genes were detected; which indicates that this is a coagulase-negative methicillin-susceptible *Staphylococcus* spp. confirmed that it was. Growth on Matrix Assisted Laser Desorption/Ionization Time-of-Flight Mass Spectrometry (MALDI-ToF MS) resulted in *S. pettenkopheri*. It was inoculated on blood agar (BA) and Sensitivity was investigated [Figure 2 and Table 1]. The general condition of the patient, who was added methicillin in addition to his treatment, deteriorated and cardiac arrest occurred. The patient, who did not respond to cardiopulmonary resuscitation for 50 minutes, was accepted as ex in 7 days of follow-up, although CRP regressed.

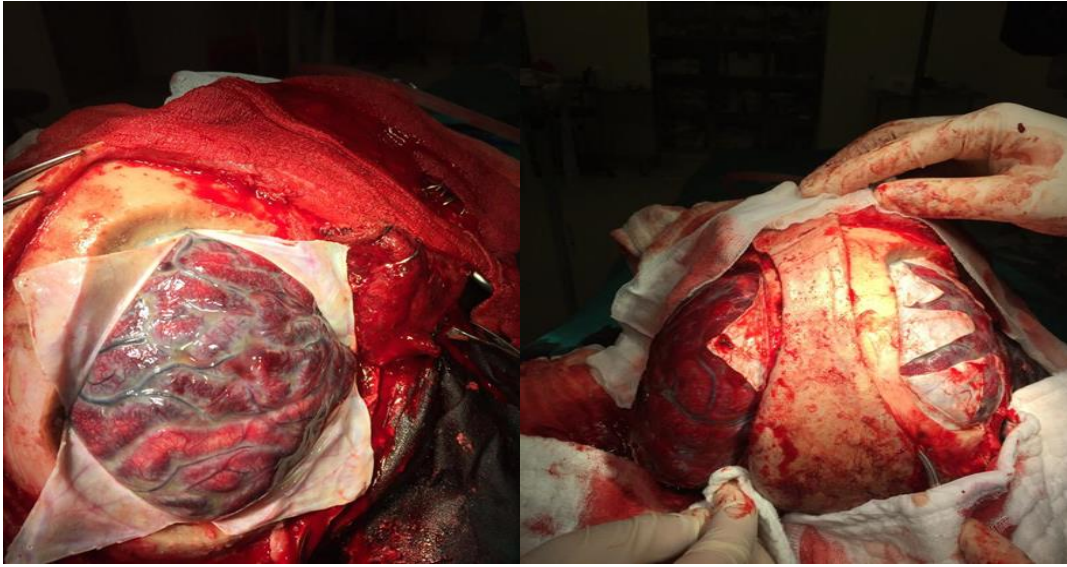


Figure 1: Intraoperative Image.

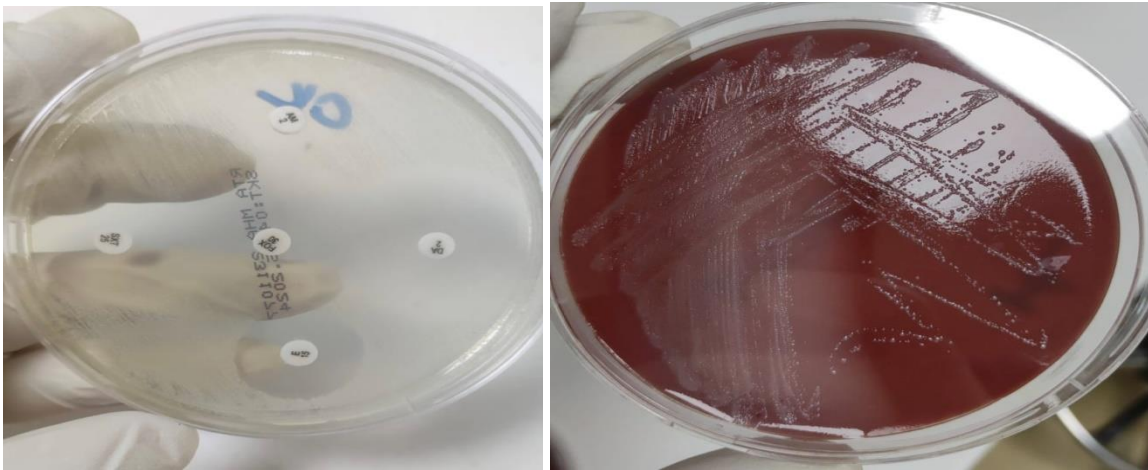


Figure 2: *S. Pettenkoferi* in blood agar (BA) and Disc Diffusion Test (DDT).

Table 1: Susceptibility Test.

İlaç	Duyarlılık
Clindamycin (DA)	S ≤0.25 mg/L
Erythromycin (E)	S 0.5 mg/L
Methicillin/Sefoksitin (FOX)	S 2 mg/L
TMP/SMZ (SXT)	S ≤ 10mg/L
Vancomycin (VA)	S 1mg/L

Discussion

There are not many studies on this bacterium in the literature. Although it presented as bacteremia, osteomyelitis, and wound infection; meningoencephalitis was found to be the causative agent in this reported case. It should not be forgotten that it may occur in gram-positive central nervous system infections. In 2002, it was first isolated from the blood of a 25 year old woman with extrapulmonary tuberculosis, then from the wound of a 76 year old patient with leukemia and DM.⁴ The same study group

reported three more isolates of *S. pettenkopheri* from different patients in 2007.⁵ A case of osteomyelitis caused by this bacterium was reported in the same year.⁷ In another new study, it was found to be a causative agent in Prosthetic Joint Infection.⁸

Since 2002 till 2024, cases of infection by this strain have been reported in countries around the world, including Germany, Belgium, France, South Korea, Italy, Brazil, Mexico and the UK. One of the reported case,⁹ bacteria grew in the peripheral blood culture of a 75 year old female patient, who was admitted to the emergency department after falling unconscious at home. A few days before admission, there were symptoms consistent with vertigo. She had a history of hypertension, type 2 diabetes mellitus, psoriasis, dyslipidemia, and epilepsy. It was stated that the patient was evaluated for a planned total knee arthroplasty 1 week ago and it was postponed after the patient had a trunk rash that had been present for two weeks. It was stated that after 2 days of vancomycin treatment, the patient's treatment with 2 gr IV cloxacillin was revised and then she recovered. There are case reports of elderly patients with this bacterium.^{4,5,8,10} In addition, there are cases of premature patients and patients aged 9, 15, and 17 years. It has been stated that patients aged 9,15 years have congenital genetic diseases.^{4,5,11} In a published case from China, a 17-year-old patient similarly exhibited dermatological manifestations¹²

In the cases published in the literature so far, there have been cases of all ages. There is no predisposition to infection was observed in terms of age and gender. In most cases, growth was observed in blood culture (at least 2 bottles / one set), and in 1 case, growth was observed in bone biopsy. In this case, growth was detected in brain tissue and blood culture. Treatment success was observed in most of the cases, but the majority of the patients who died either had cancer, major surgery, or severe immunosuppression like followed up with Acquired Immune Deficiency Syndrome (AIDS), hepatitis C, cerebral toxoplasmosis). When we look at the underlying disease of the cases, there are diseases such as pulmonary tuberculosis, extrapulmonary tuberculosis, diabetes mellitus, leukemia, prematurity, AIDS, senilite immunosupresyon cause of Gastric Cancer /Lung Cancer, Chronic Obstructive Pulmonary Disease (COPD), hepatitis C.^{8,9,13-16}

Infections may present as central system infections after causing bacteremia. As the infection spreads, it may lead to various complications such as skull base osteomyelitis. Additionally, progressive osteomyelitis can cause cranial polyneuropathy.^{14,17} The fact that the patient in this case was admitted to the emergency department and seen in many different clinics makes us think that the infection has spread to the brain tissue, and the image during the operation supports this. In this case, the patient does not have an underlying disease. Blood-borne diseases also tested negative. However, when his social life was examined, it was learned that he used alcohol. Alcohol consumption at an early age has many adverse effects on people's health. It is known that frequent and long-term alcohol use suppresses the immune system.^{18,19} Literature review revealed bacterial infection in patients with alcohol and drug addiction. Consequently, it was accepted as the causative agent of endocarditis in a 28-year-old African-American patient with an underlying disease who used marijuana.^{16,20}

In a retrospective study conducted in the USA, *S. pettenkoferi* growth was detected in approximately 80 patients, only those over the age of 18 were included, and 3 of them were followed up with immunosuppressive therapy. However, bacteria were not considered as the real causative agent in any of them.²¹

After the identification of the bacterium, clinicians recognized it as the causative agent in cases where two or more biological cultures exhibited growth without the presence of any other potential pathogens. Demographic and clinical data of patients with cases documented in the literature since 2002 for this bacterium, which is considered to be the causative agent, were compiled. The treatment protocol as described in the collected cases has been provided. However, there is a lack of information regarding the frequency and dosage. Patients should be evaluated with their clinical presentation [Table 2].

Table 2. Demographic and clinic data of patients.^{4-13,15,16,20-22}

Age/sex	Infection Patern	Underlying Conditions	Clinic	Treatment	Outcome	Country
25/F	CA	Extrapulmoner Tbc	Bacteremia	?	Recovered	Belgium

76/M	CA	Leukemia, DM	W.E	Vancomycin	Recovered	S.Korea
?	CA	?	O.M	?	?	Germany
49/M	NOCL	Post-traumatic hydrocephalus	Fever	Daptomycin+ Piperacillin-tazobactam	Died	Italy
63/M	CA	Diabetes	DFI, OM	Ampicillin+Pristinamycin	Recovered	France
Pre	NOCL	?	Fever	?	?	Belgium
56/?	CA	?	Fever	?	?	Brazil
Pre's (2)	NOCL?	None	Fever	Ampicillin, Amikacin	Recovered?	Mexico UK
45/M	CA	AIDS,Hepatitis C,Cerebral Toxoplazmosis	Fever	Clindamycin, TMP/SMZ, Azithromycin, Amphotericin-B	Died	Mexico
75/F	CA	HT,DM,Psoriasis	Bacteremia	Vancomycin	Recovered	Canada
33/M	CA	Alcohol Addict?	ME	Meropenem, Vancomycin, Asiklovir, Metisilin	Died	Turkey
3 cases?	NOCL	?	Fever	?	?	Japan
28/M	CA	MS,Using synthetic marijuana	E.cardit	?	Recovered	USA
81/F	CA	CAD,HT	PJI	Vancomycin, Daptomycin,Rifampin	Recovered	USA
17/M	CA	None	Fever, Pustulosis	Linezolid	Recovered	Chine
73/M	CA	Immunsuppression, Rituximab treatment	Extremity weakness, abdominal pain	Vancomycin	?	USA
9/F	NOCL?	Epileptic Encephalopathy	Fever	Vancomycin	Recovered	Japan
15/M	NOCL?	Chromosomal abnormality, Epilepsy	Fever	Vancomycin	Recovered	Japan
72/M	CA	DM,Chronic Alcoholic,HT	Septik Shock	Ceftriaxone	?	S.Korea
38/F	CA	Chemotherapy of Gastric Cancer	Fever	Metisilin	Recovered	S.Korea
90/F	CA	Senilite	Fever,Encephalilitis?	Naficilin	?	S.Korea
88/F	CA	Alzheimer's,COPD	Fever	Tigecyclin,Rifampin	Recovered	Italy
79/F	CA	Smallcell Lung Carcinoma	Fever	Meropenem,Vancomycin, Azithromycin	Died	USA
86/M	NOCL	AAA Surgery	Septic Shock	Meropenem,Clindamycin etc.	Died	Italy

Cases that have entered the literature since 2002. NOCL-Nasocomial; CA-Cominity-acquired; D.M-Diabetes Mellitus; HT-Hypertansion; O.M-osteomyelitis; Bact.-Bactremia; M.E-Meningoensefalitis; DFI-Diabetic Foot Infection; CAD-Coronary Arter Diseases; AAA- Abdominal Aort Aneurysm; COPD- Chronic obstructive pulmonary disease.

Early identification of predisposing factors is a very important warning that brain abscess may develop. Cerebrospinal fluid (CSF) collection is recommended in high-risk patients for early diagnosis and effective treatment of central system infections ve It is critical for clinicians to include this condition in the differential diagnosis.²³ In this case, CSF was not taken due to diffuse brain edema and tonsillar herniation, but the agent was grown in direct peripheral blood culture and brain tissue culture. This was considered sufficient for preemptive treatment. Unfortunately, surveillance of the patient was not sufficient for further differential diagnosis.

Today, the use of MALDI-ToF in species determination, different bacteria are detected as infection agents. This may lead to increased reports of *S. pettenkoferi* infection in the future. Again, although early diagnosis and treatment can be achieved with the developments in neurosurgery and the development of imaging methods, sometimes clinical problems occur. In addition to surgical treatment, appropriate medical treatment is decisive for the prognosis in brain abscesses.²⁴⁻²⁶

Conclusion

Based on published studies and opinions, it can be stated that *S. pettenkoferi* is a human and animal commensal bacterium. On the other hand, recognizing the true bacteraemia is critical to taking further steps in patient care.²⁷ It should not be forgotten that in the presence of predisposing factors, many microorganisms present as normal flora elements in the body can cause serious infections.²⁸ When this bacterium is detected, it is thought that it is appropriate to consider it as an infectious agent rather than a contaminant and start preemptive treatment. Although there was no known underlying disease in the case, the diagnosis was investigated by taking culture. This actually facilitated the importance of culture taking and the rapid initiation of diagnosis-oriented treatment in treatments. It is important for clinicians to know that they may encounter different factors. *S. pettenkoferi* is one of them. This case shows a different clinical reflection of a rarely heard bacterium. Therefore, it is valuable. In addition, it should not be forgotten that many microorganisms present as normal flora in the body can cause serious infections in the presence of predisposing factors.

Disclosure

The authors declared no conflicts of interest.

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